



PATRÍCIA CRISTINA DO NASCIMENTO SOUTO

The Knowing Work Practice
as Situational Creation of Meaning

A Study to Facilitate the Communication of Knowledge



ACADEMIC DISSERTATION

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Department of Information Studies and Interactive Media

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Distribution
Bookshop TAJU
P.O. Box 617
33014 University of Tampere
Finland

Tel. +358 3 3551 6055
Fax +358 3 3551 7685
taju@uta.fi
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The research, the development and the writing of this thesis are totally dedicated to my mother, Clarita Maria do Nascimento, for her loving encouragement and endless support during this learning journey.

With deepest and eternal gratitude,

Patrícia Cristina do Nascimento Souto

Abstract

The work of creating knowledge to ground business strategies and actions, i.e. the knowing work, is essentially a meaning creation practice. The creation of knowledge is one of the most unstructured and difficult work practices to be facilitated and supported. The knowing work practice presents a particular nature and dynamics that is marked by emergent, unplanned and situational sense-making, demanding different approaches to communicate knowledge as inputs to and products of such practice. The distinct nature of knowing work needs to be accounted for when knowledge is communicated to support it. So far, prior research has not considered how such knowledge is situationally needed and used for meaning creation in practice. Thus, there has been a disconnection between how knowledge is needed and used for knowing and how knowledge is communicated for such practice.

In order to propose ways to reduce this disconnection, the present research investigated how knowing work is accomplished as a situational meaning creation or sense-making practice, and how the situationality of this practice was brought to life. A practice-based perspective was taken by drawing on the theoretical assumptions of the tacit knowing theory of Michael Polanyi and Sense-Making Methodology as developed by Brenda Dervin. The empirical study of knowing work was informed by Sense-Making Methodology. The empirical data were gathered in 2007-2008 by in-depth interviews with 36 knowledge workers whose primary work is knowledge creation for business (in England, UK). As a result, 36 knowledge creation situations with 100 input-encountering moments were analyzed qualitatively and quantitatively.

The study evidenced that the situationality is a major aspect of meaning creation in the knowing work practice. Five knowing situations in knowing work were identified. The ways in which knowledge workers defined why and how they need knowledge for their meaning creation differed across the five knowing situations, thus evidencing the situationality of their meaning creation acts. The configurations of the five knowing situations reveal the patterns and differences in how meaning was created, and how knowledge was situationally needed and used for meaning creation within knowing work. The ways in which knowledge workers needed and were helped by knowledge (input) was driven by the appropriateness of such knowledge in relation to the meanings they needed to create. Furthermore, meanings were situationally created by interpretive actions that were

predominantly related to interpreting and incorporating the tacit dimension of individuals' knowledge. Finally, how knowledge was mobilized, activated and used for knowing practice was marked by emergent, unplanned, and synergistic actions.

To support such an emergent and situational work practice as knowing, the communication of knowledge has to be adaptive to the different ways that individuals need and use knowledge for their meaning creation in different points in time and space, i.e. situationally. The findings also indicate that it is necessary to facilitate the communication of and the access to the tacit dimension of knowledge by means of conversational practices and competencies, and to ensure the access to knowledgeable individuals in consonance with knowing. In addition, the findings suggest the need of a balanced approach in communicating both dimensions of knowledge (tacit and explicit) to facilitate knowing work.

At the theoretical level, the findings imply that in research focusing on knowing practices for strategy in for-profit-knowledge-intensive organizations, the situationality of knowing and the uses of knowledge for such practice can be approached in a more concrete way, thus opening the 'black box' of such situationality. The present study empirically evidenced the situationality of knowing. Importantly, the study considerably enriches the Polanyi's sense-giving process or communication of knowledge.

At a practical level, the main implication of the findings is that the communication of knowledge for knowing can be elaborated by drawing on the frameworks generated by the study to make the adaptivity to situationality happen. The study generated practical frameworks – the Knowing Situation Building Blocks, the Situational Conversation for Tacit<ing>, and the Knowing-Situations-Based User Modeling – that reflect the aspects of knowing as a situational meaning creation practice. They are used to help with attuning the communication of knowledge to the knowing practice, i.e. to situational meaning creation. The communication of knowledge becomes closer to the knowing work practice, enabling the effective use of time and efforts, and reducing complexity in accessing, reusing and recreating knowledge in an ever-challenging and changing business environment.

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PART I – INTRODUCTION

CHAPTER 1: INTRODUCTION

Judge a man by his questions rather than his answers.

Voltaire

The most important, and indeed the truly unique, contribution of management in the 20th century was the fifty-fold increase in the productivity of the manual worker in manufacturing. The most important contribution management needs to make in the 21st century is similarly to increase the productivity of knowledge work and knowledge workers.

Peter Drucker (1999)

1.1 Introducing

The current chapter explains the research context, purpose and questions, and it briefly conceptualizes the main terms used throughout the dissertation. The purpose of the chapter is to help comprehending the issues that the present research is addressing in the context of knowledge creation for strategy in for-profit business organizations.

The research reported here is about knowledge creation and communication for business strategy at the level of situational meaning creation¹. It provides a distinct perspective to understand how knowledge is situationally mobilized, used, and enacted in knowing, and how these situational actions for meaning creation can be considered in the access to and communication of knowledge. The present study will evidence how meaning is situationally created, and how the main knowing situations are structured in the knowing work. In addition, the study suggests an approach for communicating and accessing knowledge in consonance with the situational creation of meaning for which this knowledge is needed and used.

The current study addresses a practical organizational challenge that is the access to and the communication of knowledge that should facilitate and support the creation of new knowledge. How can knowledge workers access and communicate knowledge in a way closer to how it is needed and used for the creation of new meanings, in practice?

The creation of meanings or new knowledge to ground business strategies that is accomplished in for-profit organizations is the context of the study (i.e. knowing work). This is performed by knowledge workers who are primarily focused in creating knowledge and knowledge-based solutions to support organizations strategies and actions: internal or external consultants, analysts, strategists, planners and researchers.

The dissertation suggests that as knowing work is a situated practice of meaning creation, this situationality and meaning creation practice should be taken into account in the access to and in the communication of knowledge. When creating approaches to facilitate the access to and the communication of knowledge it is necessary to consider the ways that this knowledge is needed and used by knowledge workers to construct answers and meanings.

¹ The term 'meaning' appears with myriad definitions across both social science and humanities. Many other terms also point to much the same assumed phenomenon, although with many varied assumptions. For the purposes of the present research, the term refers to individuals' interpretations.

So far, approaches to facilitate the access to and communication of knowledge for the knowing work have not considered the situational meaning creation underlying the needs and uses of knowledge. Importantly, the current approaches have not considered how this situational meaning creation is accomplished in practice. These approaches have been predominantly based on users' characteristics, and mainly on the characteristics of the object needed, i.e. knowledge, without connecting it to the practice in which it is needed and used, i.e. knowing. Further, the current approaches have been detached from the characteristics of the knowing practice, from the actions of meaning creation with knowledge, and from the situationality of these actions. The knowing practice, i.e. the creation of new knowledge by using existing knowledge, exhibits a very distinct nature and dynamics that need to be accounted for. Creation of knowledge is one of the most unstructured and difficult work practices to be facilitated and supported. However, a step further can be made if the knowing practice perspective and the situationality of this practice are incorporated in the way knowledge is accessed and communicated.

Based on the empirical study of knowing work, the practical objective that the present research aims to achieve is to propose approaches to facilitate the access to and the communication of knowledge in consonance with meaning creation actions, and their situationality. The findings are used to propose frameworks that help to flexibly attune the access to and communication of knowledge to the situational creation of meaning. This means that in accessing knowledge, knowledge workers can communicate how and why they need what they need in a specific knowing situation, i.e. the situated meanings they need to create, articulating it as the situated questions they need to answer, and the situated helps they need to obtain for their meaning creation. It also means that the communication of knowledge (inputs for and products of knowing) includes the situated meanings that this knowledge contributes to be created, i.e. which questions it supports to be answered, and how it helps the creation of meaning. Therefore, the present study proposes ways to connect the required knowledge with the knowing practice it is needed to be used, at the level of meaning creation.

Such concern with communicating knowledge in consonance with its uses in practice is important to reduce the efforts, time and complexity in accessing knowledge. This can create more space for knowledge workers to concentrate their efforts and improve their performance in the process that actually adds value for the business: creating new knowledge that grounds and drive effective strategies. Timely and smooth access to needed knowledge can favor the creation of richer and insightful knowledge for the business.

In addition, understanding the knowing work to propose ways to facilitate the communication of knowledge is also important because of the following: (a) the impact that knowledge creation and communication processes have on financial, non-financial and innovation performances (Crawford, 1977; Gilad , 1991; Hoban, 1998; Lackman et al., 2000; Choo, 2002; Choi & Lee, 2003; Prieto & Revilla, 2006; Tanev & Bailetti , 2008; West & Noel , 2008; Frenza & Ietto-Gillies, 2009); (b) the increasing of complex knowledge exchange interactions in knowledge-intensive organizations (Bradford et al., 2005); and (c) the need to amplify the productivity of knowledge workers in these interactions by making them more effective in what they do, i.e. interacting to construct and share knowledge (Beardsley et al., 2006).

The approach towards understanding the knowing work and proposing methodological frameworks for the access to and the communication of knowledge were deliberately accomplished to make these frameworks less vulnerable to changes and new technologies, domain boxes, and management fads.

The present research adopts a practice-based, rather than content-based perspective. It specifically and mostly draws on the tacit knowing theory of Michael Polanyi and Dervin's Sense-Making Methodology (from the field of Communication). The knowing work practice was empirically studied based on Sense-Making Methodology. The research was undertaken using an interdisciplinary approach, mainly intersecting pertinent and particular knowledge from the fields of Information Science (information access and information retrieval), Organizational Knowledge (e.g. Tsoukas, 1966; 2005a; 2005b; 2005c; Brown & Duguid 1991; 2000; 200; Cook and Brown, 1999; Gherardi, 2000; 2001; 2003; 2006; 2007; 2008; Gherardi & Nicolini, 2000; and Nicolini et al., 2003) and its prescriptive stream of research² Knowledge Management (e.g.; Stenmark, 2001; Markus et al., 2002; Stenmark & Lindgren, 2004; Davenport, 2005; Castro et al.; 2007), and Communication of Knowledge (e.g. Eppler, 2004; 2005; 2007; Kikoski & Kikoski, 2004; Mengis & Eppler, 2005a; 2005b; 2008; and Göranzon & Hammarén, 2006).

The motivation for such study also came from more than 20 years of practice as a knowledge creation worker, in communicating knowledge created, and facilitating such practices in the corporate environment. As a knowing worker, disconnections were identified

² According to definitions of the organization knowledge and knowledge management fields give by Vera and Crossan (2003).

between what organizations were trying to do to support knowing work and how this kind of work was in fact accomplished. The identified disconnections occurred mainly because approaches to support knowing work were based on paradigms related to a kind of work of different nature: a work that is structured, based on relatively well defined processes, and has clearly known and measurable inputs-outputs.

This dissertation presents an empirical qualitative and quantitative study of knowledge creation for business strategies, and proposes a more practice-based approach for the communication of knowledge for such practice. The primary field of research is the Organizational Knowledge and its prescriptive stream of research, Knowledge Management, and more specifically the topics of Knowledge Creation and Communication. The current research addresses the needs of for-profit knowledge-intensive organizations in supporting the work of creating knowledge for business strategies, by facilitating the communication of knowledge in and for such work practice. The study draws on interpretive and constructivist perspectives, and it takes a practice-based view of knowledge and knowing.

Above all, the vision that guides the present research is to contribute to the advancement of the understanding of knowledge creation and communication, and to inspire new ideas and perspectives for the communication of knowledge for knowing. This research is, to a great extent, about helping to change the way scholars and practitioners think in relation to the communication in and for knowing work in the corporate environment.

1.2 Terminology

In order to help the understanding of some of the core concepts used in the present study, brief explanations of the main ones are given below. The definitions are based on pertinent literature, which was used to ground the present study. More detailed explanations are given throughout the dissertation.

(a) *Knowing, knowledge creation and meaning creation.* The terms knowing and knowledge creation are synonyms and they are used interchangeably in the present study. Knowing is a concept that was foundationally explained by Polanyi (1958; 1966; 1968; 1969). Following Polanyi, knowing is understood as the creation of meaning. In the present research, knowing as meaning creation was considered as one of the sense-making

phenomena. As such, knowing was empirically studied as a situated sense-making practice based on Dervin's Sense-Making Methodology. Thus, knowing as the creation of meaning is an action, a practice, and specifically in the present study it is a work practice. Meanings are created by internal interpretations of tacit or explicit knowledge. When the present study refers to 'meaning creation', it is related to interpreting or the interpretive acts performed by individuals; their sense-making practices. As such, meaning is the coherent whole that is constructed by combining and interpreting tacit and explicit knowledge. The terms knowledge, meaning and sense refer to the result or the product of these interpretive actions, and to what, consequently, nourishes new knowings (inputs for knowing).

(b) *Sense-Making and sense-making*³. 'Sense-Making' with capital initials refers to the methodology and the term 'sense-making' with lower case refers to the phenomena studied by Dervin's Sense-Making Methodology (SMM). In brief, Sense-Making Methodology is a way of looking at and studying how individuals make sense or create meaning in time and space. It is an empirically validated set of metatheoretical assumptions and research methods that enable the study of human meaning creation practices from a situational perspective, i.e. the sense-making phenomena: SMM is a "set of theoretically derived methods for studying human sense-making" (Dervin, 2003g/1992, p. 270). Its objective is "to study and design communication communicatively and ultimately to improve communicating – to change systems and procedures" (Dervin, 2008, p.3). Sense-making is how individuals make sense of their world. The knowing practice is one of the sense-making phenomena. SMM informed the empirical study, and together with Polanyi's tacit knowing theory (TKT), they theoretically grounded the present research.

(c) *Knowing work practice and knowledge creation work practice*. These synonymic terms refer to the kind of work in which the primary activity is to create knowledge for business. The knowledge creation work is one type of the work that is commonly referred to as 'knowledge work'. Davenport (2005) categorized knowledge work in five different work activities^{xxix}, and the knowledge creation work is one of them. It is defined by having the

³ The terms sense-making, sensemaking and sense making have been used in other contexts and studies by Karl Weick, David Snowden, Gary Klein, and Daniel M. Russel. The use of the term in the current research is specifically and solely related to its conceptualization and use in Brenda Dervin's Sense-Making Methodology.

practice of creating knowledge (i.e. knowing) as the main work activity. The knowledge created in the knowing work is typically used to ground business strategies, actions, innovation and changes. It is commonly performed by internal or external analysts, researchers, and consultants, creative people, and authors (e.g. competitive intelligence analysts). When the terms ‘knowing practice’, ‘knowing work practice’, or ‘knowledge creation work’ are used in the present study they refer to ‘knowing’ as a work practice, or simply, the knowledge creation work that is done in and for business organizations.

(d) *Practice*. In the present study, this term is used in two meanings. First, it refers to the way of seeing or the point of view by which knowing work is studied, and therefore, an epistemology. In particular, the present study draws on the ideas of the epistemology of practice proposed by Cook and Brown (1999), and thus, adopts the practice-based perspective for the study of knowing. The knowing experiences of knowledge workers were studied as a ‘situated doing’. Second, the term ‘practice’ refers to the object of study that is a specific work practice, i.e. the knowing work.

(e) *Knowledge workers or knowing workers*. In the present study, both terms specifically refers to those workers whose primary professional activity is the *creation of business-related knowledge*. Davenport (2005, pp. 10-11) explained that knowledge workers are those who “think for a living, they “solve problems, they understand and meet needs of customers, they make decisions, and they collaborate and communicate with other people in the course of doing their own work”. The present study is focused on the knowing practices performed by knowledge workers in for-profit business organizations.

(f) *Information, knowledge and sense*. In Sense-Making Methodology, there is no difference between information, knowledge and sense (Dervin, 1998, p.36). Thus, they are all products of knowing; at the same time they all nourish new knowings (as inputs). They are products of human practices of meaning creation or sense-making. In the present study, they are conceptualized according to the principles of Sense-Making Methodology and Polanyi’s theoretical assumptions. When the terms information, knowledge and sense are used in the present study they refer to what nourishes knowing (input) or to its product. The respective use of the term as input to knowing or as product of it may be explicit in the context of its

text, or it is explicitly highlighted in brackets. Following the above theoretical approaches, the terms information, knowledge and sense are used interchangeably, but preference is given to the terms knowledge and meaning. It is beyond the focus of this research to discuss differences between information and knowledge.

(g) *Inputs or knowledge-based inputs.* These concepts are rooted in Dervin's Sense-Making Methodology and Polanyi's theory of tacit knowing. Inputs or knowledge-based inputs are considered as the inputs for the knowing work, which nourishes knowing. Based on Polanyi, inputs are the parts (or particulars, terms, subsidiaries, clues) which individuals integrate and interpret in order to create meanings or knowledge (the coherent whole). Similarly, in SMM inputs for knowing are what individuals use to construct interpretive bridges over gaps faced in situations, as explained by Reinhard et al. (2006). Inputs are what informants get from accessing and using knowledge that can be explicitly formalized in documents (knowledge representations) (namely, explicit-knowledge based inputs), or that is based on the tacit dimension of individuals' knowledge (namely, tacit-knowledge based inputs). Therefore, inputs may be communicated by humans and by artifacts. Inputs can be ideas, insights, intuition, body senses, written or oral content, a picture, a scene, a scent, and memories. Regarding explicit-knowledge based inputs, they are not restricted to what conventionally is considered as information or to what experts or systems commonly consider as information. They are neither sources of information, nor the document itself. Inputs refer to the latent content⁴ (meaning underlying the obvious and surface content). It is what is inferred by knowledge workers from the manifest content (the surface features like words) and that is not necessarily intended, acknowledged or known by the author. The use of the term 'input' is not associated with the same meaning of the term when used in the input-output approach of information processing theory.

Inputs, knowledge, knowledge-based inputs, clues, terms, parts, subsidiaries and particulars are synonymic concepts based on Polanyi's theory and Sense-Making Methodology. *These concepts always refer to what nourishes knowing, to what is integrated and interpreted to construct meaning.* These terms are used interchangeably in the present

⁴ Surface and manifest content were defined by Case (2002, p. 210). The manifest content is the "surface features, such as words". The latent content is the "underlying themes and meanings" of communication artifacts (newspapers, journals, articles).

study. Detailed definitions and explanations are given in the Literature Review in Part II of the dissertation (on page 27).

(h) *Tacit and explicit knowledge and consequently, tacit-knowledge-based inputs and explicit-knowledge-based inputs.* The concepts regarding tacit and explicit knowledge that are used by the present study are rooted in Polanyi's seminal work of knowing (Polanyi 1958; 1966; 1968; 1969; Polanyi & Prosch, 1975). Tacit and explicit are considered as inseparable and interdependent dimensions of knowledge. One dimension does not exist without the other. They are not considered as separate, independent and convertible types or forms of knowledge. The explicit dimension of knowledge is the part of knowledge that is articulated, e.g. verbalized. Explicit knowledge is not tacit knowledge that was converted or translated, because tacit knowledge is the dimension of knowledge that is inarticulate. However, according to Polanyi (1958, p. 88; 1958, p. 91; 1966, pp.4-5) and Tsoukas (1966; 2005a) tacit knowledge can be partially articulated and communicated with the appropriate method. Explicit knowledge is always rooted in tacit knowledge and as explained by Polanyi (1966) all knowledge is tacit or rooted in it. Respectively, tacit-knowledge and explicit-knowledge based inputs are those based on the dimensions of knowledge described above (e.g. practical experience in specific energy technology and a market report). As input to knowing, tacit and explicit knowledge are the clues or parts that individuals integrate to construct a coherent whole or meaning, as explained by Polanyi (1958; 1966; 1968; 1969).

(i) *Intellectual access to inputs, to knowledge-based inputs, and to knowledge.* The focus of the present research is on the intellectual access to knowledge, rather than on the physical access. The intellectual access was explained by Kuhlthau (2004) as the one that "addresses interpretation of information and ideas within resources" (Kuhlthau, 2004, p. xv). In the present study, this access may be referred to as 'access to inputs', as 'access to knowledge-based inputs', and as 'access to knowledge'. All these terms are synonyms and used interchangeably.

(j) *Situationality and situation.* Situationality is a concept derived from SMM. Situationality means the fact that a sense-making phenomenon is anchored in time and space. The situationality of sense-making, and consequently, of knowing, is reflected by the ways knowledge workers differently create meaning and use knowledge for it. These actions differ

according to the characteristics of the knowing situation (e.g. its nature, focus) in which meaning is created.

Situation is one of the elements of a sense-making moment, together with the gap, help, and bridge. In SMM, situation is defined as the moment “when there is a missing piece in a picture of a situation and old sense run out” (Dervin, 2003a/1980, p. 44), and “as where the informant sees self as moving from - the nature of the situation, its history, its constraints, it links to lived experience, its links to contexts and power structures” (Dervin, 2008, p. 18). The term ‘situation’ refers to the specific moment in time and space in which individuals perceive themselves as blocked or stopped in their creation of sense or meaning, i.e. when the old sense has run out or it is not able to aid and support an individual to advance in her/his activity. The situation and its characteristics are the framework or the background against which the other elements of a sense-making moment occur, are identified and analyzed: the gaps faced, the interpretive bridges constructed over these gaps, and the help needed from the uses of inputs to construct such bridges. It is the characteristics of a situation and the occurrence of the other sense-making elements (gaps, help and bridges) in the respective situation that shows the situationality of knowing or meaning creation.

The concept of situation that is used in the present study does not refer to the concept of ‘context’ that is commonly used in studies on knowledge creation, knowledge management, and information seeking and use. Additionally, it does not refer to the ‘semantic context’ (linguistic semantics) that is typically used in the information retrieval fields. The term does not refer to the physical or technological aspects of the individual’s environment, which is commonly used in the Computer Science field. Further, situation is not understood as task or as goal, and it is not restricted to problem-solving, problematic or decision-making situations.

(k) *Knowing situation and sense-making situation.* These are synonyms concepts and they are based on SMM. Both terms are related to a situation in time and space, in which knowledge, meaning or sense is created. In the present study, a knowing situation is comprised of a situation in which gaps are faced and bridged, and diverse help are needed. A knowing situation is defined or determined by the focus of the situation, i.e. on what the knowledge creation is focused. Varied meanings can be constructed in a single knowing situation. In the present study, the situated meaning creations are articulated by the critical

questions (the faced-gaps in situation), and by the help that is needed within a specific situation.

(1) *Needs in knowing or knowing needs.* The concept of knowing needs refers to the needs that individuals have for creating meaning in their knowing situations. It is not the need of information or of something as a standalone object or entity. It is the need of something to be employed for the creation of meaning. Informed by SMM, in the current study knowing needs is articulated as the conjoint occurrence of the elements of a sense-making moment, when situation, gap and help intersect and occur simultaneously in a specific point in time and space.

1.3 Research Purpose

The purpose of the present research is to explore how meanings are situationally created in knowing work and how such work can be supported by the access to and communication of knowledge.

Meaning creation was thus, the central concern and the entrance to understand how knowledge, as inputs for knowing, was enacted, activated and used in knowing work with the purpose of contributing to the creation of meaning. Figure 1 illustrates the overall research setting and the level of access to and communication of knowledge with which the present study is concerned.

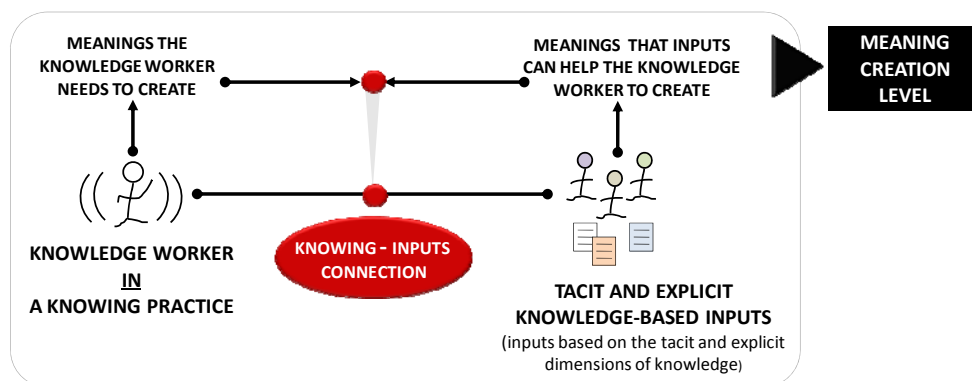


Figure 1 : The research setting and the level of access to and communication of knowledge under focus.

As Figure 1 suggests, the study is concerned with the connections between the meanings that a knowledge worker needs to create in a specific knowing situation, and the meanings that a specific knowledge (input) contributes to be created. When these two meaning-creation aspects coincide, a knowing-inputs connection happens. This means that knowledge workers get an input that can contribute to her/his situated meaning creation. In this case, the access to and communication of knowledge happens at the meaning creation level.

Given the above, the derivative and procedural level of the access to knowledge, i.e. the processes and procedures of information search and retrieval, the uses of types of information and knowledge, sources and channels, and the organization of knowledge *were not the focus of attention in the present study*. Additionally, the following aspects set up the boundaries of the above research setting:

(a) *Knowing as a purposeful knowledge creation work practice in the corporate environment*. The present study is concentrated on knowledge creation as a purposeful work practice. It is neither related to the knowing by chance or passively, nor to becoming skilled or an expert by practicing an activity.

(b) *Knowing at the individual level, but not with an individualistic perspective*. Despite focusing on the individual level of the creation of knowledge, this creative practice is not considered to be performed individualistically or independently. On the contrary, the present study assumes that in creating knowledge, a knowledge worker interacts with diverse inputs that are communicated by human- and technology-based systems, such as colleagues, experts, customers, suppliers and sometimes even competitors. The fact that the present research studies the knowing practice at the individual level does not mean that social factors that are involved in knowing are neglected.

Based on empirical study of knowing work as situated meaning creation in the research setting explained above, the current research aimed to provide frameworks to help:

(a) The communication of knowledge *in relation to situated meaning creation*. This means to communicate the explicit dimension of knowledge considering how it can

contribute to the meaning creation in knowing situations, rather than only by its subject matter⁵ or characteristics (e.g. author, source). It also means to communicate the tacit dimension of knowledge by taking into account the meanings that are needed to be situationally created with it.

(b) The communication of needs *in relation to meaning creation*. This means to facilitate for knowledge workers to communicate not only what is needed, but also *how and why it is needed for the creations of meanings*.

(c) The communication of needs *in relation to situated meaning creation*. This means to facilitate for knowledge workers to communicate not only the needs in relation to meaning creation, but also in relation to its inherent situationality. This means the communication of the ‘hows’ and ‘whys’ of needs *within a knowing situation*.

1.4 Research Questions

When accessing knowledge as inputs for the knowing work, there is often a disconnection between the ways which individuals need and use these inputs to create meaning, and how these inputs are communicated to them (this assumption is substantiated by the literature review). The disconnection between knowing and inputs occurs because there are limitations in the two main communication processes that enable the knowing-inputs connections: the communication of the needs to systems, and the communication of knowledge to knowledge workers (Figure 2).

⁵ The concept of subjects or subject matter adopted by the present study is the one defined by Hjørland (1997, p. 55) as "that about which something is said". Hjørland (2001, p.776) also considered "subject (including the compound subject matter) and aboutness as synonymous concepts". Regarding the term 'content', Hjørland (2001, p.777) explained that it specifies what is said on a given subject" and "the content of a text is different to its subject".

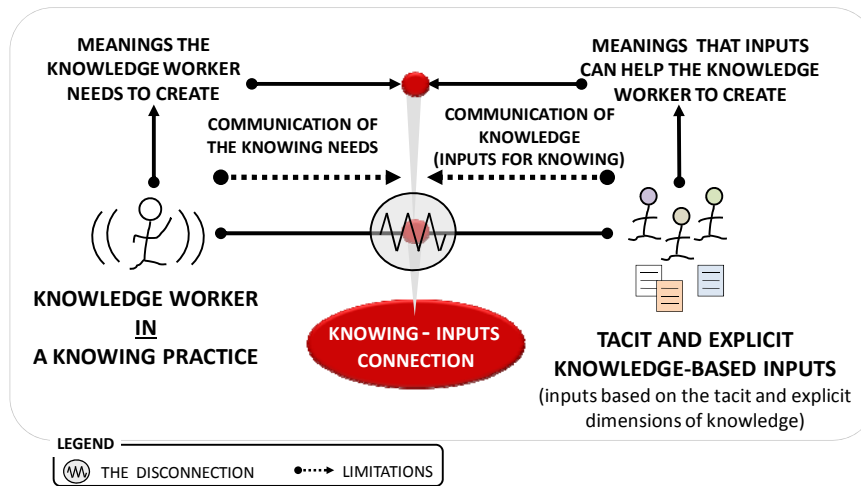


Figure 2 : The disconnection generated by limitations in the communication of knowledge and needs.

The disconnection is due to the detachment of the communication of knowledge and communication of needs in relation to knowing as a practice, and in relation to the situationality of this practice. So far, research has not taken into account how and why knowledge workers differently need and use knowledge, and how these uses should contribute to and support their meaning creation (i.e. the situated knowing practice) in knowing work. The present study fills this gap by focusing on the following research issue:

How are meanings situationally created in the knowing work within business environments?

The above research issue is specified by addressing the following research questions:

1. What are the main knowing situations that knowledge workers experience and how are these knowing situations configured in terms of meaning creation?
2. How do knowledge workers create knowledge in their situated knowing practice?
 - 2.1 What are the most critical gaps that knowledge workers face in specific knowing situations that lead them to use inputs to create new meanings?
 - 2.2 What communicates the most helpful inputs that knowledge workers use to bridge the most critical gaps they face in specific knowing situations?
 - 2.3 How do knowledge workers need inputs to help them to overcome their gaps and to create meanings in specific knowing situations?

2.4 Which of the helps needed is most frequently associated to the gaps knowledge workers face in specific knowing situations?

3. How can the situational creation of meaning in the knowing work practice be supported while accessing and communicating knowledge?

1.5 Dissertation Structure

This thesis is organized in the following way:

Part I. Introduction. This part helps understanding the purpose and focus of the present research.

Part II. Literature Review. This part contains the review of the main literature related to knowing, the uses of the explicit and tacit dimensions of knowledge for knowing, and the approaches to communicate knowledge for and needs in knowing.

Part III. Methodology. This part explicates Sense-Making Methodology that is used as the methodological framework used of the present study.

Part IV. Research Design. This part explains how the empirical research was designed and conducted.

Part V. Findings, Discussion and Applications. This part presents and discusses the qualitative and quantitative findings, and their main applications.

PART II – LITERATURE REVIEW

CHAPTER 2: KNOWING, COMMUNICATING KNOWLEDGE, AND KNOWING WORK

Conhecer é tarefa de sujeitos, não de objetos. E é como sujeito e somente enquanto sujeito, que o homem pode realmente conhecer.

Knowing is a task of subjects, rather than of objects. And it is as a subject, and only while being a subject, that a man can actually know.

Paulo Freire

(Brazilian educator and influential theorist of critical pedagogy)

2.1 Structure and Logic of the Literature Review

According to the research purpose and questions, the following literature review condenses the main ideas, studies and approaches related to the knowing process, how meaning is created in it, the access and use of knowledge for this meaning creation, how needs and knowledge are communicated to enable these uses, the situationality of knowing, and the knowing work. Figure 3 shows the main topics considered in the literature review and their interrelationships with the issue, question and purpose of the present research. The main topics generated by the research issue, research question and purpose are highlighted in their statements at the top of Figure 3. The structure for the literature review that was generated by these topics is at the bottom of Figure 3.

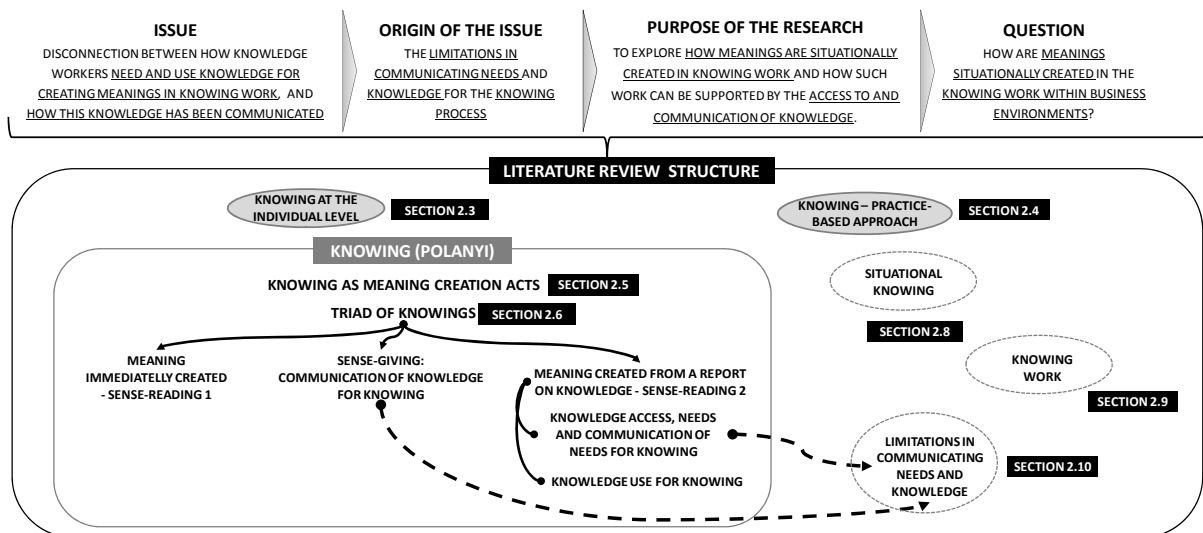


Figure 3 : The issues and structure of the literature review.

In the literature review, the content related to the *communication of knowledge and needs* in particular was not approached in a neutral way. This means that earlier studies on the communication of knowledge and communication of needs were not only described, but their findings were also assessed critically by devoting attention to their strengths and weaknesses. This approach aimed to ground the limitations in the communication of knowledge and needs for the knowing processes, which were argued by the present research.

Firstly, the literature review discusses two fundamental and guiding points concerning how knowing was approached in the present research: knowing at the individual level (not

individualistic), and based on a practice-based perspective. Thereafter, the seminal theory of tacit knowing developed by Michael Polanyi is presented. The structure of the knowing and communication of knowledge processes as developed by Polanyi is also used to relate, arrange and present other complementary ideas and studies under these topics. To this end, approaches and studies related to the access and use of knowledge for knowing, and to the communication of needs and knowledge are included by drawing on Polanyi's theory. Subsequently, the situational nature of knowing and the main characteristics of the knowing work are reviewed. The chapter ends with the main points and a summary of the limitations in the previous approaches to the communication of needs and knowledge. The aim of the respective section is to systematize the main points of the critical analysis made throughout the literature review. Therefore, the final section helps with setting the ground in order to provide the rationale for the present study.

2.2 Introducing

The impact of business-relevant knowledge (e.g. market intelligence, competitive intelligence) to organizations strategies, actions and performance has been evidenced by Gilad (1991), Lackman et al. (2000), Tanev and Bailetti (2008), and West and Noel (2008). High on a list of reasons for new products failures is the poor planning (second highest reason) (Crawford, 1977). Knowledge creation and communication processes impact financial, non-financial and innovation performances (Gilad , 1991; Crawford, 1977; Hoban, 1998; Lackman et al., 2000; Choo, 2002; Choi & Lee, 2003; Prieto & Revilla, 2006; Tanev & Bailetti , 2008; West & Noel ,2008; Frenza & Ietto-Gillies, 2009). Narrow understanding of the market was indicated as the second barrier or negative influence in organizations' product development efforts (Hoban, 1998). Common to all the above is the significance of the product of a knowing work, i.e. the knowledge created for the business strategies. In this context, the value of knowledge created to ground business strategies and actions can be reflected by its insightfulness, its power to uncover new realities and opportunities, and its applicability to its users' needs, context and priorities. To achieve such level of contribution to a business, knowing work needs to be supported and facilitated to potentiate its source of value: the sense-making or the creation of meaning processes. To this end, it is necessary to

understand the nature and dynamics of these value-generation processes in order to facilitate them appropriately.

The nature of knowledge creation as a work practice (knowing work) is different from more predefined, ordered and predictable activities and “perhaps the most difficult knowledge activity to structure and improve” (Davenport, 2005, p. 29). Knowing work is highly demanding in terms of accessing and using knowledge as input, which are processes accomplished in an ad hoc, emergent and situational way. Significantly, it presents a very different nature from the paradigms related to structured, planned, and sequential work, tasks or activities, such as the bureaucratic and administrative ones. As such, facilitating and supporting knowing work require different approaches.

Knowing work may exhibit familiar and patterns of action and it may be tied in culturally and historically constituted conditions, rules, methods and standards. However, the significance of these for what happens in the actions of meaning creation within knowing work is not fully predefined, pre-given and self-evident. These factors are reenacted by knowledge workers according to circumstances and in ways that predefined work plans or methods cannot predict. Knowing is a situational meaning creation practice.

The nature and dynamics of knowing work reveal that the use of the traditional approaches based on rationality and sequentiality to explain the interpretive actions and the significance of such actions in this kind of work are not valid enough. Coherently, knowing work requires the access to and communication of knowledge to be flexible, responsive, and adaptive to the unstructured, ambiguous and situational nature of its meaning creation actions. It is not productive to facilitate a work practice of this nature with an approach conceived as routinized, highly structured work activities that can be relatively easy to be specified into all possible individual actions and states (e.g. administrative routines).

The ambition of this chapter is to unmask the nature and dynamics of knowing and knowing work from a practice-based perspective, at the individual level (not necessarily individualistic), and as a situational meaning creation practice. The practice-based perspective of knowing work is outlined in this chapter under three propositions: (a) knowing is a meaning creation action, (b) knowing is a situational practice, and (c) knowing work is an emergent, unstructured and situational practice.

The following literature review is not focused on the discussion of types, organization and the epistemological dimensions of knowledge, but rather on knowing or knowledge creation as a practice (how it is actually done). Detailed discussion on the epistemological

(tacit versus explicit) and ontological dimensions of knowledge (individual versus organizational) is beyond the scope and objectives of the present research. Additionally, the purpose of the current chapter is not to discuss models of information behavior (Wilson, 1981, 1999), information seeking (Wilson & Walsh, 1996; Ellis, 1989, 1993; Kuhlthau, 2004) or information searching (Ingwersen, 1996; Ingwersen & Järvelin 2005; Belkin et al., 1995; Saracevic, 1997; Bates, 2005, 1989). Despite their undoubted contributions, these models are related to the operational and procedural aspects of the information seeking behavior, like steps, stages, strategies, tactics, and procedures, particularly when users are searching for information in an information retrieval system. As previously explained, this is not the level of analysis of the present study. The current research is not concerned with the operational levels of the search process itself (e.g. query, matching techniques, algorithms, behavior or performance) or on the use of sources, channels, strategies and tactics used to search information from an information retrieval system (e.g. the search terms, the performance of the search task, navigation). The focus of the present study is on meaning creation in the knowing work.

2.3 Knowing at the Individual Level

The central concern of the present research is with situational meaning creation at the individual level, i.e. an individual acting to create meaning in specific knowing work situations is the primary unit of analysis. This does not mean that this practice is approached from the individualistic perspective. Although individual, group, organizational knowing are intertwined processes, the attention here is concentrated on the knowing practice at the individual level. It is believed that this elementary and initial creation of meaning is different from the epistemic work⁶ at the group level (Cook & Brown, 1999, p. 386). The understanding of how knowledge is firstly created at the individual level is considered to be a seminal and influential understanding to the organizational level. It can generate the groundings and insights to help illuminate and move the discussion about knowing at other

⁶ Epistemic work is defined as “work people must do to acquire, confirm, deploy, or modify what needs to be known in order for them to do what they do” (Cook and Brown 1999, p. 399).

levels (group, intra- and inter-organizations), and the understanding of knowing and knowledge communication a step further.

The creation of knowledge to ground business strategies often involves the work of dedicated knowledge workers at diverse levels of expertise, such as market or competitive intelligence analysts, and strategic planners. Acknowledgedly, the creation of this knowledge is not accomplished individualistically, but it begins with individuals interpreting and creating meaning of the signals, events, entities, and of the available knowledge in the business context. To construct these interpretations, knowledge workers relate with diverse inputs and systems, both human- and technology-based, evidencing that at the individual level of knowing, this practice is not accomplished individualistically. Tsoukas (1996, p. 14) emphasized that social and individual knowledge are interdependent and “mutually defined” given that the “individual knowledge is possible precisely because of the social practices within which individuals engage”.

Albeit being intertwined, the study of knowing at the individual level differs from the one performed at the organizational level, according to Spender (1996a), and Cook and Brown (1999). Cook and Brown (1999, p. 386) emphasized these differences by highlighting that “individuals and groups each do epistemic work that the other cannot”, and that “the work done by a group, as informed by the body of knowledge it possesses, is work that is epistemically distinct from the work done by an individual in it, as informed by the knowledge he or she possesses”.

An often cited work in knowledge creation is Nonaka and Takeuchi’s (1995) approach and their SECI model (Socialization, Externalization, Combination, Internalization), which is based on the Resource-Based View or Knowledge-Based Theory of the firm⁷. They had a focus on the organizational level of knowledge, which was defined as the knowledge shared by individuals. They made the interaction between tacit and explicit knowledge central to their approach to knowledge creation and they developed the SECI

⁷ The Resource-Based View is a perspective of organizational studies (more specifically of strategic management) which suggests and leads to a Knowledge-Based Theory of the Firm. The Resource-Based View argues that resources and products fundamentally contribute to sustainable competitive advantage (Priem & Butler, 2001). The Knowledge-Based Theory of the Firm argues that knowledge and the capabilities in creating and using knowledge are the main sources of sustainable competitive advantage (Nonaka et al., 2000), and it assumes that "services rendered by tangible resources depend on how they are combined and applied, which is in turn a function of the firm's know-how (i.e. knowledge)" (Alavi & Leidner, 2001, p. 108).

model, which reflects a knowledge creation cycle. However, one of the limitations of their model is that it does not make clear how individuals first create knowledge to consequently share and have it incorporated as organizational knowledge. The SECI Model does not explain how individuals create tacit knowledge, and how problems related to human agency are solved (Levina, 1999; Spender, 1996b; Patriotta, 2003). Spender (1996b, p. 51) pointed out that “their theory of the firm, in the sense of explaining (a) how individuals generate tacit knowledge, and (b) how the obvious agency problems are resolved, remains unexplained”. Nonaka and Takeuchi “focus on the way individual creativity contributes to the growth of collective knowledge” (p. 52). Further, the focus of the SECI model is clearly on cognitive aspects of ‘converting’ explicit to tacit and vice-versa. Nonaka and Takeuchi were only focused on the cognitive and rational perspectives of knowledge. Even when they talk about non-cognitive aspects such as “emotions, passions and bodily experiences” they are “always in the service of rational, cognitive knowledge” (Zhu, 2006, p. 108). Other criticismsⁱ have shown inconsistencies and weaknesses of Nonaka’s theory and of the SECI Model. Gourlay (2006a, p. 1430) pointed out that “Nonaka’s proposition that knowledge is created through the interaction of tacit and explicit knowledge via four knowledge conversion processes has been found wanting on empirical and conceptual grounds”ⁱⁱ. In addition, the perspective underlying Nonaka and Takeuchi’s approach to knowledge creation is the transmission model or the conduit metaphor of communication (Tsoukas, 2005a, p. 154), reducing “practical knowledge to technical knowledge”. This is an opposite perspective to knowledge creation in relation to the one adopted in the present research. For the reasons described above, Nonaka and Takeuchi’s approach and the SECI model are not considered in the present study.

The knowledge creation practice in business organizations is a phenomenon that occurs at multiple levels (Simon, 1991; Hedlund, 1994, Crossan et al., 1999), and with multiple directions within and between organizations. Nevertheless, it has been mostly studied at the organizational level (Akbar, 2003, p. 1997)ⁱⁱⁱ. Despite varied studiesⁱⁱⁱ that have provided insightful ideas to knowledge creation at the organizational level, there is a need to understand the primary knowledge creation practice that occurs at the individual level as well. As pointed out by Polanyi and Prosch (1975), knowledge or personal judgments are created and manifested not only at the collective level (e.g. science or organizational), but equally at the individual level: “personal, tacit assessments and evaluations, we see, are required at every step in the acquisition of knowledge – even ‘scientific’ knowledge” (Polanyi & Prosch, 1975, p. 31).

Knowledge creation at the organizational level starts with individuals creating knowledge; with their own and personal actions to create meaning about entities, events and situations. It is this personal creation of meaning or knowing that is the seed of the knowledge creation at the organizational level. In the present research, the study of knowing at this level is mostly informed by the tacit knowing theory of Polanyi and Dervin's Sense-Making Methodology.

The knowledge creation at the individual level was considered by Crossan et al. (1999) when they explained organizational learning as being comprised of four processes. These processes flow between the individual, group and organizational levels: *intuiting*, *interpreting*, *integrating* and *institutionalizing*. Particularly, two of these processes – *intuiting* (subconscious) and *interpreting* (conscious) – occur at the individual level. This does not mean that they occur individualistically. On the contrary, *interpreting* was defined to be the development and refining of insights, conclusions, inferences, and thus, it also demands interactions, and conversations. Crossan et al. (1999) did not limit the explanations of *interpreting* and *intuiting* to the cognitive realm. The 'intuiting' and 'interpreting' as individual processes were explained by Crossan et al. (1999, p. 525) as follows:

“...intuition is a uniquely individual process. It may happen within a group or organizational context, but the recognition of a pattern or possibility comes from within an individual. Organizations do not intuit. This is a uniquely human attribute that organizations do not possess. Similarly, organizations do not interpret. Interpreting has to do with refining and developing intuitive insights.”

As explained by Crossan et al. (1999) *intuiting* is related to the subconscious perception or recognition of patterns. It is also related to the ability to identify new and emergent connections. In this case, individuals do not need to consciously think about an action. *Interpreting* (conscious) is also an individual process, even if the product of this interpretation is then shared and enriched in interaction with other individuals. It can be richer and more robust when made in interacting with other individuals or groups, as pointed out by Crossan et al. (1999, p. 525). The sharing of individual's interpretation with other members in a group was referred to as the “integrating” process by Crossan et al. (1999). But before sharing with others in order to create, enrich, or simply to communicate it, meaning or knowledge is firstly created at the individual level. It is then, communicated to other individuals, and incorporated to the group or organizational knowledge.

Castro et al. (2007) developed a general framework for the analysis of knowledge creation in organizations and considered knowing at the individual level. However, they used

the framework in an empirical study focusing only on the knowledge creation processes at the organizational level. More specifically, they focused on the intra-organizational knowledge transfer processes (from the individual and group level to the organizational), and the inter-organizations knowledge creation (Castro et al., 2007, pp. 61-64).

The individual creation of knowledge is only one of the levels considered in the whole organizational knowledge creation. At the individual level, the creation of knowledge is inherently a personal creation of meanings that can be enriched, co-created, recreated and developed in and for a group work. Even if the professional is working collaboratively, what firstly happens is the creation of meanings as a personal interpretation and assessment. In this moment of interpretive action, how individuals create meaning, how they use knowledge and assess its uses for their knowing process are under their control. A knowledge worker constructs her/his own understandings and meanings, and then find a way to articulate and to communicate these meanings to others. In doing so, the individual interpretations can be shared at the intra and inter-organizational levels, and they can be enriched and recreated conjointly with other individuals. As explained by Polanyi (1966), individuals have to be aware of their knowledge, find a way of expressing it and then, share it.

Therefore, the knowing practice at the individual level is a significant focus in the understanding of knowledge creation work in business organizations. Understanding this practice at the individual level allows the identification of how it can be appropriately supported by the access to and communication of knowledge for knowing, benefiting the understanding of knowing at other levels of the organization.

2.4 A Practice-Based Approach to Knowing

The present study is grounded on a practice-based perspective to study knowing and knowledge. Such perspective leads to distinct assumptions and the purpose of the present section is to explain the main ones. As follows, the core characteristics of the practice-based approach to knowing and the consequent implications in studying knowing are presented.

The use of a practice-based epistemology to study knowledge creation allows incorporating the understanding of the ongoing creative and interpretive actions in which knowledge is needed, used and enacted. Importantly, a practice perspective brings a “non rational-cognitive view of knowledge” (Corradi et al., 2008), through which the focus turns to

the practice that produces knowledge and in which this knowledge is used for the creation of new knowledge.

The separation between the knowing practice and the uses of knowledge in it has been aggravated by typical knowledge management approaches. This is justified by the fact that “knowledge management tends to treat knowledge as a tangible thing, as a stock or a quantity, and therefore separates knowledge as some *thing* from the use of that thing” (Pfeffer & Sutton, 2000, p. 22) (Emphasis in the original). Similar concerns were pointed out by Tsoukas and Mylonopoulos (2004), who discussed one central problem of current approaches to the uses of knowledge in organizations:

“...one of the common fallacies concerning organizational knowledge is what we may call the apple-tree fallacy: the knowledge individuals make use of in their work is considered to be a collection of freestanding items waiting out there to be plucked from the tree of organizational knowledge (Gates, 1999; Stewart, 1997). The problem with this view, largely influenced by the emergence of, and the discourse on, the ‘digital economy’, is that *it tends to ignore, among other things, the constructed nature of knowledge: whatever knowledge is, the form as well as the content it takes depends on what questions are asked, how they are answered and how the answers are made to fit together.*” (Tsoukas & Mylonopoulos, 2004, p. S3) (Emphasis added)

The practice-based perspective to knowing and knowledge contemplates these as constructing and situational practices. For the purposes of this research, *a useful definition of the practice perspective* to knowing and knowledge was given by Sole and Edmondson (2002, p. S18). They explained this perspective as the one which “emphasizes the collective, situated and provisional nature of knowledge, in contrast to a rational-cognitive view of knowledge. Practice connotes doing and involves awareness and application of both explicit (language, tools, concepts, roles, procedures) and tacit (rules of thumb, embodied capabilities, shared worldviews) elements”.

Drawing on the concept above, the practice-based epistemological position adopted by the present research approaches the experiences of knowledge workers in the context of their knowing work, as these experiences are, as ‘situated doing’. According to Schultze and Orlikowski (2004, p. 88), the practice perspective “focuses on people’s everyday activities as the unit of analysis, and examines the structural and interpersonal elements that produce and are produced by those activities”. As highlighted by Cook and Brown (1999, p. 386), practice denotes “‘real work’ itself”. It aims to understand the activity of knowing work *as it is actually done*, “the way in which work gets done” (Brown & Duguid, 1991, p. 200). In the

present study, the *use of the term 'practice' means doing real work, how the work of knowing for business is done*, as the actions that knowledge workers perform to get their work done (Orlikowski, 2002, p. 249). Thus, *knowing work and knowledge are looked and studied from the perspective of epistemology of practice*, rather than the epistemology of possession (Cook & Brown, 1999).

Consistent to the assumptions and vocabulary used in practice-based approaches, knowing^{iv} is used as a verb, because “knowledge and actions are never complete – they are verbs, not nouns” (Nicolini et al. 2003, p. 23). The practice-based approaches have a vocabulary that is mainly verbs in the form of gerund, indicating the constructive and process-orientation, and translating “a world always in the making, one which ‘doing’ more than ‘being’ is at the center of attention” (Nicolini et al. 2003, p. 21). Scholars who have used the practice-based perspective include Lave (1988), Chaiklin and Lave (1996), Spender (1996b), Von Krogh (1998), Cook and Brown (1999), Tsoukas (1996; 2005a), Strati (1999; 2003), Gherardi (2000; 2001; 2006; 2007; 2008), Gherardi and Nicolini (2000), Orlikowski (2000), Schultze and Boland (2000), Gomez et al. (2003), Nicolini et al. (2003), Schultze and Orlikowski (2004), and Corradi et al. (2008).

Contrasting views regarding the practice-based approach to knowing and knowledge are the ‘cognitive’ and the ‘economic or structural’ perspectives (Gherardi, 2000; 2006; Patriotta, 2003). Both perspectives are based on a rationalistic and objectivistic idea of knowledge, which is considered as detached from human action, and as a ‘thing’ that can be transmitted or transferred. The cognitive or taxonomic perspective considers knowledge as a “codification of experience in some form of cognitive structure” (Nicolini et al. 2004, pp. 5-6), and it has a dichotomized view of knowledge. It has a focus on knowledge as rational cognitivism, or symbolic cognition, and it considers that all action is inside individuals’ heads (mind-body, thought-action dichotomies). Gherardi (2006, p. xv) explained that in this perspective “knowledge resides in the heads of persons, and that it is appropriated, transmitted and stored by means of mentalistic processes”. Human action and behavior are always oriented to a goal, and thus, actions and organizations are decision-making mechanisms (Patriotta, 2003; Gherardi, 2006). The cognitive perspective reflects what Cook and Brown (1999, p. 384) described as the “epistemology of possession”, which is based on the Cartesianism and privileges the analytic reasoning. The main limitations of the cognitive approaches include the consideration of knowledge as a static and standalone object that is independent of human interpretation and action, and the restriction of knowledge as

something located only in individuals' minds and objectified in some sort of artifact. The cognitive perspective "relegates the complexity of knowledge-making dynamics to a fixed and static image" (Patriotta, 2003, pp. 24-25). Nicolini et al. (2003, p. 6) highlighted that "the conceptualization of knowledge as an object instead of a process – that is, as a mental substance mainly located in individual minds and manifested in written texts, representations and routinized behaviors – is needlessly and, in our view, erroneously restrictive".

The economic, finance or structural perspective consider knowledge as an asset in the form of intellectual capital, or as an object that can be taken out of its context, codified, recorded, classified, distributed by the use of communication technologies. It contemplates knowledge in a causal link with competitive performance, as an independent variable. Approaches within this strand consolidated the knowledge-based view of the firm, such as the one adopted by Nonaka and Takeuchi (1995). Approaches with this perspective produce content theory and "gloss over the processual aspects of knowledge creation" (Patriotta, 2003, p. 33). Among the weaknesses of this perspective, the claimed link between knowledge and competitive performance is an interrelationship that is difficult to measure (Patriotta, 2003). Another weakness includes the objectification of knowledge, and the fact that this perspective leads to an interpretation that rests on "too linear a view of the causal relationships between organizational knowledge and competitive performance", treating other influential aspects on the creation of knowledge superficially, such as the broader institutional and strategic context (Scarborough, 1998, p. 220).

The practice-based perspective to study knowing complements the cognitive and structural perspectives, rather than substitutes them (Orlikowski, 2002, p. 251). The understanding of knowing and knowledge based on practices bring the human action into the scenario, together with different ontological and epistemological assumptions. Individuals' actions are part of a whole. Under this perspective, knowing as a practice has been characterized as relational, situated, rooted in context and in action, dynamic, provisional, and as being not limited to cognitive aspects, but rather considered as a social construction (Polanyi, 1969; Polanyi & Prosch, 1975; Suchman, 198; Cook & Brown, 1999; Nicolini et al., 2003, p. 3; Carlsen et al., 2004;). In addition, inconsistencies, incoherencies, conflicts, tensions, and paradoxes are considered as fundamental components of a practice. Importantly, the practice-based approaches use predominantly a social perspective, historicity and heterogeneity, and knowing has a situated nature, i.e. a "spatio-temporal localized nature" (Nicolini et al. 2003, p. 23).

Corradi et al. (2008) highlighted that the interdisciplinarity of the practice-based perspective includes varied authors who have differently used the practice dimension to study organizational phenomena in a non-rational, non-functionalist and non-cognitive manner. One of the common aspects across authors and studies with a practice-based perspective is that the practice dimension is used in two ways. First, it can be used as a way of seeing or a point of view to study a context, and therefore, an epistemology. The other common use is the practice dimension as the empirical object of study. In this case, practices are the locus of the study (Corradi et al., 2008). The present study studied knowing from a practice perspective or epistemology, and it studied a specific work practice, which is the knowing work.

The major voices in the debate regarding knowing from a practice-based perspective include scholars and social scientists that have incorporated the discourse of knowing in organizations, including Maturana and Varela (1997), Tsoukas (1996; 2005a), Cook and Brown (1999), Skaret and Bygdas (1999), Strati (1999; 2003), Gherardi (2000; 2001; 2006; 2007; 2008), Orlikowski (2000; 2002), Bjørkeng and Hydle (2002), Skaret et al. (2002), Gomez et al. (2003), and Carlsen et al. (2004). The seminal work of Polanyi (1958; 1966; 1968; 1969; Polanyi & Prosch, 1975) in tacit knowing has also a practice-based perspective, since his focus was entirely on knowing, the process, rather than on knowledge, the object.

The practice perspective enables the study of knowledge (as inputs for and results of knowing) as mobilized and used in the knowing work practice, shifting the concern from knowledge as an object with meaning by itself, to knowledge as an aspect of knowing. In addition, a practice perspective also allows seeing the connections knowledge workers may construct with and between knowledge-based inputs in relation to their construction of knowledge, other individuals, institutions, practices and artifacts.

Gherardi (2003, p. 357) summarized the core aspects of a practice-based approach to knowing and knowledge as being the following:

- (a) Knowledge is constructed by situated practices of knowledge creation and by the use of technologies for representing and mobilizing knowledge by human and non-human agents.
- (b) Knowledge is an emergent process, rather than a given one. It is a “bricolage of material, mental, social and cultural resources”.

(c) Knowledge is “embedded in the world of the sensible and corporeal”, meaning that knowing and knowledge is not limited to cognitive and mind aspects.

Several reasons led to the use of a practice-based perspective in the present research. A practice-based perspective can provide useful insights into understanding how the knowing work is performed and how knowledge is used for it. Knowledge-based inputs are always mobilized, used, and enacted in an activity, in and for knowing: it is through the knowing work practice that knowledge-based inputs constitute knowledge (the result of knowing). Therefore, a practice-based perspective to the study of knowing and knowledge enables the knowledge workers’ actions and their influence in the construction of knowledge to be introduced. Furthermore, it allows considering the human actions that mobilize and use knowledge.

Undoubtedly, studying knowing from the practice-perspective immediately leads to specific theoretical and methodological considerations, which are mainly focused on knowing and knowledge as constructive, relational and situated actions. Empirically, knowledge is studied as activated in practice and the level of analysis become situations or situated practices, rather than individuals. Since Sense-Making Methodology (as developed by Brenda Dervin) and the seminal theory about tacit knowing developed by Michael Polanyi thematizes these issues in detail, these approaches were chosen as theoretical and methodological frameworks used in the present research.

2.5 Polanyi’s Theory of Tacit Knowing

In the present research, the understanding of knowledge creation was directly drawn on Polanyi’s theory of tacit knowing because he is the key theorist of this topic and, by tradition, the authoritative source for the concept^v (Polanyi, 1958; 1966; 1968; 1969, and Polanyi & Prosch, 1975). The focus of his whole theory is on knowing, i.e. on the process⁸ or actions of creating knowledge. Particularly contributive to the present research is Polanyi’s

⁸ When the term ‘process’ is used in the present study it does not mean a sequential and structured series of steps or actions that are performed to bring a result. It is more related to a set of actions, but not necessarily sequential and pre-defined.

consistent emphasis on knowing as creation of meaning, on communication of knowledge as acts of knowing, and on the influential but often misunderstood concept of tacit knowledge (for the problems see Tsoukas 1996; 2005a; Gourlay 2000; 2002; 2003; 2004a; 2004b; 2006a; 2006b; Haldin-Herrgard, 2001; Tsoukas & Vladimirou, 2001; Grant, 2007)^{vi}.

Polanyi *focused on the process of knowing, rather than on the product of this process, i.e. knowledge*. When discussing knowledge, he did not consider the idea of knowledge as objective, self-contained that is, independent on human participation and action, and detached from personal judgments. Polanyi considered knowledge as always attached to its creation and uses process, i.e. knowing. Mainly, he did not distinguish tacit and explicit as two separated and independent types or forms of knowledge. Rather, they are two inseparable and interdependent dimensions of knowledge.

Essentially, according to Polanyi (1958; 1966; 1968; 1969) tacit knowing is a combination of acts of meaning creation or integrations of particulars, parts, subsidiaries, terms, or clues⁹. These clues are integrated to the meaning they point to, or to the whole (a coherent whole) they contribute to. The clues are pointers to the meaning they contribute to, and they are relied as such. The individual attends *from* the clues (parts or particulars) *to* the meaning or whole (coherences, coherent whole of an entity, pattern). This integration between clues and the meanings that they direct to is an *act of meaning construction or tacit knowing*. How knowledge workers integrate and relate these clues to their world of experience is tacit knowing. As explained by Polanyi (1969, p. 218) “tacit knowing integrates the particulars of a comprehensive entity and makes us see them forming the entity”. In other words:

“...a scientific discovery reduces our focal awareness of observations into a subsidiary awareness of them, by shifting our attention from them to their theoretical coherence. This act of integration, which we can identify both in the visual perception of objects and in the discovery of scientific theories is the tacit power we have been looking for. I shall call it tacit knowing.” (Polanyi, 1969, p. 140)

Polanyi defined meaning as the “intelligible coherence” (Polanyi & Prosch 1975, p. 54). He explained that meaning is given by the pattern that particulars or subsidiaries jointly generate (Polanyi, 1958, p. 57). Polanyi (1968, p. 29) also explained that “the focal target on which they bear is the meaning of the subsidiaries”. “The subsidiaries of from-to knowing

⁹ These terms are used as synonyms by Polanyi (Polanyi, 1958; 1966; 1968; 1969, and Polanyi & Prosch, 1975).

bear on a focal target, and whatever a thing bears on may be called its meaning” (Polanyi & Prosch, 1975, p. 35).

The joint meaning or the coherent whole is on which individuals are focused on or focally aware. Clues are the things that individuals are subsidiarily aware of. These two levels of¹⁰ attention or awareness are given to the same clues. The integration or connection between clues-meaning or parts-whole is tacitly accomplished by knowers, by attending from the clues to the meaning these clues point to. The acts of meaning creation or integrations are “essentially tacit” (Polanyi, 1969, p. 194), personal, and they may occur effortlessly and smoothly, but this does not mean that these integrations are unconscious. In addition, the fact that these integrations are made with difficulties or demanding great efforts does not mean that the integration is less tacit (Polanyi, 1969, p.194).

In knowing, individuals’ attention is focused beyond the particulars, on the entity to which these particulars contribute to in terms of meaning, i.e. seeing the particulars “while looking at the context of which they form part” (Polanyi, 1969, p.128). But individuals’ attention can be focused on isolated particulars, e.g. focusing on the words of a document or on the words spoken by a colleague. When attention is given to the clues or particulars in themselves, when individuals are aware of these clues in themselves as isolated clues, then, these clues become relatively meaningless when compared to “the significance when noticed subsidiarily within the comprehensive entity to which they contribute” (Polanyi, 1969, p.128). Tsoukas (2005a, p. 158) explained that “since subsidiaries exist as such by bearing on the focus to which we are attending from them, they cannot be separated from the focus and examined independently; for if this is done, their meaning will be lost”. This means that if particulars are under focal attention (e.g. words), their meaningfulness is lost. In the other way, when attention is given from the particulars to the meaning they contribute to, then a meaningful relation is made. As emphasized by Polanyi (1969, p. 185) “while the meaning of a string of words lies in the sentence they form, the sentence is even more meaningful than the words which form it”. Therefore, meaning is not in the clues, but rather, it is in their integration to the focus or whole. In tacit knowing, it is the integration of clues or particulars made by knowers that emerges their meaningfulness.

¹⁰ They are not degrees of awareness.

As the tacit integration is made *from* the clues or particulars which individuals are subsidiarily aware *to* the meaning or whole they are focused on, tacit knowing is considered as having a vectorial quality, i.e. the tacit knowing intentionality (Polanyi, 1969, p. 141). By making what is subsidiarily aware subordinate *to* what is focally aware, tacit knowing acquires a direction, because it is directed *from* clues *to* meaning. This directness or from-to relation between clues to what is on focal target, i.e. meaning, is the *functional aspect of knowing* (Polanyi, 1966; 1969). As explained by Polanyi, (1968, p. 31) “the functional structure of from-to knowing includes jointly a subsidiary ‘from’ and a focal ‘to’ (or ‘at’)”.

The above explained *functional* aspect is only one of the four aspects of knowing (Polanyi, 1966, 1969). The *semantic* aspect of knowing is related to the meaning that the clues contribute to (Polanyi, 1968, p. 29). The *phenomenal aspect* is associated to the transformation or integration of clues in new sensory experience, when “a new coherent sensory quality appears (i.e. sense of a cavity) from the initial sense perceptions (i.e. the impact of a probe on the fingers)” (Tsoukas, 2005a, p. 148). The *ontological aspect* of knowing involves the fact that “the act of tacit knowing thus implies in the claim that its result is an aspect of reality which, as such, may yet reveal its truth in an inexhaustible range of unknown and perhaps still unthinkable ways” (Polanyi, 1969, p. 141).

The clues that a knower has a subsidiary awareness of, the meaning or the whole that the knower is focused on, and the knower, who integrates both, compound together what Polanyi (1966; 1969) referred to as the *triad of tacit knowing*. Thus, this triad consists of subsidiary things that are also referred to as particulars, clues or proximal terms (e.g. words, text, sounds, feelings, intuition, memories, body senses), their direction to and support of a focus (also referred to as the distal term), and their integration made by an individual. The *knower is the core element of the triad*, because the integration or the tacit knowing is only made by her/him. The creation of meaning always involves personal participation, i.e. knowledge is always personal and dependent on the knower to be created. As emphasized by Polanyi and Prosch (1975, p. 31) “personal, tacit assessments and evaluations, we see, are required at every step in the acquisition of knowledge”.

The provisional nature of meaning was emphasized by Polanyi (1968; 1969), who highlighted that the meaningfulness of an integration is alive as long as this integration is kept by the knower. The clues are integrated by the knower and the meaning created by this process remains only while this integration is sustained by the individual. According to Polanyi (1969, p.182) “a meaningful relation of a subsidiary to a focal is formed by the action

of a person who integrates one to the other, and the relation persists by the fact that the person keeps up this integration”. In this sense, the knowledge created is only meaningful in and during a specific time and space, while it is sustained by the knower. Polanyi (1968, p. 31) pointed out that “this pair [clues and meaning, ‘from’ and ‘to’, subsidiaries and focus] is not linked together of its own accord. The relation of a subsidiary to a focus is formed by the act of a person who integrates one to the other. And so, *the from-to relation lasts only so long as a person, the knower, sustains this integration*” (Emphasis added).

Additionally, knowing includes both intellectual and practical knowledge as two coexistent aspects of knowing as well. Polanyi (1966, p. 7) stressed that when he speaks of knowing, he covers “both practical and theoretical knowledge”. He explained that “these two aspects of knowing have similar structure and neither is ever present without the other”. Polanyi’s (1966, p. 7) theory gives examples “of knowing, both of a more intellectual and more practical kind; both the ‘wissen’ and the ‘können’ of the Germans, or the ‘knowing that’ and the ‘knowing how’ of Gilbert Ryle” (Polanyi, 1966, p.7).

Importantly, Polanyi (1969, p. 183) included the participation of the body, its sensations, and the interpretations made by it (eyes, memory, muscles) into the tacit knowing process: “this applies to all the examples of tacit knowing that I have listed. The expert recognition of specimens, the use of probes and tools, the major skills of our body and mind are all based on a meaningful integration of our body and of the sensations felt by our body”. In this context, *intuition was also included in the tacit knowing process* (Polanyi, 1966; 1969; Strati, 1999; 2003; Ewenstein & Whyte, 2007), and it may take place at any moment of the integrative acts of knowing. According to Polanyi (1969, p. 201), intuition is “the faculty for surmising with a fair degree of probability the presence of a hidden coherence in nature”.

Likewise, emotions were also considered as playing a role in knowing. According to Polanyi (1958, p. 312) “into every act of knowing enters a tacit and a passionate contribution of the person knowing what is being known, and that this coefficient is no mere imperfection, but a necessary component of all knowledge”. Polanyi highlighted the role of feelings in the knowing process performed in the scientific research practice, as follows:

“Even when attempts are made to state them explicitly, what these explicit statements mean can be known only by scientists in the particular field involved. There is much that cannot be made explicit because it lies at the level of feelings about fitness and in working attitudes that betray an essentially imaginative grasp of how things in that field may be expected to work or to be.” (Polanyi & Prosch, 1975, p. 186)

Essentially, knowing is *a process of creating new meanings*, by tacitly integrating parts to a coherent whole, or clues to the meaning they contribute to. It is a personal process that goes beyond the rational-cognitive-mental actions. Knowing also includes intuition, sensorial perceptions, personal history, emotions; and also the practical and theoretical knowledge. It is provisional and its temporality depends on the knower. Importantly, meaning creation entirely depends on the knower's actions. It is only by her/his integration of the two terms of knowing – the parts and the whole – that the meaningfulness of these parts is vitalized. Understanding the consideration of how knowing is accomplished and the characteristics of this process are core to identify ways to appropriately facilitate knowing work.

2.6 Knowing and Communicating Knowledge: Acts of Meaning Creation

Particularly contributive to the present research is Polanyi's explanation of knowing as *acts of meaning creation* (Polanyi, 1969). Polanyi (1969, p.181) defined acts of meaning creation or tacit knowing as "the way we endow our own utterances with meaning and our attribution of meaning to the utterances of others". In these acts there are two directions of "using meaning" or making tacit integrations (Polanyi, 1969, p. 186), which Polanyi named as *sense-giving* and *sense-reading*. Thus, sense-giving and sense-reading are the two directions in which tacit integrations between clues can be made, and in which individuals respectively attribute meanings to their own and to other individuals' articulations of knowledge. "Both the way we endow our utterances with meaning and our attribution of meaning to the utterances of others are acts of tacit knowing. They represent *sense-giving* and *sense-reading* within the structure of tacit knowing" (Polanyi, 1969, p. 181) (Emphasis in original).

The sense-reading and sense-giving are respectively the creation, and the communication of knowledge to other individuals. The creation of knowledge or the knowing process is a triad composed by the subsidiaries (the parts), the meaning (the whole), and the knower who performs the integration between these two. Equally, the communication of knowledge is also a triad or an act of meaning creation. The knowledge that is communicated is used by other individuals for new knowings, which is another sense-reading process.

Altogether, the creation and communication of knowledge are essentially a “triad of triads” as named by Polanyi (1969, p. 184), or three consecutive knowings, integrations, triads or acts of meaning creation: a sense-reading, a sense-giving, and another sense-reading (Figure 4).

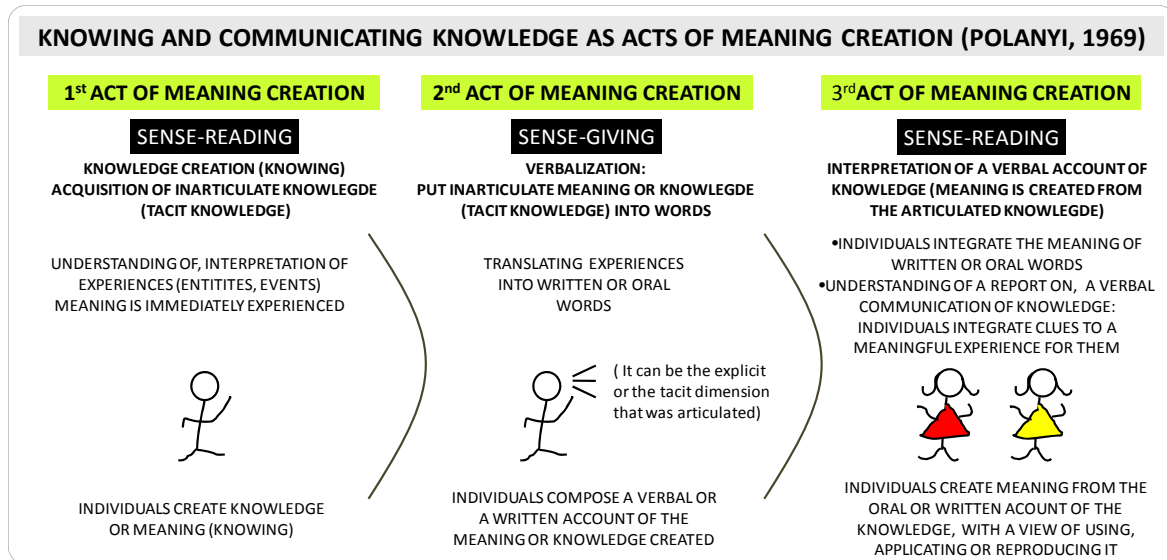


Figure 4 : Knowing and communicating: a triad of triads or acts of meaning creation (based on Polanyi, 1969).

As Figure 4 suggests, the first and the second acts of meaning creation or triads are performed by the same individual, and the *third triad is performed by a different one*. The *first and the second acts of sense-reading* are related to knowers understanding experiences and creating knowledge, but *these acts have differences* (explained further). “The *first* is an intelligent understanding of sights and events, the *second* the composing of a verbal account of this experience, and the *third* the interpretation of this verbal account with a view to reproducing the experience which is reported” (Polanyi, 1969, p. 186) (Emphasis in original).

The second act of meaning creation is sense-giving, which is basically a process of verbalization of the knowledge previously created (in the first triad). Knowledge is articulated in written or oral format (Polanyi, 1969, p. 188). The sense-giving is the articulation of knowledge to other individuals, who, then, use it to create new meanings. This *creation of new meanings on the basis of a report on specific knowledge* is an act of meaning construction as well, which Polanyi referred to as *sense-reading* (1969). This is the *third act of meaning creation* or the second sense-reading in Figure 4. When knowledge workers have contact with other individuals’ articulation of knowledge, they are getting and connecting with clues based on this articulation. These clues are then, integrated to a focal meaning.

A general illustration of the triad of triads in knowledge work would be the following:

(a) *First Triad (Sense-Reading)*. A manager's experience in the launching of a very new product in a shopping mall, by observing the consumers' reactions to the product; an analyst who goes and stays in a location to understand a new market or competitor; a sales professional interaction with a specific customer while s/he is using a product.

(b) *Second Triad (Sense-Giving)*. The manager has to report to his boss and colleagues about how the product launching and the consumers' reactions were in oral and written ways; the analyst has to explain his observations to the top management board in oral and written format; the sales man has to explain the customer's complaints to his team.

(c) *Third Triad (Sense-Reading)*. Bosses, management board members, and team members try to understand what the manager, analyst and sales professional communicated. They interpret the verbal and written account of their experiences and knowledge created. Their creation of meaning is from what the manager, analyst and sales professional articulated.

Acts of meaning creation as sense-reading and sense-giving are intrinsic in and vital for the knowledge creation work. Knowing workers are continuously demanded to create new meanings and to communicate them to their customers, teams and managers. Such processes involve interpretive and communicative skills in order to generate actual insightful and applicable business-relevant knowledge. The sense-reading and the sense-giving process compound the essence of knowing and communication of knowledge, and they are the primary source of value generation in a knowing work practice. *The present research focused mostly on the communication of knowledge that happen in the sense-giving process (communication of knowledge), and in the second sense-reading or knowing (communication of needs and uses of knowledge as input for knowing).*

In the next sections, knowing and the communication of knowledge as acts of meaning creation are explained by following the triads presented in Figure 4. Such understanding is essential given that the purpose of the present research is to facilitate the sense-giving or knowledge communication based on how the sense-readings or knowings are

accomplished. In addition, the structure of the ‘triad of triads’ served as the framework to present and discuss the topics of communication of knowledge (Polanyi’s sense-giving process), knowledge uses as inputs for knowing (both tacit and explicit dimensions), and communication of needs (the third triad or the second sense-reading). Therefore, the structure of the ‘triad of triads’ also served to present the studies and approaches that are related to the communication of needs and knowledge, and the access and uses of knowledge for knowing. Therefore, related topics and ideas that were needed to be included in the present literature review were structured and added to the description of Polanyi’s theory, relating them to the triad, i.e. to the processes of knowing (focus on the second sense-reading processes), and to the communication of knowledge (sense-giving).

2.6.1 The First Act of Meaning: Sense-Reading

The first triad or act of meaning creation is the sense-reading (Figure 4, on page 46). This is the moment in which individuals make sense of their own experience by directly interacting with, interpreting and understanding entities, signals and events.

The first sense-reading is the acquisition of *inarticulate knowledge*, of the “intelligent understanding of”, the creation of the “*original meaning*” (Polanyi, 1969, p. 186). It is the essential process that is needed and that precedes the verbalization of the knowledge or meaning created. What differentiates the first sense-reading from the second one is that in this first triad, *meaning is immediately experienced, whereas in the third triad meaning is created from a report of knowledge*. According to Polanyi: “I have described the tacit process of understanding experience and that of understanding a report on experience as two acts of sense-reading” (Polanyi, 1969, p. 190). In addition, the first and the second sense-reading *are performed by different individuals*. In the *second sense-reading, a different individual interprets a report on knowledge which was created by another individual in the first sense-reading* and verbalized in the sense-giving process. Examples were given previously.

The results of knowing are the meanings created by individuals. As a result of knowing, knowledge is what Polanyi named as the fourth aspect of tacit knowing, “which tell us *what tacit knowing is a knowledge of*” and that represents the ontological aspect of tacit knowing (Polanyi, 1966, p.13) (Emphasis added). This resulted ‘knowledge of’ has two *interdependent and inseparable dimensions* (not types, not kinds, not ends of a continuum),

which are the tacit and the explicit one (Polanyi, 1969). All knowledge has its tacit aspects, its “tacit presuppositions” (Tsoukas, 2005a, p. 119). According to (Polanyi, 1969, p. 144) “*all knowledge is either tacit or rooted in tacit knowledge. A wholly explicit knowledge is unthinkable*” (Polanyi, 1969, p. 144) (Emphasis in the original).

When this knowledge is articulated in oral or written formats (i.e. the sense-giving process) it becomes the input to other acts of knowing that are accomplished by other individuals, i.e. the second sense-reading (the third triad in Figure 4, p. 46).

2.6.2 The Second Act of Meaning: Sense-Giving

Consecutively to the first act of meaning creation individuals articulate the results of their knowing, i.e. knowledge. They express their knowledge into words (Polanyi, 1969, p. 186), into a written or an oral account of it. This is the second act of meaning creation: the sense-giving (see Figure 4, on page 46). In this case, writers or speakers endow words with meaning. Polanyi (1969, p.180) pointed out that sense-giving is a process “by which a writer picks his words for describing his experience”.

Central to knowing work is the communication of knowledge for (input) and of the knowing process (product of). Polanyi’s approach to the knowledge communication as a sense-giving process is significant for the purpose of the present research. Its main ideas encompass the fact that the articulation of knowledge is a meaning creation act because it demands endowing meaning to verbal or written words. Another key idea from Polanyi’s sense-giving process is that both dimensions of knowledge can be communicated (in different ways), but the fact that someone succeeds in articulating the tacit dimension of knowledge does not mean that tacit was converted into explicit knowledge. Polanyi’s approach makes clear that in communicating knowledge there is a distinction between the original meanings created by a knower and the meanings s/he endow words in reporting about the original meaning. Polanyi’s approach to the communication of knowledge as a sense-giving is important to understand and consider because it provides a consistent base that avoid being caught in the trap of facilitating communication to convert tacit knowledge into explicit. His ideas also provide consistent grounds to create approaches that acknowledge the differences in facilitating the communication of the tacit and explicit dimensions of knowledge.

Sense-giving is an activity that demands skills because individuals need to invest meaning to words. They need to translate to words the original meanings they previously attributed to entities, experiences, events or situations in the first sense-reading process. As explained by Polanyi (1969, p. 193) “our capacity to endow language with meaning must be recognized as a particular instance of our sense-giving powers”. The use of language to articulate knowledge in the sense-giving process is an act of meaning creation. It demands the writers or speakers to have subsidiary attention to clues from her/his tacit knowledge and integrate them to the joint meaning these clues should contribute to. In articulating the original meanings created in the first sense-reading, these meanings become under subsidiary attention.

Importantly, most of an individual’s knowledge cannot be communicated. Polanyi (1966) and Tsoukas (1996) emphasized that individuals can communicate *part of their knowledge*, not all of it. Most knowledge cannot be “*fully* described by words, nor even by pictures” (Polanyi, 1966, p. 4) (Emphasis added). The word “fully” in the previous quote evidences that part of tacit knowledge can be articulated and part cannot. Significantly, there will always be a part of individuals’ tacit knowledge that they do not know how to articulate, and they even know that they have it. The communication of tacit knowledge is such a polemic and misunderstood issue, and because it is essential for the present research, it is worthy to quote Polanyi in full to make clear that *tacit knowledge is not totally ineffable or inarticulate*:

“...strictly speaking nothing that we know can be said precisely; and so what I call ‘ineffable’ may simply mean something that *I know and can describe even less precisely than usual, or even only vaguely.*” (Polanyi, 1958, p. 88) (Emphasis added)

“To assert that I have knowledge which is ineffable *is not to deny that I can speak of it*, but only that I can speak of it adequately, the assertion itself being an appraisal of its inadequacy.” (Polanyi, 1958, p. 91) (Emphasis added)

“It exemplifies the subsidiary elements of perception may be unspecifiable, but shows also that such tacit knowledge can be *discovered*, without our being able to identify what it is what we have come to know” (Polanyi, 1969, p. 142) (Emphasis in original)

Likewise, regarding the communication of tacit knowledge, Tsoukas (1996), Göranzon and Hammarén (2006), and Ratkic (2006) have also highlighted that part of knowledge can be verbally articulated.

“Comments and verbal direction occur in the process of learning tacit knowledge, whether it be sport, music, glassblowing, knowledge of the human condition an engineer’s assessment of a project’s timeframe and budget limits, or a researcher’s expertise in handling laboratory equipment. *To be unable to capture the tacit dimension in words is not a question of being unable to capture it exclusively and precisely in the form of statements. But this is different than saying that it is unnecessary and even impossible to speak of it. The question of the connection between tacit knowledge and language does not condemn us to silence. Rather, it is a question of the kind of language we can use to identify the tacit aspects of our knowledge, and gain access to them.*” (Göranzon & Hammarén, 2006, p. 325) (Emphasis added)

Thus, Polanyi clearly meant that a considerable part of knowledge cannot be articulated, but that there is a part that can, if an appropriate method is identified and used. Polanyi (1958, p. 91) stressed that there are “particular contents of our knowledge which *we cannot adequately specify*”, but we can communicate tacit knowledge “provided *we are given adequate means* for expressing ourselves” (Polanyi, 1966, p. 5) (Emphasis added). Polanyi explained that there are methods that can help the communication of knowledge, such as those used by the police to help individuals recognizing a physiognomy. Most of human knowledge “cannot be put into words. But the police have recently introduced a method by which we can communicate much of this knowledge” (Polanyi, 1966, p. 4). Given this, part of knowledge can be communicated, for example, in a conversation or report. Individuals can linguistically articulate their tacit knowledge if they use appropriate methods and draw attention to how knowledge was once constructed (Polanyi & Prosch, 1975, pp. 39-41, Tsoukas, 2005a; 2005b). Individuals can help others in articulating the tacit dimension of knowledge by reminding them and drawing their attention to what they already know.

“The ineffability of tacit knowledge does not mean that we cannot discuss the skilled performances in which we are involved. We can – indeed, should – discuss them, provided we stop insisting on ‘converting’ tacit knowledge and, instead, start recursively drawing our attention to how we draw each other’s attention to things.” (Tsoukas, 2005a, p. 158)

The existence of methods to communicate knowledge does not eliminate the fact that the articulated knowledge is rooted in tacit knowledge. The articulated knowledge does not substitute its writers’ or speakers’ created knowledge, or tacit knowledge. *Sense-giving is not a conversion of tacit into explicit.* The original knowledge remains tacit to its owner. Its articulation or the account of it remains rooted on the tacit knowledge originally created. As pointed out by Polanyi (1966, p. 5) “the application of the police method does not change the fact that previous to it we did know more than we could tell at the time”. Even when

articulated, any dimension of knowledge is always rooted and grounded on knowledge that is tacit. Tsoukas (2005a, p. 158) pointed out that “even the most explicit kind of knowledge is underlain by tacit knowledge”. Articulate knowledge is rooted in the tacit dimension of the writers’ or speakers’ knowledge (knowledge created in the first triad), and on the meanings they attributed to the articulated piece. In communicating knowledge, “tacit cooperates with the explicit, the personal with the formal”, “tacit participates in the process of articulation” (Polanyi, 1958, p. 87). Without these two levels of dependence between the tacit and explicit dimensions of knowledge, and their integration, the articulate knowledge is ineffective. According to Polanyi (1969, p. 195), “*all knowledge falls into one of these classes: it is either tacit or rooted in tacit knowledge*” (Emphasis in the original).

When individuals articulate their knowledge they are not in the activity that generated such knowledge, but on the activity of thinking about the knowledge created in a past action (the original one). This is another subject of reflection. Using an example of reading a letter, Polanyi (1969, p. 189) explained that “the observed meaning of an experience [first sense-reading] differs structurally from one conveyed in a letter [sense-giving]. They are the focus of two different triads”. Thus, in the second sense-reading, when an individual interacts and interprets other individuals’ report on their knowledge, what s/he interacts with is *not the original meaning* that was created by them in their original experience.

The *knowledge that is articulated is not the same that was created in the past original action; it is not the same of the original knowledge*. This original one was generated from that initial connection, from a previous integration (in the first triad). When an individual reports or articulates knowledge s/he has the ‘original tacit knowledge’ under subsidiary attention, and this process is performed in a different context from the original one, in which this original knowledge was under focus or focal awareness (in the original meaning creation). Having tacit knowledge as subsidiaries after the action in which they were integrated (after the original knowing) is a different process from the one in which tacit knowledge was under focus in its original creation. In the original meaning creation tacit knowledge was under focal attention, it was the whole, the meaning, and it was underlined by other subsidiaries. The original meaning was formed by integration of clues, and reporting these meanings is the integration of written or oral words. According to Polanyi (1969, p. 189), “we may say that the first meaning [original sense-reading] is immediately experienced, while the second [meaning, second sense-reading] is only present in thought”. The articulation of an individual’s knowledge in a sense-giving process merely reports a “conception of the writer’s

experience” (Polanyi, 1969, p. 190), rather than the knowledge itself. This is illustrated at the bottom of Figure 5 (gray background).

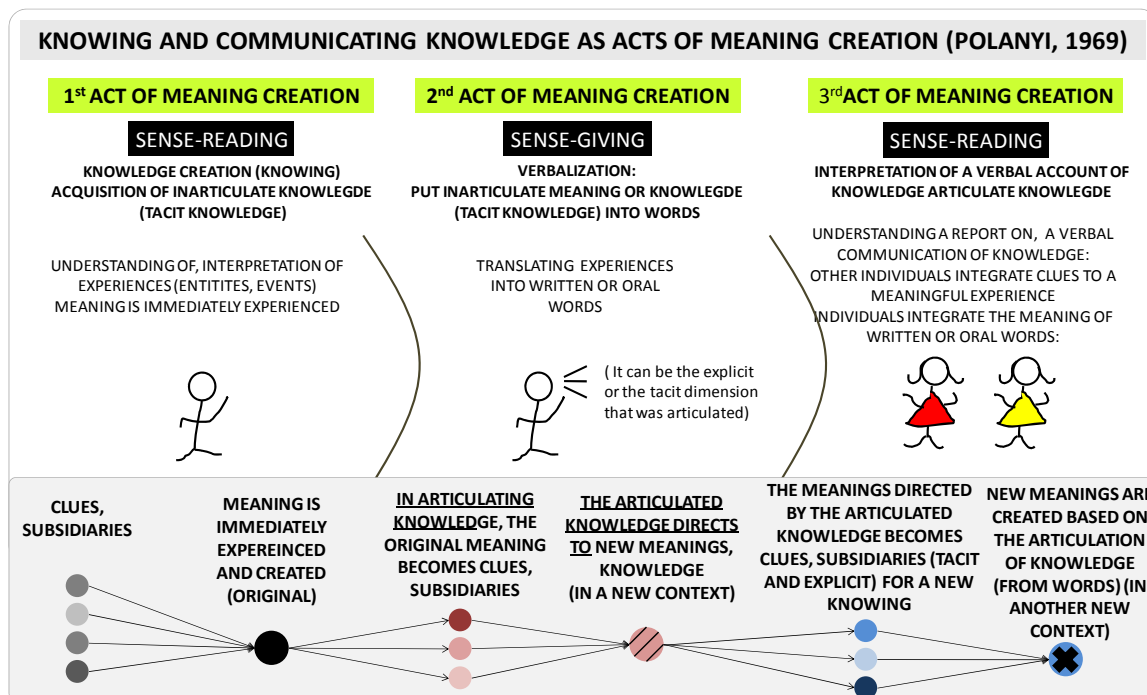


Figure 5 : The original meaning that was created, its communication and use for new knowings.

Given the above, *tacit knowledge is not converted or translated into explicit knowledge*. “The idea that somehow one can focus on a set of particulars [tacit knowledge] and convert them into explicit knowledge is unsustainable” (Tsoukas, 2005a, p. 158). It is only possible to bring tacit knowledge forth, to punctuate salencies and connections that were done in the original meaning creation action. But this would be a reflection and a report on the knowledge created in its original action, rather than the knowledge itself. Therefore, *there is no conversion, translation or transferring of the tacit dimension of knowledge*. Explicit knowledge is not the tacit dimension that was converted or translated, captured, or even transferred (Tsoukas, 2005a, pp. 156-157). When individuals succeed in communicating part of their tacit knowledge to others, *they articulate their reflection and understanding about it; they just make a report on it, rather than convert tacit into explicit knowledge*. They “punctuate” their understanding, see connections, evidence some distinctions, and notice certain aspects of the circumstances that so far, remained unhidden (Tsoukas, 2005a, p. 157). *What is brought forward and is communicated is not the original tacit knowledge or*

meaning, but rather, observations, reflections and thoughts of it. When knowledge workers listen to an expert's knowledge about a topic, they are getting saliences that underlie this knowledge, features, observations of the expert's knowledge; distinctions and connections that the expert punctuates in relation of her/his own knowledge. When more experienced or knowledgeable individuals talk about their knowledge, they draw the audience's attention to certain aspects, making it see new connections, to notice specific features; they use language to remind them of things they already know (Tsoukas, 2005a). Given this, when individuals communicate knowledge (write or talk about it), they *do not convert or transform it from tacit to explicit, because the tacit knowledge does not end existing to become explicit knowledge.*

“To treat practical (or tacit) knowledge as having a precisely definable content, which is initially located in the head of the practitioner and then ‘translated’ (Nonaka and Takeuchi 1995: 105) into explicit knowledge, *is to reduce what is known to what is articulable*, thus impoverishing the notion of practical knowledge.” (Tsoukas, 2005a, pp.154-155) (Emphasis added)

Therefore, when the tacit dimension or aspect of knowledge is articulated it does not become explicit, because the tacit dimension is not defined by what is not-yet-articulated, and that can be extracted and converted. When the tacit dimension of knowledge is articulated by an individual (e.g. talking with someone) it is a recollection, not a conversion or transfer of tacit knowledge. Tacit knowledge does not become explicit knowledge because they are not separate and independent things, that one disappears for the other to exist. Rather, they are aspects of the same knowledge, as the two sides of a single coin.

“What we do when we reflect on the practical activities we engage in is to re-punctuate the distinctions underlying those activities, to draw the attention of those involved to certain hitherto unnoticed aspects of those activities.” (Tsoukas, 2005a, p. 157) (Emphasis added)

In addition, the articulation of knowledge per se is meaningless. It only acquires meaning for individuals when it is introduced subsidiarily into new knowings, and the individuals' attention is focused on the meaning this verbalization directs to.

In this section it was explained how Polanyi approaches the communication of knowledge as a meaning creation act, i.e. sense-giving. Essential for the purposes of the present research, the conception of communicating knowledge as a sense-giving process brings the focus to its core value, that is, to convey meaning to words and describe knowledge in a way that facilitates other individuals' knowing. The concerns are not in

converting one dimension of knowledge into another, but to make both dimensions understandable. It is to give sense to both dimensions, to be able to communicate both dimensions acknowledging their interdependent, intertwined and different natures, and consequently the required methods to communicate them. Such focus in sense-giving leads to the use of different approaches and issues that should be under attention in facilitating the communication of knowledge.

Communicating Knowledge for Knowing

Knowledge workers communicating a market analysis for green products to their customers; a professional communicating her experience while launching a biomedical publication to knowledge workers; and knowledgeable individuals communicating to knowledge workers their experiences with bioenergy technologies in development countries. All these actions have in common the need of sense-giving processes and skills, in order to communicate knowledge in a way that engages the audience, and facilitates their interpretation and understanding as well. The key challenge in communicating knowledge is to make it timely and smoothly accessible intellectually, to communicate it in a way that helps and facilitates the knowledge users to identify the meanings the respective knowledge contributes to. Significantly, communicating knowledge demands understanding and adaptation to its audiences' needs, uses, priorities, background and situations.

The communication of knowledge was explained by Polanyi (1969) as a sense-giving process, as an act of meaning creation. Extending this concept, Eppler (2005, p.2, 2007, p. 291) defined knowledge communication as “the (deliberate) activity of interactively conveying and co-constructing insights, assessments, experiences, or skills through verbal and non-verbal means”¹¹. Knowledge is considered communicated “when an insight, experience or skill has been successfully reconstructed by an individual because of the communicative actions of another” (Eppler, 2005, p. 2). According to Eppler (2007, p. 292), the knowledge communication demands “conveying context, background, and basic assumptions. It requires the communication of personal insights and experiences”. In

¹¹ According to Eppler (2007, p. 292) knowledge can be communicated relying on “speech, text, graphics, and other means of communication (i.e. verbal and no-verbal).

addition, communicating these insights demands “the elicitation of one’s rationale and reasoning (i.e., one’s argumentation structure), of one’s perspective, ratings and priorities, and of one’s hunches and intuition”.

Based on empirical research, Eppler (2004; 2005; 2007) identified the main problems that occur in communicating knowledge between individuals, particularly between experts and non-experts, or between the creators and owners of complex and specialized knowledge and those who need to use this knowledge for other knowing processes and business actions. The typical identified problems in communicating knowledge in corporate environment can be summed up as follows: (a) absence of overviews, backgrounds and connections with users’ world, (b) the lack of adaptation to users’ needs, priorities, situations and uses of the respective knowledge, (c) natural knowledge asymmetry between professionals, (d) communication with an excessively focus on content-based criteria, and (e) knowers’ needs are not made clear to knowledgeable individuals. These main problems make it difficult to reduce complexity and help the timely access to and clear understanding of the knowledge being communicated.

One of the many ways that can impede the effective communication of knowledge between experts and non-experts is caused by the experts or the individuals who communicate a specific knowledge. The problem is generated by the absence of “overviews, background, summaries, ramifications or consequences of their [experts] analysis” making the participants of the communication process to “struggle to create coherent structure themselves, in order to make sense of the presented complexity” (Eppler, 2004, p. 13).

Another key problem is the lack of adaptation in communicating knowledge. Adaptation is related to how the communication is associated with the needs, situations and priorities of those who demand, access the respective knowledge, e.g. managers. This problem in knowledge communication is caused by the expert’s or specialist’s behavior when they do not relate “the insights to the manager’s situation” (Eppler, 2007, p. 296), and when there is the “inadequate adaptation of an expert’s contribution to a managerial process” (Eppler, 2004, p. 13).

“Adaptation in this sense refers to the expert’s ability to relate his or her findings to the context of managers that is to say to their goals, options, restrictions, to their prior knowledge and experience, and to their functional background. This implies that the expert has to take into account the manager’s unique perspective, his or her prior projects, general priorities and preconceived notions. Many times, however, the expert focuses on the problem at hand and its drivers, and does not offer

possible linkages to the manager's background or even to possible solutions.” (Eppler, 2004, p. 13)

The lack of adaptation was also identified in the communication of knowledge accomplished in conversations for the work planning process of a unit of a public agency. In an empirical study about the role and place of information in the annual work planning, Solomon (1997, p. 1120) found that the informants described their situations in the planning work as involving “information games”. They indicated gaps in communication that occurred in conversations for the planning work. The gaps manifested themselves in diverse ways such as (a) too much information was provided when summaries were desired, (b) it was provided information that “did not pertain to the problem at hand (relevance – asking for particular information and getting a story with no bearing on the initiating situation)”, (c) avoidance of the issue of concern in the conversation by employing indirect references (e.g. metaphors, analogies and anecdotes) that “did not directly address the issue on the table”. The gaps identified by Solomon (1997) also evidenced the lack of adaptation of the communication to the users' needs and situations, and also a lack of focus in communicating according to the participants' issues.

In knowledge communication, there is a natural knowledge asymmetry (Eppler, 2007; Dervin, in press). This asymmetry generates a distance in the communication between ‘experts’ or owners of in-depth and specialized knowledge, and the ‘non-experts’ or those who need the specific knowledge. Dervin (in press) stressed that “the world of expertise never equals the world of the everyday”, “in actuality, the fundamental problematic – like communicates best with like – is a pervasive and historically documented struggle for all those involved in communicating with others”. However, for the purpose of communicating knowledge in knowing work, this chasm needs to and can be partially overcome; allowing the contribution of the knowledge created to not be diluted or even be unnoticed.

Considering the problems presented above, the communication of complex knowledge and insights demands special attention and techniques to reduce their inherent complexity and facilitate their understanding. Particularly, the communication of knowledge requires adaptation to the needs of its users. Specific indicators and approaches can help users to make sense of the knowledge being communicated and to smoothly identify the meanings it contributes to, and its applicability to their needs, priorities and situations. To communicate pure content is not enough.

“Communicating expertise-based, complex insights, by contrast, calls for didactic tricks and at times sophisticated indirect speech acts and visualization means that *help the other side to become actively involved in the communication and engage in a collaborative, goal-directed sense making process – a prerequisite for the construction of new knowledge.*” (Eppler, 2005, pp. 3-4, 2007, p. 292) (Emphasis added)

In this context, varied techniques and indicators can be incorporated to the communication of knowledge. According to Eppler (2005), additionally to the common strategy of communicating knowledge (pure content) other indicators should be provided. *“These indicators help the person who requires insights from another to understand the other’s perspective, to reconstruct the other’s insights correctly, and to connect them to one’s own prior knowledge”* (Eppler, 2005, p. 3; 2007, p. 292) (Emphasis added).

Additionally to the problems described above, explicit-knowledge based inputs have been mostly communicated based on their own characteristics, as it is indicated by the literature review about the communication of explicit-knowledge based inputs by means of documents that will be presented in the further section in the present chapter. The focus has been on communicating knowledge by describing it with characteristics of itself, mainly of its content¹². These characteristics are generated from terms derived from the content of knowledge, such as its subject matter or topic descriptors (describe the subject or the domain of knowledge). The explicit dimension of knowledge that is communicated by documents has been predominantly described in relation to itself and to its domain, rather than on its relation to human interpretive actions with it and the needs in such actions. According to Suchman (2007, p. 64) “the prevailing strategy in representing knowledge has been to categorize the

¹² Equally evidencing that the concern has been focused on communicating knowledge by only considering characteristics of itself or its content is the increasing use of ontologies to represent knowledge (Weinberger et al., 2008; Holsapple & Joshi, 2004; Kabel et al., 2004), latent semantic indexing (Deerwester et al., 1990; Cui & Heidorn, 2007; Rishel et al., 2007), semantic annotation of resources (semantic metadata) (Grobelnik & Mladenic, 2006, p. 9), and concept or topic maps and metadata (Yi, 2008; Hawking & Zobel, 2007). Within this context, other ways of enriching the communication of knowledge in a corporate environment have included the addition of a second level of description about it that is made by users. The latter can be added to the representation of knowledge that is commonly made by authors. One of the original approaches related to this was the second level of description of knowledge by users that was incorporated in adaptive hypermedia by Mathé and Chen (1996). They developed the Adaptive HyperMan system (AHM), a “user-centered indexing approach to adaptive information access” (Mathé & Chen, 1996, 233). In the AHM “users select and mark any part of a document as interesting, and index that part with user-defined concepts”, and these marked parts can be subsequently retrieved by other users (Mathé & Chen, 1996, 233). Currently, a second level of knowledge description can be made by folksonomies or tags (keywords assigned by users), but they have been rarely used in corporate environments.

world in domains of knowledge (e.g. areas of specialization such as medicine along one dimension and propositions about physical phenomena such as liquids along another) and then to enumerate facts about the domain and relationships between them”.

The strategy for communicating knowledge employed in a knowledge-intensive company (consultancy) is the development of what was referred to as “knowledge objects”. According to Hansen et al. (1999, p. 108), these knowledge objects are developed by eliminating client sensitive information and “by pulling key pieces of knowledge such as interview guides, work schedules, benchmark data, and market segmentation analyses out of documents and storing them in the electronic repository for people to use”. The aim was to achieve scale in knowledge reuse by making these knowledge objects searchable and retrievable without having to contact the individual who created it.

The strategies to support the communication of the explicit dimension of knowledge in six consulting organizations¹³ were evidenced in a comparative analysis of knowledge management experiences in this kind of organizations (Apostolou & Mentzas, 1999a). The strategies used were the following: (a) repositories of methodologies and tools; (b) database-driven expert skills directory (by level of expertise); (c) information repository from which information can be retrieved by data nature and types; (d) employee directories; (e) knowledge bases with content described by clients, services and industry sector with search tools (by keywords, metadata); (f) synthesis of materials in standard templates organized by people, sales & marketing, leading practices, articles & research, learning resources, regulations and standards, service delivery, and network communications; (g) knowledge organized in knowledge domains such as competitor, product, employee, engagement, client, news, industry, practice and Web; (h) best practices repositories; (i) research databases; (j) market & customer information; and (k) general intellectual capital repositories. Another illustration would include a system in the KPMG consultancy company, which contains a database-driven expert skills directory (Apostolou & Mentzas, 1999a, p. 135). Additionally, a commonly used strategy to communicate knowledge has been the use of knowledge maps, such as the one used by Arthur Andersen’s (a consultancy company), which is based on competency area (Apostolou & Mentzas, 1999a, p. 135).

¹³ Arthur Andersen, Booz-Allen & Hamilton, Ernst & Young, KPMG, IBM Consulting, and McKinsey & Company.

An additional problem in knowledge communication is related to the individuals who need to access and use others individuals' knowledge, i.e. the knowers. According to Eppler (2005; 2007), problems are caused by knowers who do not leave it clear to the experts or knowledgeable individuals what they actually need and expect from them. This makes the communication process arduous to be accomplished and contributive, demanding considerable efforts by the knowledgeable individuals to share what they know. In addition, the generated outcomes from this interaction may not be appropriate to the knowers' needs. For example, Jacobson and Prusak (2006) showed that knowledge workers spent 37.7% of their work time eliciting knowledge from experts. Thus, effectiveness in communicating needs is advisable to make better use of the resources devoted to this process.

As shown above, the communication of knowledge has been mostly accomplished with insufficient adaptation to its users' needs, priorities and situations. In addition, insufficient attention has been paid to the knowledge asymmetry, without attempting to reduce complexity, and on the basis of its own characteristics (e.g. format, source, nature, and type) and content. The communication of knowledge in business contexts has been typically accomplished without indicating any association of the specific knowledge with its potential users' knowing needs and how its uses can contribute to meaning creation actions. Empirical evidence has shown that the communication of knowledge has been challenged by the need of adaptation to the audiences' perspectives and situations, and by the need of reducing its complexity. Furthermore, when communication of knowledge is made on the basis of aspects not related to it (e.g. industry sectors, products and employees), these aspects have been commonly detached from the meaning creation actions for which the respective knowledge can be needed and used. Empirical evidence has also showed the lack of clear explanations of needs and expectations by the knower to the knowledge owner. Consequently, the explained problems and approaches somehow limit the intellectual access to knowledge in a specific knowing work. It reduces the identification and understanding of how specific knowledge (input) can contribute to how users need to use it for their meaning creation.

2.6.3 The Third Act of Meaning: Sense-Reading

The third act of meaning creation is another sense-reading process (Figure 4, on page 46). In this second sense-reading, *knowing is accomplished on the basis of knowledge that*

was articulated by another individual in the sense-giving process. This second sense-reading is performed by different individuals than those in the first sense-reading. In the first sense-reading it is one individual interpreting and making sense of his own experiences. The individual is immediately having an experience, and the meaning is immediately experienced. As such, meaning is directly created, it is the “original meaning” (Polanyi, 1969, p. 186). Whereas in the second sense-reading meaning is created by a different individual from the first one, and meaning is created by using *a verbal report on another individual’s knowledge* (oral or written format) or the articulation made in the sense-giving process. Here meaning is created on the basis of a report on knowledge; individuals try to understand and create meaning of another individual’s knowledge. As such, individuals integrate the meaning of oral and written words of an account on knowledge (Polanyi, 1969, p. 189).

In the second sense-reading, individuals read or listen to and try to make sense of knowledge that was articulated by other individuals in written or oral format. They “try to make sense jointly of its text and of the experience described by the text” (Polanyi, 1969, p. 188). They *interpret these articulations into a meaningful experience for them.* The second sense-reading is “the interpretation of this verbal account [made in the sense-giving] with a view of reproducing the experience which is reported” (Polanyi, 1969, p. 186). This means that these individuals need to interpret the verbal or written account with a perspective to use, apply, draw on or reproduce the knowledge that was reported.

Using the example above, when the analyst interprets the report, s/he interprets the meaning attributed by its author, creating then, her/his own meaning according to what s/he needs to know, and according to how s/he needs to apply or reproduce it. There are then, different meanings attributed to a single articulation of knowledge: the one endowed by the writer or speaker, and the one endowed by the knower (respectively sense-giving and sense-reading). Polanyi highlighted this in relation to an example of the letter received from a friend “the knowledge I thus retained was the meaning of a letter as I understood it” (Polanyi, 1969, p. 189).

The first and second sense-reading processes are mainly cognitively performed, but they are not limited to cognition as the rational mental processes of judgments and reasoning. According to Polanyi (1966; 1969), tacit knowing includes body senses and intuition. Knowledge workers, may also use their feelings in relation to a situation (e.g. ‘I feel insecure to invest given the failures of similar products in this market’), or in relation to information

given by a professional (e.g. ‘I feel that this manager is not telling me the whole truth about this market’).

In addition, Polanyi (1969, p. 188) explained that in understanding an articulation of knowledge, “we can usually rely on our previous understanding of familiar experiences”. This means that when individuals create meaning they may bring and use their history, their personal, past and similar experiences. As an effect of this assumption, Polanyi included individuals’ internal aspects in the knowing process and by doing this, he emphasized the inseparability of individuals’ past experiences and knowledge in the creation of new ones.

2.6.3.1 Knowing and Knowledge Uses (in the Second Sense-Reading)

Considering that in the second sense-reading meaning is created from reports on knowledge, the attention in this section turns to the uses of such inputs that are based on the tacit and explicit dimensions of knowledge. The focus on such a topic is essential for the present research, because it allows understanding how knowledge, as inputs for knowing, is a means to an end, i.e. knowing. The following section mainly draws on Polanyi’s tacit knowing theory, but also provides contributive and complementary ideas to it.

Knowledge is different from knowing. The latter, tacit knowing or simply knowing, is the process or the actions of meaning creation by integrating clues or particulars that are under subsidiary attention, to the meaning that these clues contribute to, which is under focal attention. Knowing is a verb, referring to actions or processes, which is a characteristic of practice-based approaches. Knowledge is a noun. It is simultaneously the result of knowing, and what nourishes new knowings.

Throughout Polanyi’s publications (1958; 1966; 1968; 1969; Polanyi & Prosch, 1975) he *was concerned and focused on tacit knowing*, the process, rather than on tacit knowledge, the product of the process. As emphasized by Gourlay (2004a, p. 90), Polanyi “actually discussed a process, ‘tacit knowing’ and not some *thing*, ‘tacit knowledge’” (Emphasis in the original). Gourlay (2002; 2004a) reminded that Polanyi used ‘tacit knowing’ approximately five times more often in his work^{vii} than referring to ‘tacit knowledge’ or knowledge being tacit.

Knowledge is used to nourish knowing in the second sense-reading or meaning creation process. It is this specific knowing process on which the present research

concentrates hereafter. The *second kind of sense-reading* focuses on how individuals create meaning from knowledge that was articulated by other individuals (e.g. an article and a conversation with the author), in written or oral forms in the sense-giving process.

Individuals interpret the articulated knowledge to nourish their new knowing processes. The articulated knowledge becomes clues or inputs (namely knowledge-based inputs) to these new knowings. Therefore, the function of knowledge as input to knowing *occurs in the second sense-reading* in Polanyi's 'triad of triads' (Polanyi, 1969).

Knowledge-based inputs are what knowledge workers infer from the manifested content (the surface features like words) and such inference is not necessarily intended, acknowledged or known by the author or the creator of the knowledge. What individuals access and communicate (the knowledge-based-inputs) is not the knowledge itself. They are only articulations; reports on a specific knowledge. To illustrate, a report made after an analysis of a competitor is not the knowledge itself, but rather, it summarizes and draws attention to the points and connections that were salient for the creator of the respective knowledge in his/her original meaning creation. The report is a representation of the knowledge that can be used by other individuals to construct new knowledge, serving as input to new knowings. When these articulations or representations of knowledge are put into use they become "potential building blocks for new knowledge" (Rice et al., 2001, p. 45). Therefore, what is accessed and used as inputs for knowing are based on articulations or representations of knowledge, rather than the knowledge itself.

Knowledge that is communicated is not necessarily explicit knowledge. As explained previously, explicit knowledge is a dimension of knowledge. It was defined by Polanyi (1966, p. 22) as the dimension of knowledge that can be clearly stated. *All the explicit dimension of knowledge can be articulated, but not everything that is articulated is the explicit dimension knowledge.* The tacit dimension of knowledge can also be articulated, but not precisely, fully or clearly. When articulated it is not tacit knowledge 'converted' into explicit. Tacit does not 'become' explicit knowledge; it continues tacit to be tacit for its owner. In articulating the tacit dimension of knowledge only its part which is possible to be verbalized in propositions or with language is described (Tsoukas, 2005a, p. 156). When described, it is just the tacit knowledge that an individual succeeded in articulating, but *it does not become explicit knowledge*, as explained in section 2.6.2. Therefore, articulated knowledge can be a piece of the explicit dimension of knowledge, but it can also be what is reminded and recollected from the tacit dimension. Inputs for knowing are based on both

dimensions of knowledge. However, these inputs can only nourish knowing if they are communicated (Figure 6).

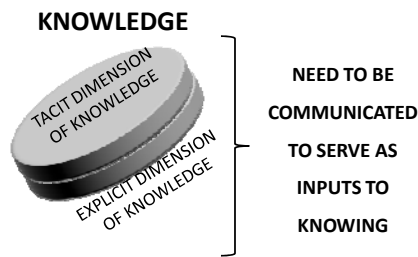


Figure 6 : The tacit and explicit dimensions and their articulation to serve as inputs for knowing.

In addition to the use of the explicit dimension of a specific knowledge, individuals may need or want to access the tacit dimension of the specific knowledge. For example, an individual uses a financial report to nourish her/his analysis of a market and at the same time, talk with the analyst who created the respective report in order to get more insights and new perceptions regarding the topic. In this case, individuals can try to access not only the report, but also the authors' tacit knowledge in order to enrich their own knowing process. In addition, individuals can also access and use the tacit dimension of their own knowledge, their own intuition, emotions, experience, and history. In using knowledge for knowing, individuals always need to *rely on* the tacit dimension of their knowledge, even when interpreting the explicit dimension of knowledge. Such inputs (authors' and own tacit knowledge) are referred to as tacit-knowledge based inputs, because they are *based on* a dimension of knowledge that is tacit. Therefore, individuals can use knowledge as inputs for knowing that are based on the explicit dimension of knowledge. Inputs can also be based on the tacit dimension of knowledge that is communicated, such as one's own and others' personal knowledge, thoughts, ideas, insights, one's own intuition, body senses, emotions, history, and experience (Polanyi 1958; 1966; 1968; 1969; Polanyi & Prosch, 1975). Inputs to knowing can be *based on* the explicit dimension of knowledge, namely explicit-knowledge based inputs, and on the tacit dimension as well^{viii}, namely tacit-knowledge based inputs.

The inseparability and interdependency of the tacit and explicit dimensions of knowledge were clearly explained in Polanyi's work. Polanyi asserted that tacit and explicit knowledge "are not sharply divided", and that "while tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly understood and applied. Hence *all knowledge is either tacit or rooted in tacit knowledge*. A wholly explicit knowledge is

unthinkable” (Polanyi, 1969, p. 144) (Emphasis in the original). Tacit knowledge is the foundation of all knowledge, and the foundation of all explicit knowledge (Polanyi, 1969, p. 187). Likewise, Brown and Duguid (2001, p. 204) pointed out that Polanyi “is not, then, arguing for two types of knowledge, merely for two dimensions – two interdependent dimensions”. Tsoukas (1996, p. 14) pointed out that “to split tacit from explicit knowledge is to miss the point – the two are inseparably related”.

Conversely to be the opposite of explicit knowledge, tacit knowledge “is simply its other side” (Tsoukas, 2005a, p. 143). Tacit and explicit are mutually constituted, and thus, cannot be considered as two separate and independent forms or types of knowledge. When individuals access and interpret explicit knowledge as an input for their knowing they may also need the tacit dimension of this knowledge, and they depend on their tacit knowledge to interpret it as well. “Tacit and explicit knowledge are not two ends of a continuum but *two sides of the same coin: even the most explicit kind of knowledge is underlain by tacit knowledge*” (Tsoukas, 2005a, p.158) (Emphasis added). The tacit-explicit interdependence and inseparability has been equally claimed by Tsoukas (1996; 2005a), Tsoukas and Mylonopoulos (2004), Duguid (2005), Orlikowski (2002), Brown and Duguid (1991), and Wagner and Sternberg (1985). According to Brown and Duguid (2001, p. 204), the tacit-explicit interdependency was also reflected on Ryle’s work regarding ‘know how’ and ‘know that’; “they are interdependent and cannot be reduced to one another”.

The inseparability and interdependence of the tacit-explicit dimensions of knowledge has an important influence to the purposes of the present research. For communication of knowledge to be attuned to the knowing practice it has to acknowledge and encompass the fact that to reinterpret the explicit dimension individuals will use the tacit dimension of their own knowledge. This means to acknowledge human action with such knowledge and demands considering such actions when the communication is accomplished. In addition, users may also need to access the tacit dimension of knowledge (e.g. to talk with the author of a report). All these implications drive the attention to a different way to think, facilitate and adapt the communication of knowledge in corporate environment.

An example of inputs based on both dimensions of knowledge would be a strategist who is preparing an analysis of a product. She can study a market research and interact with the researchers who were involved in it. She can also talk with the author of the report, and discuss with the sales people, as well as study similar competing products. All these actions generate inputs based on different dimensions of knowledge. They synergistically contribute

to the strategist's knowing process. Importantly, they may be blended in a way that the distinctness of these contributing dimensions to knowing becomes invisible.

The meaningfulness of knowledge-based inputs emerges in their integration, in tacit knowing. It is revealed in the actions of meaning creation. This meaningfulness only materializes when these inputs are mobilized in action, activity, or practice (Polanyi, 1958; 1966; 1969; Cook & Brown, 1999; Orlikowski, 2002; Carlsen et al. 2004; Ellingsen & Monteiro, 2004; Gherardi, 2006). According to Starbuck (1992, p. 722), "for old knowledge to have meaning, people must relate it to their current problems and activities". Given this, knowledge and knowing activate each other; they are "complementary and mutually enabling" (Cook & Brown, 1999, p. 383).

Based on the practice-based perspective and its intrinsic assumption that knowledge is used and activated in knowing, the present study considers the concept of 'knowing needs'. Knowing needs is a concept that incorporates the knowing practice for which individuals' needs are fulfilled and knowledge is used. When individuals access the knowledge-based inputs they try to fulfill needs that are associated with some kind of interpretive actions, being this action simple or complex. Purposeful access to knowledge implies that individuals have reasons for accessing it and need to put the accessed knowledge into use in some way. The access to and uses of knowledge are not isolated actions from the knowing process that underlie them. Inputs are needed and accessed because they contribute to a knowing process, to meaning creation. As Polanyi (1958; 1966; 1968; 1969) stressed, individuals' focal attention is always on the meaning that the clues (the inputs) contribute to.

Knowing needs *are how individuals need to be supported by inputs in their meaning creation*. Knowing needs are individuals' needs for their meaning creation, rather than needs of an input by itself, as an independent and self-contained object. What is needed is *not an object by itself*, but an object that in specific ways *enables and contributes to an action of meaning creation performed by a knower*. Therefore, knowing needs are conceptualized in relation to the knowing practice for which inputs are needed, mobilized and used, rather than only in relation to what is needed, i.e. knowledge by itself. It incorporates the meaning creation practice in which knowledge is to be used and should serve and contribute to. The concept of knowing needs attempts to include the knowing process, and the knowers' actions in and for it. Therefore, to need and use knowledge (inputs to knowing) is a means, because it is needed and used for the creation of meaning. Polanyi (1958, pp. 58-59) emphasized that knowledge is used as a tool, when he explained that "hammers and probes can be replaced by

intellectual tools” (p. 59) that individuals can rely on as interpretive frameworks. Tsoukas (2005c, p. 127) also highlighted knowledge as a means, “for knowledge to be effectively applied it needs to be instrumentalized – to be used as a tool”.

Importantly, the relationship between knowledge-based inputs and the individual’s knowing process occurs at the meaning level, because this relationship is based on the meanings that the respective knowledge contributes to. Clues to tacit knowing (inputs) only have meaning when they are attended to subsidiarily “within the comprehensive entity to which they contribute” (Polanyi, 1969, p. 128). This is very important for the communication of knowledge, because the communication process should facilitate the easy and timely identification of the meanings that a specific knowledge contributes to. In communicating knowledge for knowing, the better/clearer the indication of the meanings that are contributed by this knowledge, the better and faster can be the identification of its association and potential usefulness in relation to individuals’ specific needs in meaning creation processes.

2.6.3.2 Tacit-Knowledge Based Inputs to Knowing

The present research draws directly on Polanyi’s conceptualization of tacit knowledge. Tsoukas (1996; 2005a; 2005b), Brown and Duguid (2001), Stenmark (2001), Strati (2003; 2007), Tsoukas and Mylonopoulos (2004), and Duguid (2005) used the same interpretation of tacit knowledge made by Polanyi.

Polanyi (1969, pp. 144-146) explained that the clues that individuals integrate to the meaning they point to can be of two kinds: those which are observable and identifiable (i.e. the explicit dimension of knowledge), and those which are not (Polanyi, 1969, pp. 144-146). The unidentifiable clues or particulars are “nearer to us” and in this case, they are named as the proximal terms of tacit knowing and they are on subsidiary awareness (Polanyi, 1966, p. 10). These proximal terms, which may not be identified or observed, are the tacit dimension of knowledge: “it is the proximal term, then, of which we have a knowledge that we may not be able to tell” (Polanyi, 1966, p. 10). Equally, Tsoukas (2005a, p.158) explained that tacit knowledge “consists of a set of particulars of which we are subsidiarily aware as we focus on something else”. Therefore, tacit knowledge as inputs to knowing is the unobservable and unidentifiable clues under subsidiary attention. It is the dimension of knowledge that

individuals are only aware, and that they only know it exists when they need to attend to something from this knowledge.

Tacit knowledge is not knowledge-not-yet-articulated (Tsoukas, 2005a, p. 158). This reduces what is known to what is articulable (Tsoukas, 2005a, p. 155). Tacit is not a type of knowledge that is waiting to be translated or converted in explicit knowledge. Noteworthy, tacit and explicit are aspects of the same knowledge. They are sides of the same coin, not two ends of a continuum (Tsoukas, 2005a, p. 158). Therefore, *tacit is not the opposite of explicit knowledge*. It is solely an aspect, a dimension of the same knowledge that has also an explicit dimension.

The unobservable clues or the tacit dimension of knowledge can be on a level of consciousness¹⁴ that differs from the observable clues. According to Polanyi (1968, p. 31) “Focal awareness is, of course, always conscious, but subsidiary awareness, or from-awareness, can have all levels of consciousness; *it can range from a subliminal level to a fully conscious level*” (Emphasis added).

Inputs based on tacit-knowledge are *originated from the tacit dimension of workers’ own knowledge, or from other knowledgeable individuals and groups*. An example of the former would be when individuals listen to their intuition regarding something (e.g. an investment). An example of inputs based on the tacit dimension of other individuals’ knowledge would include a novice analyst having the coaching or mentorship of a more experienced analyst. This interaction allows the novice to access the senior professional’s personal experience. Research has showed that knowledge workers have used tacit-knowledge based inputs, such as intuition or gut-feeling, their own and others’ experience (Isenberg, 1986; Hammond, 2004; Brockmann & Anthony, 2002;).

It is important to highlight that the interpretation of ‘Polanyi’s tacit knowledge’ made by Nonaka and Takeuchi (1995) is different from Polanyi’s, because they considered it as a type of knowledge that can be converted into explicit knowledge. As stressed by Tsoukas (2005a, p. 154) the account of tacit knowledge by Nonaka and Takeuchi “has very little in common with that of Polanyi. Nonaka and Takeuchi assume that tacit knowledge is

¹⁴ Sanders (1988, p. 6) highlighted that “It would be a mistake, however, to suppose that tacit knowledge, or subsidiary awareness, is necessarily unconscious, preconscious or subconscious”. For more details, see also Polanyi (1969).

knowledge-not-yet-articulated: a set of rules incorporated in the activity an actor is involved in, which is a matter of time for him/her to first learn and then formulate”.

The different concepts that express or symbolize tacit knowledge, as the epitomes of tacit knowledge (ETK) were identified by Haldin-Herrgard (2001). These epitomes were generated from a literature review on the field of knowledge and tacit knowledge, and they are a way to create a language of tacit knowledge in organizations (Haldin-Herrgard, 2005). The most used ETK that were found by Haldin-Herrgard (2001; 2005) were systematized into two dimensions: (a) extent of abstraction (abstract and concrete groups) and actors included (individual, team and collective groups), and (b) human competence that is affected (mental, sensory, social, and practical groups) (see Appendix V and VI).

Similarly, the main types, representations or epitomes of tacit knowledge in the literature (more at the collective than at the individual level) were identified by McAdam et al. (2007, p. 52). These epitomes were the following: intuition or gut-feelings (the most used one), skills (negotiation, physical, coordination or cognitive skills), insight (understanding, glimpses into one’s own or others’ knowledge), know-how (“ability to put know-what into work”), beliefs (“understandings that reflect our perspective of the world”), mental models (cognitive structures), and practical intelligence (ability to use intelligence in everyday life).

Essential to the creation of knowledge to ground business strategies is the use of the tacit dimension of individuals’ knowledge. This dimension constitutes a rich aspect of an individual’s knowledge and can be very contributive to the knowing work. For the communication of knowledge to be in consonance to how it is needed and used in practice, it should acknowledge the uses of tacit-knowledge based inputs and that the communication process of this dimension of knowledge demand specific methods.

Uses of Tacit-Knowledge Based Inputs

Attention here is concentrated on studies that explored how the tacit dimension of knowledge has been used in knowledge work in business organizations. The main purpose is to evidence the uses and role of the tacit dimension of knowledge, and how it has been an important input for knowledge and managerial work. This section also aims to evidence how such concept has been operationalized in empirical research in this field.

As explained by Polanyi (1958; 1966; 1968; 1969), tacit and explicit knowledge are interdependent, given that they are inseparable dimensions of knowledge (inputs). Studies have shown the complementarity between these two dimensions in the knowing work (Werr et al., 1997; Werr & Stjernberg, 2003). For example, in management consultancies it was found “a reciprocal relationship between articulate knowledge, in the form of methods and tools and cases, and tacit knowledge, in the form of consultants’ experiences” (Werr & Stjernberg, 2003, p. 889).

The access to and use of the tacit dimension of individuals’ own knowledge (e.g. intuition) was evidenced by a study developed by Hammond (2004). The study was designed to evaluate the state of information access and decision making among 675 executives and managers working in organizations in the USA and Europe^x. The findings showed that executives make over half of their decisions based on simple ‘gut feel’, rather than on empirical information (Hammond, 2004, p.1).

Similar research^x was developed by Information Builders (2007), which investigated the barriers to making good decisions in organizations. The findings showed that 75% of the respondents (at the management level) considered experience as the most important factor in making a decision, whereas only 13% claimed that business data and market information were important (Information Builders, 2007, p. 9).

Still regarding the use of experience by managers, another study developed by Isenberg (1986) showed that “managers used their experience rather than additional case information to interpret quite heavily from the presented information” (Isenberg, 1986, p. 784). The surprising finding was that managers used their own experience even knowing that there was complete information available to them without extra cost (Isenberg, 1986).

Furthermore, intuition has been found to be one of the skills guiding the most important management decisions (Agor, 1986). Concerning strategic decision-making in high-velocity environment, intuition has helped to “react quickly and accurately to changing stimuli in their [executives’] firm or its environment” (Eisenhardt, 1989, p. 555). Likewise, Khatri and Ng (2000) evidenced that intuitive synthesis (experience, judgment, and gut feeling) was extensively used and it was an important factor in strategic decision making. Furthermore, the findings of their study (in banking, computer and utilities sectors) showed that intuitive synthesis has an important role and a strong relationship with financial performance.

The different aspects of intuition in relation to creativity in pharmaceutical research were studied by Sundgren and Styhre (2004). Pharmaceutical researchers explained that intuition was considered as intimately associated with “emotionality and embodiment (e.g. gut feelings) than with cognitive capacities”. The findings revealed that they considered intuition as an “important resource in new drug development activities” (p. 276). According to Sundgren and Styhre (2004, p. 277) intuition was recognized among the researchers “especially in cases in which the researchers must account for a multiplicity of facts during decision making”. The pharmaceutical researchers considered that intuition played the role of “some kind of supplement to more conventional forms of thinking” (p. 277).

Moreover, in intelligence research, findings of a study accomplished by Sternberg (1997) evidenced that successful managers use a combination of three aspects of intelligence: (a) the analytical intelligence (analytical skills), (b) practical intelligence, or common sense or tacit knowledge (“action-oriented knowledge, acquired without direct help from others, that allows an individual to achieve goals they personally value”, p. 483), and (c) creative intelligence (creative thinking).

Turning to the tacit dimension of other individuals’ knowledge as the basis of inputs to knowing, a study of the uses of such knowledge was developed by Cook and Brown (1999). A group of designers in Xerox needed to interact with old artifacts as a source of insights to design new technologies. Through the years it was realized that valuable aspects of the competence in Xerox paper path design were also embodied in the paper mechanisms. When the design teams sense that an old mechanism has something that could be used in the design of new ones, they start working with it. In the described study above, they worked with old mechanisms of ‘paper paths’ because “they refer to be interested in how the mechanisms ‘sound, feel, and work together’” (Cook & Brown, 1999, p. 397). Therefore, the design teams were looking for knowledge that was in the old mechanisms and on how it works. This evidenced that they were “after tacit knowledge, not explicit knowledge (they have the technical drawings for that)” (Cook & Brown, 1999, p. 397).

In the management consultancy work, Hansen et al. (1999, p. 108) explained that consulting firms such as Bain, Boston Consulting Group, and McKinsey privileges what was considered as a ‘personalization strategy’. This refers to a strategy which is concentrated on helping individuals to communicate knowledge. In this sense, the companies cited above “focus on dialogue between individuals, not knowledge objects in a database”. Knowledge that has not been codified and that couldn’t be is communicated in brainstorming meetings

and one-on-one conversations. By doing this, consultants at the above companies get “deeper insights by going back and forth on problems they need to solve”.

Findings related to a study of the efforts employed by management consulting firms in implementing knowledge management showed that “experience was the central source of consultants’ knowledge on how to design, and carry out a consulting project” (Werr & Stjernberg, 2003, p. 895)¹⁵. Regardless of the extensive amount of knowledge explicitly articulated in form of “methods and tools”, and as documentation of prior projects and cases, “the consultants in our study repeatedly referred to their own and their colleagues’ experience as the most important source of knowledge in designing and carrying out consulting projects” (Werr & Stjernberg, 2003, p. 893).

The integrated use of the tacit dimension of one’s own and other individuals’ knowledge were identified by a study performed by Tsoukas and Vladimirou (2001) with the Greek leading mobile phone operator. This study identified the knowledge practices in the customer care department. By participating in an induction programme, and using unstructured and semi-structured interviews, document review, and job observation, Tsoukas and Vladimirou (2001) identified that to provide answers to most of the customer queries, the operators used printed and electronic information. In addition, all participants (the operators) emphasized “how important it is for them to be able to draw upon the accumulated experience and knowledge of one another at work” (p. 986). The communication among members occurred naturally, during their breaks and as part of the informal story telling that occurred among them. Interestingly, the use of accurate perception skills was needed to understand if a customer was unhappy, nervous, or confused. In this sense, operators needed to use sophisticated perception skills, given that a customer’s message was also communicated through the tone of voice or by how customers communicated their message, and not only by words or what they said. According to Tsoukas and Vladimirou (2001, p. 987) “the tacitness of operators’ knowledge was manifested when they were asked to describe how and why they tackled a particular problem in a particular way. To such questions, “operators were at a loss for words, ‘you feel it’, ‘you know so’, ‘I just knew it’ were some of the most often repeated expressions they used”. Additionally, it was observed improvisational elements during the work (knowledge generated in action). The operators

¹⁵ The consulting firms studied were the following: Arthur Andersen, Booz-Allen & Hamilton, Ernst & Young, KPMG, IBM Consulting, and McKinsey & Company.

constructed their own personal information system, in which was comprised of notes taken during their training, past answers given to customers, and copies of relevant manuals.

Focused on cognitive phenomena, Isenberg (1986) studied the cognitive process on which managers drew when they tried to understand and solve business problems. The aim of the study was to find out if there were anything distinctive in how managers think, and which cognitive processes account for their effectiveness in problem-solving and action planning. The study used the think-aloud method (verbal protocol analysis) with 15 managers while they solved hypothetical business cases. One of the findings was related to how the managers used information presented to them in a hypothetical business case resolution. The findings showed that instead of gathering all the information made available for the solution of the business case, the managers got ideas and presented conclusions without complete information and thorough analysis. They arrived at conclusions and presented solutions after reading only a little of the information that was available to them. They used their experience to interpret the information and situation presented to them, but omitted the extra information about the business case they were trying to solve. Isenberg explained this fact with the opportunistic thinking concept (Isenberg, 1986, pp. 784-785), which led them to use “higher-order mental processes more often than inexperienced non-managers do” (Isenberg, 1986, p. 785).

The above studies suggest that, knowledge workers and management professionals use the tacit dimension of their own and of other individuals’ knowledge. The interpretation of the tacit dimension of knowledge for new knowings have been accomplished to support actions such as to create business-relevant knowledge, think strategically, ground decision-making, problems solving, understand and serve customers, and to create new products. The tacit dimension of knowledge has been an important input to the creation of new knowledge, and as such the access to it and its communication for knowing work needs to be facilitated and supported. Accessing, emerging and communicating the tacit dimension of knowledge can be more appropriately done with skills in using reflective thinking, inquiring techniques, and dialogic interactions. Once accessible and appropriately communicated, knowledge workers can benefit from its richness to create highly insightful and applicable knowledge to ground their customers’ business strategies.

Accessing Tacit-Knowledge Based Inputs to Knowing

Since the purpose of the present research is to enhance the access to knowledge in knowing work by facilitating the communication of such knowledge, it is essential to understand how the access to the tacit dimension can occur.

By access to tacit-knowledge based inputs for knowing is meant that knowledge workers *access and connect to the tacit dimension of their own and of other individuals' knowledge as inputs for a knowing process* (the focus here is on the Polanyi's second kind of sense-reading or knowing). Here, individuals access and connect to the tacit dimension of knowledge in order to create new knowledge, to create new meanings. This is made in the *second sense-reading process* because it is in this process that individuals create meaning from articulations of other individuals' knowledge.

How can knowledge workers *communicate their needs of and access tacit-knowledge-based inputs* for their knowing to a human-based system (e.g. a financial expert)? Essentially, inputs based on the tacit dimension of knowledge can be *accessed* by means of self-reflexivity when an individual needs to *use the tacit dimension of her/his own knowledge to create new meanings*. When accessing other individual's tacit knowledge the main way is by face-to-face conversations.

The access to one's own tacit knowledge includes accessing intuitions, insights and body senses. The individual's own tacit knowledge can be accessed by reflexive methods using, for example, the self-inquiry. It is through the power of insight or informal judgment that it is possible to identify and recognize "in our experience a meaning that can then be stated in words" (Polanyi, 1969, p. 188). Individuals recollect their own tacit knowledge and use it to create new knowledge. Their own knowledge is an input to knowing. The recollection of an individual's own knowledge as an input to her/his own knowing process was considered by Polanyi (1958, p. 91): "reflections of the kind I made a moment ago, when *recalling the particular contents of our knowledge which we cannot adequately specify* [the tacit dimension], have served to substantiate the inadequacy of our articulation for the cases in question" (Emphasis added). An example would be a market analyst self-inquiring to get insights from her/his own knowledge about a specific market. The use of one's own previous and similar knowledge was highlighted by Polanyi as "for the understanding of a verbal communication of a meaningful experience, we can usually rely on our previous understanding of similar experiences" (Polanyi, 1969, p. 188).

When an individual needs to access the tacit dimension of other individuals' knowledge as inputs for her/his knowing, the appropriate methods have been inquiring and social interactions such as conversations. By its very nature, the tacit dimension of knowledge has been mostly communicated by face-to-face conversations. This is because in interpersonal communication the essential relational aspects such as trust and closeness building allow reflection and inquiry, favoring the surfacing and access to tacit knowledge. An example would be a talk with an experienced professional to identify how s/he identified competitor's next moves in the past.

The appropriate language, methods, interactions and inquiring techniques can raise individuals' awareness of their own knowledge, and help to subsequently articulate it. The access to individuals' tacit knowledge can be facilitated by making them recursively punctuate and review their own knowledge, by drawing their attention to it, driving their attention to the actions they performed when they constructed the respective knowledge, and helping them to emphasize distinctions and connections that underlie this knowledge. Individuals' tacit knowledge can be articulated by punctuating it in social interactions (Tsoukas, 2005a, p. 159), where it can be surfaced by recursive attention and reminding, using dialogic and inquiring techniques. According to Tsoukas (2005a, p. 157) "although skilful knowing is ultimately ineffable it nonetheless can be talked about: through reminding ourselves of it we notice certain important features which had hitherto escaped our attention and can now be seen in a new context". By doing this, it is possible to relate to the circumstances in which individuals' knowledge was created in new ways. The present study focuses on the access to and communication of the tacit dimension of knowledge by means of face-to-face conversation and inquiring.

How Tacit-Knowledge Based Inputs Can be Accessed

Significant to the knowing work is the access to the tacit dimension of individuals' knowledge, because it is a rich part of personal knowledge that can make a difference when creating knowledge to ground business strategies. The accessibility to this knowledge is mostly facilitated by means of social interactions. Given that the purpose of the present research is to facilitate the access to and communication of knowledge in knowing work, it is essential to understand the main ways that this access can be effectively accomplished. The following section reviews the mostly used methods to surface, access and communicate the

tacit dimension of individuals' knowledge, particularly confined to conversations and inquiring.

Inquiring to Access Tacit-Knowledge Based Inputs to Knowing

The inquiring methods help to surface and articulate the tacit dimension of knowledge and they have been used in diverse fields such as education (the conscientizing method of Freire^{xi}, 1970, Freire & Faundez, 1989), management, and communication of knowledge. In this section, attention is paid to the inquiring approach related to the communication of the tacit dimension of knowledge.

Specific inquiring techniques constitute one of the essential ways to access the tacit dimension of individuals' knowledge. It helps individuals to remind themselves of and draw attention to what they know and to help bring forth and connect to hidden and deep aspects of their knowledge. Effective inquiring enables to tap the tacit dimension of individuals' knowledge in a way that can be contributive to construct new meanings in knowing work. As a consequence of effective inquiring, communication of knowledge by knowledgeable individuals can be more focused and pertinent, improving the accessibility to tacit knowledge.

The ineffectiveness of direct questioning to get the essence of professionals' knowledge was pointed out by Göranson and Hammarén (2006). They explained that “several decades of skills research have shown that it is extremely difficult to arrive, through direct questioning, for example, in the form of questionnaires and interviews, at the core of the professional's skills” (Göranson and Hammarén, 2006, p. 323). They explained that indirect methods^{xiii}, i.e. dialogue-inspired methods, “in which conversations between researcher and professional continue over a long period of time, have proved to be more usable” (Göranson and Hammarén, 2006, p. 323).

With regard to questioning, Kikoski and Kikoski (2004) proposed the use of the General Systems Theory (GST) as a perspective from which questions can be asked to access tacit knowledge. According to them (p. 127) “questions asked from the GST perspective are likely to generate responses that evoke information, which, in turn, generate additional information that provides broader understanding of problems and situations”. The questions based on GST, namely the ‘systemic questions’, focus on the wholeness, rather than on its

parts. The theoretical framework that bases the systemic questions enables patterns to be seen and to comprehend complexity (Kikoski & Kikoski, 2004, p. 128). The systemic questions are also concentrated on a dynamic context, rather than on linear causality. The systemic questions help the questioner (e.g. a knowledge worker), to identify significant aspects of other individuals' knowledge that so far were not perceived by the questioners and the answerers, improving the inputs obtained for the knowing process.

Three kinds of systemic questions are used to access tacit knowledge: circular, reflexive, and hypothetical questions. The GST concepts which guide asking such questions are the circular or the recursive paradigm, feedback and neutrality (cf. Kikoski & Kikoski, 2004, p. 131-133).

The circular questions are exploratory and core to facilitate the access to other individuals' tacit knowledge as an input to knowing. They help to understand a situation or a topic systemically. These questions open up "space that enables individuals to connect their perceptions with emerging patterns" (Kikoski & Kikoski, 2004, p. 142). Also essential to facilitate the access to tacit knowledge are the reflexive questions. They facilitate individual or group self-discovery, and they can be used like a probe that "can cause a gentle ripple within one's thinking" (Kikoski & Kikoski, 2004, p. 140). The self-discovery is enabled by "activating a folding back of perceptions, experiences and beliefs" (Kikoski & Kikoski, 2004, p. 140), which facilitates the creation of new meanings. The hypothetical questions link the present with the future and help bringing forth new thoughts, ideas, creating fresh and different possibilities and contexts. They can be also useful to clarify and unhide problems in a situation. Therefore, the characteristics of systemic questions^{xiii} evidence their appropriateness in helping individuals to bring forth the tacit dimension of their knowledge. The use of systemic questions can generate fruitful outcomes, helping individuals to deepen and widen their perception of their own knowledge, and articulate them in dialogic ways. As an effect, the systemic questioning can facilitate the access to and communication of the tacit dimension of knowledge, allowing knowing workers to get useful and insightful inputs.

Conversations as a Means to Access Tacit-Knowledge Based Inputs to Knowing

A powerful method to surface and have access to the tacit dimension of individuals' knowledge is face-to-face conversations. The role of such conversations is to facilitate

bringing forth the tacit, deepest and more personal aspects of someone's knowledge. "Interpersonal, face-to-face conversations are central to organizational knowing" (Mengis & Eppler, 2008, p. 1288). The following section concentrates on explaining how conversations can be facilitated to help bringing forth the tacit dimension of knowledge.

The present research draws on the concept of conversation as defined by Mengis and Eppler (2008, p. 1290): "the face-to-face interactions within a small group of co-located people, interacting through verbal and non-verbal means".

In the context of the present research conversations are a central process for accessing and communicating individuals' tacit knowledge with purposes of creating new knowledge within knowing work. Von Krogh et al. (2000, p. 125) emphasized the importance of conversations in accessing and communicating tacit knowledge: "the mutual exchange of ideas, viewpoints, and beliefs that conversations entail allows for the first and most essential step of knowledge creation: sharing tacit knowledge within a microcommunity". Equally, Backlund and Sjunnesson (2006, p.141) pointed out that dialogue is the fundamental way to share tacit knowledge between individuals and groups of individuals, by means of "examples of specific situations".

However, conversations have commonly received little attention in studies on knowledge creation, knowledge communication, knowledge access, and knowledge management. It has been one of the most neglected processes in organizations (Von Krogh et al., 2000; Kikoski & Kikoski, 2004). As emphasized by Von Krogh et al. (2000, p. 125) "the most natural and commonplace of human activities – conversations – often end up in the background of managerial discussions about knowledge".

The use of conversations for accessing the tacit dimension of knowledge and creating knowledge has been studied more conceptually than empirically (Mengis & Eppler, 2005a). As explained by Mengis and Eppler (2005a) "the contributions on conversations from the field of knowledge management mainly stress the central role of dialogue and face-to-face conversations for knowledge sharing and creation processes, but they do not analyze conversations more closely". Therefore, in reviewing the literature a lack of descriptions of conversations processes for knowledge creation, and for accessing individuals' tacit knowledge was found. Nonaka and Takeuchi (1995), Bohm (1996), Isaacs (1999), Von Krogh et al. (2000), Nonaka et al. (2000), Topp (2000), Mengis & Eppler (2005a; 2005b; 2008) all stressed the importance of conversations for knowledge creation. However, they did not study conversations empirically, limiting their approaches to the conversational behavior.

Conversations for knowledge creation in business organizations often have two objectives: to confirm the existence of knowledge or to create new knowledge (Von Krogh et al., 2000). The confirmation of knowledge has a focus on the present, and it aims to confirm explicit knowledge. The concepts used in this kind of conversation are known, and the knowledge used is focused on the specific situation of the conversation. It is focused on facts and it is clear-cut. When the purpose is to create knowledge, the conversation has a focus on the future. In this case, conversation aims “to establish, not only new knowledge but new reality” (Von Krogh et al., 2000, p. 128).

Of special interest for knowledge creation and the access to tacit knowledge is the ‘generative conversations’. These conversations are “practiced when we are attempting to create new knowledge; it is creative, divergent, and builds new relations between previously separate bodies of knowledge” (Topp, 2000, p. 338). In addition, the “mutually generative conversation” was defined by Kikoski and Kikoski (2004, p. 146) as a conversation to generate new meanings by mutually understanding, exchange of interpretations, and by exploring a problem or a situation. A ‘mutually generative conversation’ facilitates surfacing ideas, making it possible to “*access the uniqueness of each individual’s knowledge and life experience – or tacit knowledge*” (Kikoski & Kikoski, 2004, p. 147) (Emphasis added).

The mutually generative conversation involves “talking with one another in order to inquire”, and it nurtures creativity and discovery (Kikoski & Kikoski, 2004, p. 146). It occurs when individuals talk with, rather than to each other, and then, share their ideas in relation to a problem, topic or situation. The fundamental groundings for making mutually generative conversations possible are what Kikoski and Kikoski (2004) explained as reflexive communication. Reflexive communication was explained as helping conversation to “get beyond the stereotypes of a person or a situation, surfacing the unique thoughts of another individual, generating new information, co-creating new realities, and discovering new solutions” (Kikoski and Kikoski, 2004, p. 148). The characteristics of the ‘mutually generative conversations’ evidence their high suitability to the purposes of accessing the tacit dimension of individuals’ knowledge.

If conversations are to help in surfacing, accessing and communicating the tacit dimension of individuals’ knowledge for knowing work, it is fundamental to care about their communication processes. This is because of the importance of the outcomes or contributions of these conversations for the knowings work processes, and of the need to intelligently use the individuals’ time and engagement in contributing with their knowledge.

In this context, totally free and open conversations may not be appropriate if the aim is to access the tacit dimension of individuals' knowledge in relation to specific issues, topics or situations. Excessively open communication may result in "undisciplined communication flow within Towers of Babel" (Dervin, in press). As stated by Dervin "interactions designed in these ways [excessively open] too often yield a cacophony that cannot genuinely bridge communication gaps. The inputs given by users are too capriciously diverse to be analyzed". As a result, outcomes of conversations to access tacit knowledge can be chaotically generated, reducing their association with the main needs and objectives of the conversations. The outcomes should be difficult to be used for the specific knowing process and needs they are expected to contribute to. They can also be difficult to be reused for other similar knowing processes. Considering the ephemerality of conversations outcomes, their use and reuse become even more difficult. The effects of excessive openness and flexibility in conversations were pointed out by Mengis and Eppler, (2008, p. 1288):

"...conversations, however, also lead to numerous challenges for knowledge management: the previously praised flexibility of conversations gives rise to situations in which topics alternate chaotically, and conversation partners have difficulty in identifying possible outcomes of a conversation. Conversations are also ephemeral, and contributions of interaction partners vanish the moment they are pronounced, which makes complex comparison difficult."

Therefore, conversations to access tacit-knowledge based inputs for knowing work demands to be lightly structured and focused. Providing some structure and management to these conversations are also needed because the participants' available time for such conversations is often extremely scarce. A balance between flexibility and structure in this kind of conversations could allow an intelligent use of individuals' time, engagement and personal efforts in bringing forth the tacit dimension of their knowledge. Structuring and managing face-to-face conversations can facilitate for these conversations to be generative, productive and contributive to the knowing work. However, structuring and managing should account for the fact that these conversations are contingent on the circumstances and as such, they demand some flexibility. This challenge was pointed out by Mengis and Eppler:

"In order for a 'management' of conversations not to be counterproductive, imposing rigidity where flexibility is needed, *approaches to conversation management have to acknowledge the situational and flexible nature of conversations*. While the quality of some conversations would suffer from too much structure and management (e.g. during informal coffee-break conversations, free form break-out sessions, or very personal and emotional discussions), *many conversations lack sufficient structure, are not managed well, and could benefit*

from a more consistent approach.” (Mengis & Eppler, 2008, p. 1289) (Emphasis added)

The need of some structure in conversations aiming at facilitating the access to tacit-knowledge can be achieved by methods such as the ‘Dialogue Seminar Method’ developed by Göranzon and Hammarén (2006). Dialogue Seminar Method (DSM) is a method for reflection, access to and communication of tacit knowledge (Fock, 2006, p. 85, Ratkic, 2006, p. 53). Göranzon and Hammarén (2006, p. 60) explained that the method is based on individuals engaged in dialogue that “creates insight and understanding”. It aims to generate an environment to practice analogical thinking, and to “create a practice for reflection, formulate problems from the dilemma, work up a common language, and train the ability to listen” (Göranzon & Hammarén, 2006, p. 62). Of special interest of this research is the use of the method for exploring a subject in depth, and to share professional experience. DSM is in continuous development and refinement and it has shown good results as “a generic tool for developing knowledge and understanding, especially in terms of project experience, team learning and product development” (Backlund & Sjunnesson, 2006, p. 150; Fock, 2006, p. 88).

Equally aiming to help managing conversations for the access to tacit knowledge, a prescriptive framework for conversation management¹⁶ with six dimensions¹⁷ originated from communication models was proposed by Mengis and Eppler (2008). These six dimensions delineate the “conversational context in which conversation partners try to make sense and co-construct knowledge when interacting” (Mengis & Eppler, 2008, p. 1297). Explicit conversational rules to manage conversations were also proposed by Topp (2000), Von Krogh et al. (2000), Gratton and Ghoshal (2002), and Beer and Eisenstat (2004). The use of rules to manage conversations should not impede flexibility and the necessary flow of creativity and natural interaction. According to Mengis and Eppler (2008, p. 1296): “conversational rules do not structure conversations excessively, but leave flexibility”.

The access to the tacit dimension of individuals’ knowledge highly depends on the quality of complex communication in face-to-face conversations. The outcomes of such communication for accessing tacit knowledge should get special attention. To achieve

¹⁶ The framework was specifically proposed for interpersonal conversations that occur in small groups, in which the relational aspects between partners in the conversation are especially important.

¹⁷ The six dimensions are the following: the message, the conversation process, the conversational intent, the mental models of the participants, the group dynamics, and the conversational background.

analyzable, helpful, and usable outcomes for knowing work, and to intelligently use individuals' time and willingness to contribute, conversations need to be managed and to have some structure without killing flexibility and openness. Specific methods for managing conversations such as the systemic questions and the DSM can improve the use of conversations to access and communicate tacit knowledge in knowing work. The communication of the tacit dimension of knowledge in knowing work demands to be focused, adapted, timely and not excessively undisciplined, helping to engage the participants in genuine contribution, and to also increase the chances of getting highly helpful and usable inputs.

Other methods that have been used to facilitate the surface and access to the tacit dimension of knowledge have been, for example, the use of problems solution in hypothetical work-related situations (Wagner and Sternberg, 1985; Sternberg et al. (1995); Williams and Sternberg, unpublished), situational judgment tests to trigger and help individuals to access their tacit knowledge (Cianciolo et al., 2006), corporate stories^{xiv} and the storytelling method¹⁸ for sharing tacit knowledge (Orr, 1986, Haghirian & Chini, 2002, Their & Erlach, 2005, LeBlanc & Hogg, 2006, McLellan, 2006); cards-based method (Haldin-Herrgard, 2001; 2005, Osteraker, 2001; Haldin-Herrgard & Osteraker, 2002.), and causal mapping to surface tacit knowledge of a management consulting organization (Ambrosini & Bowman, 2008).

The current research concentrates on accessing the tacit dimension of knowledge by social interactions, such as face-to-face conversations and the use of inquiring techniques in such interactions. Undoubtedly, the skills and techniques for triggering and surfacing the tacit dimension of knowledge are critical for the knowing work given that they enable the richest part of any individuals' knowledge to be accessed.

¹⁸ Written stories may suffer the same limitations as any kind of explicit representation that knowledge has. The stories are static and detached from the teller, "when written down, they [stories] suffer many of the same problems that all explicit representations of knowledge face: disconnection from the teller, locked linearity, and a certain element of petrification that is required of any snapshot" (Ruggles, 2002).

2.6.3.3 Explicit-Knowledge Based Inputs for Knowing

Polanyi seldom discussed explicit knowledge^{xv} in his work. He defined the explicit dimension of knowledge as the one which is “capable of being clearly stated” Polanyi (1966, p. 22) (e.g. words, graphs, maps, formulae, theories, letters, reports, articles). The explicit dimension of knowledge is the one that can be explicitly stated, it is a relation between the particulars and the meaning these particulars are pointers that can be explicitly articulated (Polanyi, 1966, p. 19); the relations that constitute meaning or knowledge that can be formalized (Polanyi, 1966, p. 20). The explicit dimension of knowledge is got by explicit inference^{xvi} (Polanyi, 1969, p. 194), and it is rooted in tacit knowledge.

The explicit dimensions of knowledge are those clearly identifiable clues to knowing that were explained by Polanyi (1969, p. 145-146). The identifiable clues were characterized by Polanyi as follows: “we have now met a number of instances where tacit knowing integrates *clearly identifiable* elements” (Polanyi, 1969, pp. 145-146) (Emphasis in the original). The explicit dimension of knowledge is articulated in oral or written words in a sense-giving process (the second triad in Figure 4, on page 46).

All explicit knowledge is brought into being and applied through tacit knowledge. Independent of the ways in which the explicit dimension of knowledge is communicated, it *relies on readers’ or listeners’ tacit knowledge to be interpreted*. Individuals depend on their tacit knowledge to interpret or make sense of explicit knowledge. Therefore, tacit dimension of knowledge works together with the explicit dimension in a knowing process. This synergistic collaboration for the knowing process evidences that the human interpretation is intrinsically incorporated into the knowing process.

Accessing Explicit-Knowledge Based Inputs to Knowing

The issues in accessing knowledge that is communicated by documents in business environments have been largely reviewed in innumerable studies. The need to address such issues is significant given the amount of time, efforts and financial resources involved in accessing and using documents within organizations. The present research addresses part of these issues.

The multitude of knowledge available within a typical knowledge-intensive organization and the lack of awareness of its existence may lead to a serious squandering of time, focus and productivity in knowledge creation work. Findings of a study developed by Manafy and McKellar (2007, p. 8)^{xviii} evidenced that 59% of the knowledge workers “miss information that might be valuable almost every day because it exists elsewhere in the company and just cannot be found”. The findings also showed that 53% think that “less than half of the information received is valuable” and 50% of the respondents stated that the information obtained has no value¹⁹. As an effect, an excessive consumption of time and efforts in accessing knowledge has been a common scenario in the knowing work. The main risk of these issues is that the knowledge created to ground business strategies and actions can be deteriorated in its insightfulness, validity and applicability. As highlighted by Feldman and Sherman (2001) “many ideas have to be reinvented because an original work cannot be located and retrieved or people are unaware of its existence. Worse, decisions may be based on incomplete or erroneous information, with severe consequences for the company”.

Other studies have pointed out the losses of knowledge workers’ time and efforts in trying to find relevant knowledge. Knowledge workers spend almost 17% of their time searching for information and arranging meetings with experts, and more than 80% trying to elicit knowledge (37.7%), and to interpret, adapt and apply knowledge (45.9%) (Jacobson & Prusak, 2006)^{xviii}. In addition, 16.3% of a knowledge worker’s typical work time³⁰ is spent in searching but not finding information (8.8%), and on recreating content (7.5%). These costs more than U\$5.000.000 to an enterprise per year³¹ (an enterprise with 1000 knowledge workers) (Feldman et al., 2005)^{xix}. Significantly, the majority of knowledge workers (70% of the respondents) spent 20% to 60% of their search time reviewing irrelevant documents (10% of respondents spent more than 60%), i.e. reviewing “a document retrieved by a query but deemed, after a quick reading by the user, to not be relevant to the original question or focus”²⁰ (Manafy and McKellar, 2007, p. 42-44)^{xx}.

The challenging scenario of the access to knowledge described above^{xxi} has been worsened by the dramatic growth of the unstructured knowledge²¹ (e.g. content in PDFs, word documents, emails, spreadsheets, and presentations), the complexity of formats, and the

¹⁹ In the publication of this research there was no conceptualization of the term ‘value’.

²⁰ Study accomplished with 200 users of enterprise search, conducted by the Delphi Group.

²¹ Unstructured knowledge representations are those which have no fixed structure or model.

existence of distributed sources. Nearly 80% of corporate knowledge is unstructured (Shilakes & Tylman, 1998; Ramos, 2003; Mukherjee & Mao, 2004; Broder & Ciccolo, 2004). In the context of the knowledge creation work, the use of unstructured knowledge (e.g. reports, analysis, best practices, strategies etc.) is high and critical. This makes the access to knowledge even more challenging.

Underpinning the above scenario of accessing and using explicit-knowledge based inputs there are the organizational strategies that have been limitedly based on the paradigm of documents. Prusak and Weiss (2007) explained that the initial efforts in knowledge management were focused on codified knowledge and documents. One of the characteristics of these efforts was that “people were not thinking about documents in context” (Prusak & Weiss, 2007, p. 35). Prusak and Weiss pointed out the issues regarding the typical organizational approaches in managing documents:

“The unhappy reality is that in most organizations, documents are presented in an isolated fashion. There is not sufficient context to enable knowledge workers to make connections between related documents, thereby identifying other material that might be useful or make the document itself useful. In this second instance, knowledge workers are required to make their own judgments and assessments about the author’s approach, thinking and key take-aways.” (Prusak & Weiss, 2007, p. 38)

The access to knowledge has been improved by the enterprise information retrieval approaches with the employment of ontologies, semantic metadata, natural language processing (NLP) to the search process, and semantic search (Davies et al., 2004, p. 134; Bontcheva et al., 2006, p. 144 ; Duke et al., 2007). An analysis of how the personalization capabilities in the best positioned enterprise search technologies classified by the Institute Gartner (Andrews & Knox, 2006; Andrews, 2007)^{xxiii} was accomplished for the present research. The findings evidenced that the improvements that these technologies have made to the access to knowledge in documents have been based on the content of the object needed or document^{xxiii}, individuals’ topical interests, work roles, functions, and work processes (structured ones).

Additionally to the access to documents, the access to information about the individuals’ knowledge by technology-based systems has been a challenge as well. This has been often based on the description of skills, expertise (John & Seligmann, 2006), expertise keywords that describe a knowledge area or domain of knowledge (Becerra-Fernandez, 2000, 2001), and also expertise described by keywords originated from the analysis of topics

mentioned in the text of documents created by an expert or that mention an individual (Maybury, 2002; Yimam-Seid & Kobsa, 2003; Song et al., 2005; Sim et al., 2006).

The current approaches to improve the access to knowledge in documents have commonly focused on the content and characteristics of documents, rather than their association with the practices in which they are to be used. Prior research in information retrieval and knowledge organization has successfully provided ways to improve the access to documents by content-based criteria. However, individuals need and use knowledge in practice as a means to an end, i.e. knowing. Such knowing process needs to be acknowledged when knowledge is communicated in order to get closer to how things are done in practice.

The consideration of how knowledge workers need and use explicit-knowledge based inputs for their knowing work practices would help in reducing the risks generated by the scenario described previously. The distance that organizational investments in supporting knowing work have from the real world of its practices was evidenced by a study about the knowledge management programs in 423 organizations (in the UK, mainland Europe and the USA), accomplished by KPMG (2000). The findings showed that the most cited reasons for knowledge management programs not attending its challenges and not meeting workers' expectations were the following: (a) lack of user uptake owing to insufficient communication (20%); failure to integrate KM into everyday working practices (19%); lack of time to learn how to use the system or a sense that the system was too complicated (18%); a lack of training (15%); and a sense that there was little personal benefit in it for the user (13%) (KPMG, 2000, p. 2). As can be seen, the reasons above reflect that organizations have supported knowledge work by facilitating the access to knowledge within a perspective that is in some way disconnected from its practices. The scenario of losses of time and efforts in accessing knowledge may be improved if systems and practices be closer to how work is actually accomplished by knowledge workers.

Accessing knowledge in the business context has demanded substantial time and efforts by knowledge workers. The approaches to improve this access have been concentrated on strategies that have not included the practice-based aspects. The contributions of such approaches are undoubtedly extensive and influential. However, the access to knowledge in corporate environment can be improved if the communication of such knowledge also incorporates more than content or matter-based aspects.

Communicating Needs of Explicit Knowledge to Technology-Based Systems

Information Needs in the Information Retrieval Field

In the context of technology-based systems and information retrieval, information needs have been typically associated to knowledge resources or objects by themselves (e.g. documents). In comparison, the concept of ‘knowing needs’ explained earlier presents a considerable difference in relation to the typical concept of ‘information needs’. The difference is because knowing needs are not necessarily restricted to the needs of information (from an objective perspective) or of any object independently of the action it should serve. Knowing needs are associated to the actions performed to create meaning or the actions of knowing.

The difference explained above can be seen by understanding how individuals’ needs have been conceptualized and understood in information retrieval. In the current approaches to the access to explicit-knowledge based inputs communicated by documents, the understanding of individuals’ needs and their fulfillment has been commonly conceptualized with a focus on information needs. Information need is an ambiguous and controversial concept (cf. Case, 2006, pp. 69-79). This concept is subject to multiple characterizations that may be conflicting; giving that its definition depends on how ‘information’ and ‘needs’ are defined.

Regarding the main conceptualizations of information needs within technology-based systems and information retrieval fields, three perspectives have been mostly used: (a) a problem to be solved (Wersig, 1979), (b) an anomalous state of knowledge (Belkin et al., 1982a, 1982b), and (c) in relation to technology-based information retrieval field, information needs have been conceptualized in terms of the search terms or keywords used in a search tool. Evidences of the latter perspective are given in the following sections.

The concept of information need was related to a problem to be solved by Wersig (1979). Needs are triggered by problematic situations. Wersig (1979) conceptualized “problematic situation” as those situations in which there were differences between an individual’s goals and the perceived data available to accomplish these goals. As outlined by Wersig (1979) “the general idea is that in certain situations the individual meet a situation in

which it requires more data to solve the situation than are actually available” (Wersig, 1979, p. 54).

Information needs were characterized as an anomalous state of knowledge by Belkin et al. (1982a, 2005). An individual’s anomalous state of knowledge (ASK) is “an inadequacy in her/his state of knowledge (an anomaly with respect to the problem)” (Belkin et al., 1982a, p. 65). This means that information needs “arises from a recognized anomaly in user’s state of knowledge *concerning some topic or situation*” (Belkin et al., 1982a, p. 62) (Emphasis added). By anomaly Belkin (2005, p. 44) meant “that the user’s state of knowledge with respect to a topic is in some way inadequate with respect to the person’s ability to achieve some goal (later generalized as the ability to resolve a problematic situation)”. The concept of anomaly explicitly indicates that “this state of inadequacy could be due not only to the lack of knowledge, but many other problems, such as uncertainty as to which of several potentially relevant concepts holds in some situation” (Belkin, 2005, pp. 44-45). Behind the idea of the ASK hypothesis is the cognitive perspective (Belkin, 2005, p. 46).

The *representation* of an individual’s ‘state of knowledge’ is made by concepts (represented by words) that are derived from problems statements. According to Belkin et al. (1982a, p. 68) “*representations of ASKs* are narrative statements by users of the IR [information retrieval] system of the problems which brought them to the system”. These problem statements contain “details of user’s research as well as what she/he wanted to know” (Belkin et al., 1982b, p. 146) (Emphasis added). The texts of these statements are analyzed and structural representations are derived from this text analysis. The result is a conceptual or association map with concepts (represented by words from the narratives) derived from the problem statement (cf. Belkin et al. 1982b, p. 147-149). Therefore, needs or the state of knowledge (ASK) was “represented by a network of associations between words, standing for concepts” (Belkin et al. 1982b, p. 147).

However, up to date, whichever terms used in a search box to access a document, this document can only be retrieved by criteria that is based on its content or characteristics (e.g. author, source). Therefore, any improvements in understanding and communicating needs to technology-based systems also require substantive advance in communicating knowledge and representing documents (indexing). Documents have to be represented (indexed) in a way which corresponds knowing workers’ ways of creating knowledge with such documents.

In the information retrieval field, information needs have been typically understood as the terms used by individuals to search for information by means of technology-based

systems. In this case, the information needs have been typically represented by and equaled as the search terms or expressions used in a search task (the query). However, these terms express concepts that have been only related to the indexed representations of the object needed, and to its subject matter, content or characteristics (e.g. author, source).

Consequently, in the information retrieval field, when the ‘context of needs’ is considered in order to expand the comprehension of needs, this context has been related to the semantic context of the words or terms used in a search task, i.e. the linguistic semantics context. An analysis of the contextual dimensions that were used to drive the selection of information resources in thirty-two systems in adaptive information retrieval²² evidenced how contextual aspects were addressed. The analysis was performed based on the levels of context of information retrieval interaction developed by Cool and Spink (2002, pp. 606-607), which are the following: (a) information environment level of context, (b) information seeking level of context, (c) information retrieval interaction level of context, and (d) query level of context. The method used was content analysis, with special attention to the conceptualizations of context and the respective variables related to it. The findings²³ showed that 91% of the systems addressed the context of needs at the query level. This means that context corresponded to the semantic linguistic context of terms or expressions used in a search box, or of terms or pages accessed while browsing^{xxiv}.

In sum, information needs have been mostly conceptualized with a focus on what is needed (i.e. knowledge, the object of the need) and on characteristics of the object needed (content, subject matter), rather than on the actions for which these needs should be fulfilled. The knowing or meaning creation practices underlying these needs have been missed from the understanding of needs in the knowing process.

²² The analyzed studies were selected because they were cited as being representative of and significant in the adaptive information retrieval by Brusilovsky and Tasso (2004, p.149-153). They were frequently cited by other important and foundational publications and authors in the field, and in conferences, and doctoral forums attended by the researcher.

²³ In the analysis, each study was coded to only one of the levels of context cited above.

Communicating Needs to Technology-Based Systems

How can knowledge workers communicate their needs of explicit-knowledge based inputs to a technology-based system? The current ways of explaining and communicating individuals' needs to technology-based information systems²⁴ have been the use of terms, plain keywords or terms expressing concepts in a search box. According to Cole et al. (2005, p. 14) "in system approaches [to information retrieval] the user's agent in the interaction, the query, is assumed to be an apt representation of the user's information need". However, as pointed out by Robertson and Hancock-Beaulieu (1992, p. 458) "there has been increasing acceptance that stated requests are not the same as information needs".

Evolutionary approaches to access knowledge, such as the use of adaptive retrieval systems, natural language processing, artificial intelligence, and semantic web technologies for information retrieval have been adopted to improve the communication of individuals' needs to technology-based systems. For example, the semantic search allows the use of concepts, facilitating for users to express the subject or topical aspects of their information needs in a more natural and meaningful way, rather than only by using Boolean expressions or keywords. However, the advancements for accessing knowledge have mostly remained restricted to the expression of the needs in terms of what is needed, and of the domain of knowledge of what is needed (the subject area of what is needed). Cole et al. (2005, p. 15) explained that in this unidimensional perspective of needs, the user "has a topic and knows what information he or she needs and types in topic elements as the request statement to the system". Newell (1997, p. 224) pointed out that natural language systems have enabled a better expression of user's needs, but "none of the generic Internet search tools available take into account a user's background when conducting a search", neither the enterprise information search systems.

The focus on communicating needs on the basis of what is needed (the needed object) and its respective subject matter allows the access to explicit-knowledge based inputs solely with basis on the characteristics of the object needed and its subject matter. Consequently, this allows access to knowledge mainly by content-criteria and topical matching. Importantly, for knowing work the use of only topical words, concepts or expressions that represent

²⁴ The technology-based information systems considered in this research are those in corporate context, such as knowledge management or content management systems.

characteristics of the needed knowledge (input) (e.g. subject matter) is insufficient to communicate how individuals need it for their knowing. Yoon and Nilan (1999, p. 877) pointed out the limitations of the topical matching to the access to knowledge. “In a topical matching, meaning is not effectively shared with the system because topic is only one of the two logically necessary aspects of representation of the user’s meaning”²⁵ (Yoon & Nilan, 1999, p. 876).

The limitations of communicating needs with a focus only on content-criteria or on the subject matter of what is needed were emphasized by Taylor (1986, p. 41) as well. He explained that information systems only respond very well to concerns such as “*what* do you want to know” and that “we do quite well with systems organized by subject matter and the imposed hierarchies and relationships we have developed over the past few centuries” (Emphasis added). However, Taylor (1986, p. 41) added that there are other concerns that should also be addressed, such as “How do you need to know it? Why do you need to know? In what form do you need to know it? What do you know already? What do you anticipate finding? How will this help you? What does your problem look like?” In spite of the continuous sophistication and contribution of approaches and models to represent needs, their focus remained on representing what is needed, that is, on just one part of individuals’ needs. As emphasized by Schamber et al. (1990, p. 758), “information systems are not yet able to resolve more than a portion of users’ real information needs”.

Cole et al. (2005) argued that conversely to have the information needs represented by a query, the user oriented researchers understand that the “user’s problem or problematic situation” (p. 15) should be brought to the study. Cole et al. (2005) proposed an approach to model the “user’s problem situation” (p. 15). They adopted the problem-situation of the Belkin’s Anomalous State of Knowledge (ASK), considered information need by cognitive states, and used a task-based perspective to information seeking. Cognitive states were statements of what users do not know. Individuals (students) were invited by the system to inform four research questions for the task they needed to accomplish (writing an essay). The students had to select one of the four questions, which become the thesis of the essay. The concepts of this selected question were organized in an index structure. These concepts were

²⁵ Yoon and Nilan (1999) argued that the two elements to represent user's meaning are 'topic' and 'comments'. Topic or aboutness (p. 878) refers to "what a person is talking about" (p. 877). The 'comment' situates the topic (semantic context) and it is "situated specifications" that represents what it is about the topic that is useful to the user (p. 878).

then compared and formed the structure of the essay. The information needs were reflected by this conceptual structure. The consideration of the user's problematic situation was accomplished by using the concepts that formed the selected question. The process of explaining needs was focused on the topic terms that were present in the questions informed by the students. Needs were considered as the concepts present on questions made by users. Therefore, despite this approach improved the communication of needs, it was focused on the object of needs, on what was needed and on its subject matter.

The multidimensional representation of the users' needs with purposes of information seeking was studied by Ingwersen (1992; 1996), Ingwersen and Järvelin (2005), and Larsen and Ingwersen (2005), who proposed the polyrepresentation principle^{xxv}. This principle includes the representation of information objects, and the representation of users. The polyrepresentation of users is considered as a representation of the "cognitive space of the searcher" (Larsen & Ingwersen, 2005, p. 45), which is the "different underlying cognitive reasons behind the development of information need". Information needs were considered as "the result of communication, sensing or thinking processes, which result in the realization that something is missing for the solving of a problematic situation" (Larsen & Ingwersen (2005, p. 45). According to Ingwersen and Järvelin (2005, p. 207), the polyrepresentation principle is applied to the "cognitive space of the information seeker in order to extract a richer context of statements to be used as search keys during IIR [interactive information retrieval] – not just problem and information need representations but also work task representations".

Kelly et al. (2005), and Kelly and Fu (2007) developed research to improve the communication of needs. They generated studies based on the polyrepresentation of information needs that was created by Ingwersen. They investigated the polyrepresentation of the cognitive space of users by creating and using an online form for users' initial querying to the system. This online form was document-independent, and it aimed to get users' feedback and to elicit "more complete descriptions of their information needs" (Kelly & Fu, 2007, p. 31). In the form, the kind of questions used to enrich the understanding of needs evidence that its focus was mainly on the subject matter of what was needed: (a) "How many times have you searched for information about this topic in the past?", (b) "Describe what you already know about the topic", (c) "Why do you want to know about the topic?", and (d) "Please input any additional keywords that describe your topic" (Kelly & Fu, 2007, p. 37). They explained that the aim of these questions was "to encourage users to talk more about their

topics” and that the questions (b), (c) and (d) were used “to elicit information from users about their topics for query expansion” (Kelly & Fu, 2007, p. 37). As can be seen, in spite of enriching the communication of needs, the four questions were used to understand needs with a focus on the topic of the need. This is a limited way of communicating knowing needs.

The variety of representations of a query was evidenced to improve the information retrieval by Belkin (1993). Similar to Kelly and Fu (2007), and to Kelly et al. (2005), the information need in Belkin’s study was considered to be represented only by the search terms. The elicitation of more information about information needs was based only on eliciting more representations of what and the domain in which the user was searching for information (more keywords or search terms).

Notwithstanding the fact that the approaches described above have advanced the ways needs can be communicated to technology-based systems, the improvements were limited to understanding needs predominantly based on the object needed (document), and on its content characteristics (subject matter or topic).

Despite users can describe their needs in a search box as they wish the description of their needs to and the use of this description by technology-based systems has remained a challenging process. As rich as the descriptions of individuals’ needs can be, documents have not been properly described to match these descriptions. Documents have been mostly described by characteristics of their content, such as terms that occur in their content, descriptions of subject matter, author, and sources. This approach has not been appropriate to match any richer description of needs that a user can make beyond the typical topicality. Richer description of needs naturally demands richer description of knowledge to enable its access.

As far as it is known, in the communication of knowledge to a technology-based system, no structured ways enabling the description of other aspects of individuals’ needs in relation to a particular knowledge have been used. Thus, there is a lack of studies showing how and why an individual needs to know about a topic, and how and why a specific knowledge can help an individual knowing about a topic in a given circumstance. Neither there have been attempts to develop methods of describing documents from this angle.

How the Communication of Needs Has Been Enriched

A way of enriching the communication of needs of explicit-knowledge based inputs to technology-based systems is by means of an adaptive user modeling^{xxvi} process. Within the information retrieval context, the application of user modeling is made to improve and adapt processes such as the selection, visualization and delivery of information (Mizzaro & Tasso, 2002a, p. 308). The advantage of a user modeling in communicating rich aspects of individuals' needs highly depends on how these needs are understood and, consequently, which aspects are chosen to translate them.

The user modeling process is conceptualized in the adaptive systems field (McTear, 1993, p. 158; McTear, 2000, p. 324; Zukerman & Albretch, 2001, p. 5). McTear (1993, p. 158) provided a useful concept of user modeling as being the “process of gathering information about the users of a computer system and of using the information to provide services or information adapted to the specific requirements of individual users (or groups of users)”.

The user modeling process begins by acquiring information about a user, which can be made implicitly (by observing user's interaction with the system and/or information resources), explicitly (by directly asking users), or a combination of both. This process is described as the user model acquisition (Brusilovsky, 1996; Jameson, 2003). The outcome of this user modeling process is a ‘user model’, i.e. the knowledge constructed about a user. Conceptualizations of the user model can be find in Kay (1995, p.1), Kobsa (1995, p. 1), Kay & Lum (2003, p.16), and Martineza et al. (2005, pp. 320-321). According to Kobsa (1995, p.1) “user models are collections of information and assumptions about individual users (as well as user groups), which are needed in the adaptation process of systems to individual actions of users”.

The core issue in a user modeling process is the definition of the kind of information about a user that should be acquired, and the use of a reliable way to acquire it. The ‘information about users’ that is provided to a user modeling process is based on what is referred to as the attributes of a user model. The kind of ‘information about a user’ is what explains to the system the individual's information needs. This information reflects the criteria by which the differences in information needs between individuals are understood. Thus, this ‘kind of information about a user’ is critical because it is what determines the level and the depth with which an individual is allowed to communicate her/his needs to a system.

If ‘topic interests’ is chosen as an attribute, then, the respective user modeling approach is based on the fact that individuals differ in their needs according to topic interests.

Importantly, it is the chosen attributes that can make the whole difference in harnessing all the benefits of a user modeling component for enriching the communication of needs.

The current adaptive user models for adaptive information access have mainly adopted the following attributes to explain individuals’ information needs: (a) user’s characteristics (i.e. socio-demographic and psychographic) or users group characteristics (stereotypes), (b) topical preferences implicitly and explicitly manifested by users, (c) interests in topics implicitly and explicitly manifested by users, (d) interests in information inferred mainly by queries and queries history, by the words and by the meaning of words present in summaries and snippets of documents accessed and navigated, (e) user’s browsing behavior and interactive actions such as ‘save’, ‘print’ or ‘bookmark’, (f) domain expertise, (g) user’s level of knowledge and experience related to topics and tasks, (h) user’s relevance perception about information (the relevance feedback); (i) cognitive and life styles, (j) other’s interests in the information (by social navigation and annotation) (Mathé & Chen, 1994; Vassileva, 1994; Lieberman, 1995; Rabinowitz et al., 1995; Mathé & Chen, 1996; Lieberman, 1997; Milosavljevic & Oberlander, 1998; and others²⁶).

The first approaches to user modeling components in information retrieval were focused on aspects similar to those described above: (a) users’ characteristics (e.g. age, sex), users’ topical interests and preferences (subject area or domain of knowledge), (b) concepts derived from queries, (c) background knowledge related to a topic, and (d) linguistic relationships among the characteristics of texts. These seminal user modeling systems include Rich (1979), Belkin et al. (1982a, 1982b), Croft and Thompson (1987), Vickery and Brooks (1987), McAlpine and Ingwersen (1989), and Ingwersen (1992) (Appendix II).

Furthermore, the current approaches in the adaptive information retrieval field^{xxvii} have improved the understanding of needs by using alternative, correlated or complementary terms to those previously employed by users in searching (the query terms and their semantic correlation to other terms). In this case, systems reconstruct the search by means of query

²⁶ Chan, 2000; Lieberman, 2001; Mizzaro & Tasso, 2002a; Mizzaro and Tasso, 2002b; Gauch et al., 2003; Ruvini, 2003; Icarelli & Sciarrone, 2004; Leuski & Allan, 2004; Magnini & Strapparava, 2004; Waern, 2004; Brusilovsky et al., 2005; Diaz et al., 2005; Psarras & Jose, 2006.

enhancement (expansion or refinement) as a tentative to enrich and deepen the understanding of an individual's needs.

Despite important contributions of the user modeling approaches to the communication of needs (attributes used), the communication of needs by means of a user modeling process has been mostly concentrated on communicating aspects of what is needed, content-criteria related to what is needed, and users' characteristics in relation to what is needed and its content. How and why what is needed is needed has not been contemplated when individuals communicate their needs to technology-based systems, despite having the user modeling process, which is a significant and empirically validated approach to improve the communication and understanding of needs. Therefore, in spite of undeniable contributions to the advance of the communication of needs, the current approaches of user modeling have commonly disregarded the knowing practice for which the needs should be fulfilled. These approaches have not been considered how and why individuals need to know about a specific topic or content. In this sense, the excellent opportunity to enrich the communication of needs by considering the aspects of the knowing actions for which these needs should be fulfilled has not been grasped by the user modeling approaches.

2.7 Summarizing Knowing and Knowledge Communication

The previous sections drew on the tacit knowing theory of Polanyi. The review explained how Polanyi's theory approach knowing and the communication of knowledge as sense-reading and sense-giving processes, the triad of triads. The structure of the knowing and communication of knowledge processes as characterized by Polanyi was used to connect and explain other important contributions. Such additional contributions were those that have been made to the topics of accessing and using the interdependent dimensions of knowledge. Polanyi's theory is core to the present study because it provides a solid ground to approach knowing and communication of knowledge as meaning creation processes.

The previous sections aimed to help understand the main theoretical framework about knowing and knowledge communication, which mostly underpins the present research together with Sense-Making Methodology.

2.8 Situational Knowing

From a practice-based perspective, knowing is inherently a situated practice. The situationality of knowing or the term ‘situated’ in the practice-based perspective “indicates that knowledge and its subjects and objects must be understood as produced together within a temporally, geographically, or relationally situated practice” (Nicolini et al., 2003, p. 23). From a practice-based perspective, knowing always has a ‘where’ and a ‘when’; it is always situated (Nicolini et al., 2003, p. 27).

Situated knowing practice was also defined by Lave (1988, pp. 180-181) as “a situated knowing constituted by a person acting in a particular setting and engaging aspects of the self, the body, and the physical and social worlds”. According to Nicolini et al. (2003, p.27) ‘situated’ conveys the idea that actions happen in a ‘context’ that is not pre-given, but rather, emerged as a consequence of the conditions brought forth by the practices themselves. “The adjective ‘situated’ also denotes that, from a practice-base perspective, knowing as well as knowledge and the world are accomplishments, transient effects, temporary alignments that bear within themselves the seeds of their demise”. Furthermore, an insightful approach to situated action was provided by Suchman (2007, p.70):

“...every course of action depends in essential ways upon its material and social circumstances. Rather than attempt to abstract action away from its circumstances and represent it as a rational plan, the approach is to study how people use their circumstances to achieve intelligent action.” Suchman (2007, p.70) (Emphasis added)

In a useful comparative study between activity theory, distributed cognition, and situation action models developed by Nardi (1996), it was explicated that the focus of a situated action perspective “is situated activity or practice, as opposed to the study of the formal or cognitive properties of artifacts, or structure social relations, or enduring cultural knowledge and values” (Nardi, 1996, p. 36). The situated actions emphasizes “improvisation and response to contingency, situated action deemphasizes study of more durable, stable phenomena that persist across situations” (Nardi, 1996, p. 36). She also emphasized the unit of analysis of situated action models “is not the individual, not the environment, but a relation between the two”. According to Lave (1988, p. 17) the basic unit of analysis for situated action is “the activity of persons acting in setting”. A setting is defined as “a relation between acting persons and the arenas in relation with which they act” (Lave, 1988, p. 150).

Coherent to the practice-based approaches to study knowing and knowledge, the approach used in the present study – Sense-Making Methodology (SMM) – explores knowing as a situated sense-making practice. Situated sense-making is intrinsic to SMM. SMM explains that how individuals create sense and how they use knowledge for this are situational practices. This is because these sense-making practices are responsive to the circumstances in time and space in which individuals’ old sense runs out and they need to create new meanings. This is further detailed in the Methodology Chapter (Chapter 3).

Situationality, the uses of the term ‘situation’ and the situational dimensions have been used with different meanings in the information needs, seeking and use studies. Importantly, the ways that situational dimensions have been used and their meaning in the approaches to the access to knowledge substantially differ from the approach to situationality of knowing used in the present study.

Cool (2001) developed an interesting review of the approaches to the concept of situation in theoretical and empirical literature in Information Science^{xxviii}. According to Cool (2001, p.5), the concept of situation “remains ill defined and inconsistently applied” and it has been used interchangeably with the concept of context, diluting the “explanatory power of each” (Cool, 2001, p.7).

In addition, other approaches to the use of situational dimensions in the access to knowledge have been developed. For example, the situational dimensions were considered by Saracevic (1997) as those based on the task characteristics of a problem a user has, which then, triggers information needs. In the ‘Integrated/Cognitive Model of Information Seeking and Retrieval’ (Ingwersen & Järvelin, 2005), the situational dimensions were considered as being the perceptions and interpretations of the following aspects: (a) knowledge gap or anomalous state of knowledge and relevance, (b) uncertainty and other emotional states, (c) potential sources for the solution of the work task or interest, (c) the intentionality, purposes, goals or motivations, (d) the information preferences, strategies and pressures of costs and time, (e) own capabilities (health, experiences, knowledge state), and (f) systemic and interactive features and information objects (Ingwersen & Järvelin, 2005, p. 279).

Mizzaro and Tasso (2002a) used situational dimensions for adaptive information access of scholarly publications. These dimensions were defined by patterns of terms used in queries when doing a search. Revilla and Shipman (2000) used a situation model to adapt presentation of medical information content. In this case, situations were classified in emergency, consultation, and educational. Sole and Edmondson (2002, p. S18) defined the

situationality in terms of geographic boundaries. Knowledge was grounded to and created differently in different work sites and specific work practices in each geographical place.

Choo et al. (2000) considered the situational dimensions of information needs as consisting of “a large number of elements that relate not just to the subject matter, but also to situational factors such as goal clarity and consensus, magnitude of risk, amount of control, professional and social norms, time and resources constraints, and so on” (Choo et al., 2000, p. 6). In addition, Choo et al. (2000) considered the situational dimensions of information use, which were defined at the organizational level, rather than at the individual one. Concerning this, the situational dimensions adopted by Choo (1998) were composed of the elements of the ‘Information Use Environment’, an approach that was developed by Taylor (1991). These situational elements were comprised of sets of people, their typical problems, work settings and problem resolution. In a later study Choo et al. (2000, p. 19) defined the situational dimensions of information use at the organizational level as “the degree to which a task has been structured by rules and routines will impact the use of information”.

As the above review indicates, the meanings commonly attached to the concepts situationality, situated, ‘situational dimensions’ and ‘situation’ as analytic constructs have varied. These multiple meanings were presented to illuminate and distinct the concepts adopted by the present study. In the present study the conceptualizations of situationality, situational, situated and situations are rooted in Sense-Making Methodology. Importantly, the situationality is a critical aspect of knowing work practices that should be acknowledged if the aim is to support and facilitate these practices with improved communication of knowledge. If knowing and knowledge uses are situational practices, then, supporting and facilitating them should account for this situationality.

2.9 Knowing Work

The value of the knowing work fundamentally resides on the powerfulness of the created knowledge in generating insights, emerging hidden connections and opportunities, and in grounding and supporting business management. The generation of insightful and actionable knowledge is heavily dependent on interpretive and sense-making capabilities and practices, and on how tacit and explicit knowledge are used for these. Therefore, to facilitate

and support the generation of value in the knowing work, it is necessary to understand its nature and dynamics.

The kind of work practice that is investigated in the present research is the knowledge work that is entirely focused on creating knowledge²⁷ to ground and guide business strategies. The knowledge that is created by knowledge workers is used by their internal or external customers to ground organizational strategies. Davenport (2005) categorized knowledge workers in five clusters^{xxix}. Of special interest to the present research is the cluster which is comprised of knowledge workers focused on the creation of new knowledge (e.g. researchers, creative people, and authors).

Knowledge work was explained by Boland and Tenkasi (1995, p. 350) as the one which “creates new understandings of nature, organizations or markets and applies them in valued technologies, products, or processes”. Another useful definition of knowledge work was given by Schultze (2000):

“Knowledge work is the production and reproduction of informational objects. It is human work that requires a feeling and thinking agent who brings his/her subjectivity (in its relative, intersubjective sense) and tacit knowledge to bear on the informational object that is product of the knowledge work.” (Schultze, 2000, p. 7)

A definition of *knowledge creation work* was given by Pirolli and Card (1999) as “knowledge crystallization task”. They defined this as “one in which a person gathers information for some purpose, makes sense of it, then packages it in some form of communication or action” (Pirolli & Card, 1999, p.12).

Knowing work is characterized by the intense use and application of intellectual resources, personal judgment and professional assessment. It incorporates “the exercise of professional judgment in the effort to solve complex, frequently unique problems” (Alvesson, 2004, p. 23). Davenport (2005, p. 155) added that these activities are approached in a more iterative way, with knowledge workers handling and using varied inputs at the same time. In addition, Alvesson (2004, p. 222) characterized the essence of knowledge work as “the use of knowledge for achieving a high level of rationality in situations of complexity”.

The nature of knowledge work have been commonly emphasized as highly ambiguous and unordered (Alvesson, 2004, p. 58), and non-routinized (Carlsen et al., 2004,

²⁷ Knowing work, knowledge creation work, and knowledge work are considered as synonyms and used interchangeably in the present study.

p.4; Lowendahl, 2005, p. 45). In knowledge work, solutions created are, to a greater extent, more emergent and responsive to the characteristics of the situation, rather than being planned, rational, and sequential (Alvesson, 1993; 2001; 2004; Brown & Duguid, 2000; Carlsen et al., 2004; Davenport, 2005, p. 155). Brown and Duguid (2000, p. 95) characterized the work practices such as knowledge creation as follows:

“In such areas, life is less linear; inputs and outputs are less well defined, and information is less ‘targeted’. These are, rather, areas where making sense, interpreting, and understanding are both problematic and highly valued – areas where, above all, meaning and knowledge are at a premium.”

Acknowledgedly, the nature of knowing work is largely different from an administrative or operational work, from the other activities of a knowledge work (such as organizing and distributing knowledge), and from those tasks which states and results are self-evident, controllable, and easily predefined.

In relation to the unstructured nature of knowledge work, Stenmark and Lindgren (2004) differentiated between knowledge work and the semi-structured or structured activities. They pointed out that knowledge work is not highly ordered, predictable and structured as the operational and administrative processes are. “Knowledge work is thus untidy in comparison with operational or administrative business processes, in which tangible inputs are acted on in some predictable, structured way and converted into outputs” (Stenmark & Lindgren, 2004, p.2). They also pointed out the less tangibility and distinctness of the inputs to knowledge work. Importantly, they highlighted that knowledge work tasks have no predetermined sequence of activities that once executed in a correct way ensure the aimed output (Stenmark & Lindgren, 2004). Similarly, Davenport (2005) emphasized that the knowledge work is “less structured, and perhaps less structurable than administrative work” (Davenport, 2005, p. 15).

The unstructured nature of knowledge work was also discussed by Markus et al. (2002), who preferred to use the term ‘emergent process’ instead of ‘unstructured process’. This is because the term ‘unstructured’ is not sufficient to characterize processes “in which problem interpretations, deliberations, and actions unfold unpredictably” (Markus et al., 2002, p. 182). New product development, basic research, strategic planning, and organization design processes are examples of “emergent process” (Markus et al., 2002, p. 181). They defined the emergent processes in the following ways (Markus et al., 2002, p. 184): (a) they have challenging information requirements, (b) they require knowledge and expertise in

applying the knowledge, (c) they require tacit and explicit knowledge, (d) they require general and contextual knowledge, and (e) they require knowledge sharing because the knowledge is distributed. The characterization of the emergent processes was evidenced by the extensive existence of the following aspects: (a) deliberations with no best structure or sequence, (b) actor set that is unpredictable in terms of job roles or prior knowledge, (c) knowledge requirements for general and specific distributed expertise (Markus et al., 2002, p. 184).

Considering the above characteristics of emergent processes, Markus et al. (2002) explained that the well-known information systems (e.g. expert systems, organizational memory systems) do not support the specific requirements of this kind of processes. They explained that there are three gaps between the characteristics of these emergent processes and the current type of information systems (Markus et al., 2002, p.185): (a) inclusion of expert knowledge but inconsideration of its contextualization, (b) excess of tools which are not integrated, (c) expert systems, decision support systems, and enterprise information systems are all designed for a user who is known in the community (i.e. a known type of user), but they do not adapt to other types of users with different knowledge requirements.

The knowledge creation work may have an underpinning plan or a predefined method for the execution of the work activities. However, these plans do not determine the action of meaning creation. These plans and methods are merely resources for a situated meaning creation action. Visscher (2006, p. 248) explained that “instead of following phase-models, consultants appear to be improvising bricoleurs, tailoring their ways of working to specific situations, and using broad, heterogeneous and partly implicit repertoires, which are built mainly through action-learning”. In the moment of meaning creation, rationally planned activities may be abandoned and the knowledge worker may act differently according to the circumstances and the resources they have for their interpretive actions. Drawing on Suchman (2007, pp. 72) the purpose of plans is not to get individuals through the action. Rather, they orient individuals to navigate through actions and possibilities in such a way that they can use their embodied skills and knowledge, on which their success in knowing depends. Suchman (2007, p. 72) pointed out that:

“Even in the course of more deliberative, less highly skilled activities we generally do not anticipate alternative courses of action or their consequences until *some* course of action is already underway. It is frequently only on acting in a present situation that its possibilities become clear, and we often do not know ahead time, or

at least not with any specificity, what future state we desire to bring about.”
(Emphasis in the original)

In the very moment of the action of creating meaning, there is a dependency on human actions and interpretations, rather than only on formal predefinitions or pre-planning of work. The moment of meaning creation is under the control of an individual, and how s/he uses knowledge for this is a personal construction. In this single moment, individual's actions, perceptions and interpretations are the core elements that influence the advancement and results of knowing. Thus, creativity and patterns of actions can work together in different moments of the creation of meaning. Therefore, in the study of a situated practice such as knowing work, attention should be given to the following:

“...the extent to which actions are not simply pre-given and self-evident but are themselves constituted through unfolding courses of action and interaction. This is not to say that action is constructed somehow always *de novo* or in a vacuum. On the contrary, human activity invariably occurs in circumstances that include more or less long-standing, obdurate, and compelling layers of culturally and historically constituted, social and material conditions. However familiar and constraining, though, *the significance of these conditions and their relevance for what is happening here and now, must be actively reenacted by participants in ways not fully specified in advance or in any strongly determinate way.*” (Suchman, 2007, p. 52) (Emphasis added)

Within the work dynamics explained above, Davenport (2005, pp. 10-11) explained that knowledge workers are those who “think for a living”, they “solve problems, they understand and meet needs of customers, they make decisions, and they collaborate and communicate with other people in the course of doing their own work”. Knowledge workers were also conceptualized by Hayman and Elliman (2000, pp. 299-300) as those who: (a) enrich given information using their competence to produce a response, (b) learn from the information they process, (c) are educated to a high level with career loyalty to an area of expertise, (d) are given significant autonomy in how they perform a task, (e) have tasks that do not follow pre-defined process, and (f) have tasks that are not just organizing information.

The knowledge resulted from knowing work is mostly personalized for each customer's needs (e.g. a strategic plan). The knowledge-based products or solutions are rarely standardized. Even if knowledge workers use their or others' past experience to create these products or solutions, their experience is used in a new context, and thus, the result is not the same. It is customized. For example, Carlsen et al. (2004, p.4) explained that in professional services work (a kind of knowledge creation work) the deliverables or products are intangibles and non-standardized. This work is characterized in great extent by non-

routinized work that is often organized in “projects or cases that are unique to the contract or situation”.

In relation to the results and communication of the intellectual work involved in knowledge creation work (Polanyi’s sense-giving process), Blackler et al. (1993, p. 1017) emphasized that the “knowledge workers are primarily concerned with communicating inferences from bodies of evidence rather than the evidence itself”. The articulation and communication of the results of knowing is possible, but challenging. It demands skills, appropriate tools and use of language. Care should be taken because when the created knowledge is articulated and externalized in any form of communication (e.g. a report, a conversation, a lecture), it is detached from the original context and actions that originated it. As pointed out by Castro et al. (2007, p. 56) “when that person, using her-his mental ability for analyzing, dialoguing and expressing, his/her tacit knowledge is reshaped in an explicit form. This action detaches knowledge from context-specific conditions, and allows it to be expressed in general or explicit ways”.

The management of the knowledge work in knowledge intensive organizations^{xxx} is accomplished under specific circumstances, including the existence of a higher level of autonomy, an orchestrating style of the communication practice that is intensively required to coordinate activities and solve problems, and a highly customized nature of the services to customers (Alvesson, 2004, p. 21).

Additionally, what is commonly adopted in other work organizations, such as rules, methodologies and plans of activities have a less important role, and they are used in a more flexible way in managing knowledge workers. “Traditional management principles such as standardization, routinization, and supervision are difficult to apply” in knowledge work (Alvesson, 2004, p. 23). Instead of this, what is more prominent in knowledge work is “organic, short-term planning and replanning following a gradual problem-solving and problem-encountering”. In knowledge intensive organizations the bureaucratic characteristics do not play an important role. The organization is more non-hierarchical and ad hoc, and the activities are characterized by complexity, uniqueness and ambiguity (Alvesson, 2004).

The knowing work presents a specific nature and dynamics that needs to be considered in the creation of approaches to facilitate and support it. Approaches based on fixed sequentiality, mechanistic, and hermetically rational perspectives, such as those used to support structured and pre-defined work tasks, are not appropriate. Visscher (2006, p. 258) pointed out that, for example, most consultants “tailor their actions to the kind of project, the

wishes of their clients, the contingencies of the process, and a whole range of other factors. *These contingencies, which are thought to be essential for good consulting work, cannot be covered by a fixed series of steps*” (Emphasis added). Therefore, it is not fruitful to facilitate knowing work with systems and practices that are rooted on an objectivist perspective to this work practice (knowing) and to its results (knowledge). It is also unproductive to acknowledge the dynamic, unstructured and situational nature of knowing work, but support it with systems and practices of communication that are not responsive to this nature.

2.10 Limitations of Previous Approaches to Communicating Needs and Knowledge

The present research argues that in accessing knowledge as inputs for the knowing work, there is often a disconnection between the ways which individuals need and use these inputs to create meaning, and how these inputs are communicated to them. The disconnection between knowing and inputs occurs because there are some limitations in the communication processes that enable the knowing-inputs connections: the communication of its needs to systems (technology- and human-based), and the communication of knowledge to and of knowing. The current section highlights the main limitations concerning how needs have been communicated to human and technology-based systems, and how knowledge has been communicated to individuals in their knowing processes. The limitations discussed below are based on the earlier discussed literature review that focused on the communication of needs and knowledge.

Essentially, the major limitations of previous studies on the communication of needs and knowledge have been the excessive focus on the object needed, i.e. on knowledge, and the significant detachment of the practices in which knowledge is needed and used, i.e. the knowing practice. The main limitations are specified as follows.

(a) The communication of knowledge.

In the studies and approaches conducted so far, the communication of knowledge has been disconnected from its users’ knowing practice and needs, and consequently, from its situationality. It has been fundamentally based on the knowledge content. As such,

knowledge has been mostly communicated without been adapted to how knowers need it to contribute and support their meaning creation or knowing practice.

According to studies concerning the communication of tacit-knowledge based inputs, this process has mostly tended to be performed without appropriate association to its users' context, perspectives and situations, limiting the understanding of the communicated knowledge. Typically, individuals may communicate knowledge without adapting to its users' knowing needs. As an effect, the identification of the meanings contributed by the communicated knowledge can be difficult.

Explicit-knowledge based inputs in documents have been mostly communicated based on the characteristics of knowledge itself, and on its content (subject matter description). It has not been indicated to which knowing needs and situations a specific explicit knowledge is created and can contribute to. The communication of what a specific explicit-knowledge based input is about has been effectively solved by increasing sophisticated and useful techniques. However, these techniques have been mainly focused on content-based criteria.

In communicating explicit knowledge for knowing by means of documents, its description by indicating only characteristics related to its content (subject matter) is not sufficient to help its users to smoothly and timely identify how the respective knowledge can fulfill their knowing needs. Indications of how a specific knowledge can contribute to the creation of specific meanings have not been incorporated into the communication of the explicit knowledge by documents. Indicators that describe how the knowledge communicated is associated to the possible audiences' knowing needs and situations have not been contemplated in its communication.

Underpinning the ways knowledge has been communicated, there is a conceptual framework that predominantly emphasizes the object communicated over the meaning creation practice for which this communication should help. This is because in such framework knowledge is considered as having meaning by itself. The assumption that knowledge-based inputs have meaning by themselves and that they are self-contained objects have been dominant in approaches to improve knowledge communication. This is because it is assumed that "the expert messages incorporate self-evident value" (Dervin, in press). This conceptual framework is rooted in a model of communication that is focused on transmission processes (sender-channel-receiver), rather than on a communication perspective. The transmission models consider that what is transmitted has meaning by itself, and the meaning

creation or sense-making processes in which knowledge is needed, used and constructed are not contemplated. The communicative models consider that knowledge is constructed by knowers in interaction, in communication.

How knowledge can differently contribute to fulfill needs in knowing, how its uses can differently contribute to meaning creation is mostly left outside of the communication of knowledge. Most importantly, the situationality of the contributions to meaning creation of a distinct knowledge has not been included in its communication.

Individuals in a knowing work practice cannot rely only on accessing knowledge solely in the basis of their content (subject matter), because this is not the unique aspect contemplated in needing and using inputs to help fulfilling knowing needs. In a complex knowing process involved in knowing work, the communication of knowledge for and of such work should be adapted to its users' needs, priorities, objectives and situations to improve its accessibility.

(b) The communication of needs.

Needs in knowing have been typically communicated and understood based on the following interdependent aspects:

(i) The 'whats': the object needed and its characteristics.

Individuals' needs in their knowledge creation have been mostly understood and communicated on the basis of what is needed (the object needed), and on aspects associated to what is needed, such as characteristics of its content and subject matter (domain of knowledge).

The tentative improvements in the communication of needs to technology-based systems have been fruitful, but up to date they have not incorporated the actions of meaning creation for which knowledge (inputs) is needed, and should be used and useful. The current approaches successfully facilitate the communication of what an individual needs in terms of the object needed, i.e. knowledge. But they do not allow communicating how and why this knowledge is needed in a specific circumstance (how and why an individual needs to know about a topic for her/his meaning creation). The approaches have often remained based on strategies around the content, the subject matter, and on the characteristics of the knowledge needed. They have neglected the

intrinsic association of any dimension of knowledge with the knowing actions for which it is needed, i.e. knowing or meaning creation, and emphasized the object of the need by itself, i.e. knowledge.

Particularly, this common detachment from the actions of meaning creation means that in most of the cases, the individuals' interpretative actions and how they need to use knowledge that they access have not been considered in the communication of needs. The individuals' needs have been commonly considered as needs of knowledge by itself. The communication of individuals' needs to technology-based systems has not been rich enough to also uncover how and why individuals need the specific knowledge they need (input) for their knowing practices (e.g. needs a document about A to help her/him answer questions such as X, Y and Z, and to help her/him in predicting potential problems with B). The fulfillment of needs have been frequently considered as being entirely on the responsibility of the characteristics of the inputs (knowledge), rather than on the individual actions in relation to these inputs.

In communicating needs for the access to tacit-knowledge based inputs, empirical evidence has shown that often there has been a lack of clear explanations of needs by the knower to the experts or owners of the knowledge.

For complex needs like those related to knowing work, the above issues lead to a problem because the knowing needs cannot be restrictively understood and fulfilled only in relation to the content of what is needed, or only by specifying the object of the need.

(ii) Aspects that do not explain how needs and uses may differ

How individuals differently need knowledge and how they differently use it to contribute to and support their knowing is mostly left outside of the communication of needs. How individuals need and use knowledge (inputs) for meaning creation is situational (Dervin, 2003b/1984, Dervin & Frenette, 2003/2001, Gherardi, 2003, Nicolini et al. 2003, p. 23), because these processes are responsive and contingent on the characteristics of the time-space moment of knowing. However, so far, the situational nature of individuals' meaning creation actions has not been sufficiently accounted for in communicating and understanding needs.

How individuals differently need to be supported in their knowing by using knowledge (inputs) have been frequently attributed to individuals' characteristics (socio-demographic, psychographics, life style, tasks, domain, job position or function, and

membership of a stereotype or group), and to individuals' interests and preferences related to a topic or to the subject matter of the needed inputs. As a consequence, how individuals create meaning, and how they need and use inputs (knowledge) for it have been considered as constant to all who have similar characteristics (e.g. demographics, job function, education level, cognitive style, doctors, engineers), and to all who experience similar conditions (e.g. domain or task).

The above ways of understanding individuals' needs are not sufficiently powerful to explain why similar individuals (e.g. two engineers or two individuals doing the same task) have different needs, how they differ in fulfilling their needs, and in how they create meaning with knowledge (inputs). By understanding individuals' needs on the basis of the characteristics described earlier, the current approaches have commonly ignored the conditions that lead to different interpretations in the same material circumstances or conditions, they have also excluded differences within and between different material conditions (domains or 'contexts'), and also the differences within and between times.

The conditions that lead to different needs and interpretations of knowledge have been disregarded because the attributes above tap conditions and characteristics that are *outside of* and *prior* to the moments of knowing actions: to the moments in which interpretive actions are performed with the needed knowledge (input) to create new knowledge. The descriptions of needs used by current approaches often fix individuals to aspects that are external to their interpretive actions, and to the circumstances in which they fulfill their knowing needs by using knowledge (inputs). According to B. Dervin (Personal communication, May, 2007) the explanation of needs is "too far removed from the action of the need, from that moment". Interestingly, these characteristics have been used to understand things that happen *in* knowing processes, but they often represent aspects that are *outside* these processes. The actions of creating meaning with the knowledge needed have been commonly epiphenomenal to the communication of needs.

The explanatory power of communicating needs on the basis of the users' and content characteristics described earlier is commonly lower also because they are "not micro enough" (B. Dervin, personal communication, May, 2007). As explained by Dervin (2003h/1999, p. 155), these are characteristics of individuals that are conceptualized "in terms of breadth of their time-space coverage: demography is wide, for example; topical context or subject domain narrower, a specific micro-moment the narrowest". As the

attributes used in the current approaches to communicate needs have covered a large breadth of time-space (e.g. topical interests and preferences, stereotypes, domain expertise, cognitive style), they do not reach the micro-moment of the interpretive actions in which a specific knowledge (inputs) is needed to be used for such actions. It is in these moments that individuals may differ in the ways they need and use knowledge for their knowing, they may need and use knowledge in habitual and in new ways to help their creation of meanings.

Certainly, the limitations in communicating needs and knowledge presented above are easier to be overcome when the focus is on the access to the tacit dimension of knowledge by means of face-to-face conversations. The richness of personal and direct interactions increases the possibilities to adapt communication, providing the participants' developed skills, and the existence of a positive conversational context. In face-to-face conversations, the excessive focus on *what one knows* can be skillfully and smoothly adapted to also attend how knowers demand that the communicated knowledge fulfill their specific knowing needs. Although, this adaptation has not been extensively present in the communication of knowledge processes (cf. Eppler 2004; 2005; 2007). Equally, unclear needs can be gradually explained if the knowers are aware of them and if they have the skills and methods to help her/him in doing so.

On top of all, the knowing-inputs connection that is formed by the communication of knowledge and needs has not been thematized: *there has been no 'knowing' in the connection*. The access to and communication of knowledge has been approached and performed in a way that is *detached from the knowing practice, and consequently from its inherent situationality*. As a result, individuals struggle in accessing knowledge at the level of the meaning creation process that they need to accomplish by using the respective knowledge.

The access to and communication of knowledge for knowing work demands communication to occur at a level beyond the characteristics of the knowledge needed, of what it is about, or of its content representation. Specific knowledge is accessed and *used to create new meanings*. How and why a specific knowledge is accessed is not intrinsic to the input itself (knowledge in documents, persons or in a community of experts), or to its description (document content or structure). Rather, it is associated to how this knowledge can contribute to specific meaning creations in specific knowing circumstances. As

emphasized by Rice et al. (2001, p. 305), “what makes a document interesting to a person is subject to an individual’s interpretation and is not a characteristic of the document itself”.

At the bottom line, the limitations in communicating knowledge and needs explained above reduce the potential value of accessing knowledge for knowing work. This is because more time and efforts are demanded to get adequate knowledge to the specific circumstances, uses and reasons it is needed. Knowledge workers can access inputs that are highly suitable to the content they need, but these inputs can be inappropriate in contributing to the construction of the meanings they need to in a specific knowing situation. As an effect, much time and efforts can be lost in trying to get appropriate inputs, rather than be invested on what actually adds value in a knowing work: in making sense of knowledge and in using it to generate new insights and ideas for business strategies.

2.11 Summarizing the Chapter

The current chapter attempted to deepen the understanding about knowing and knowledge communication as meaning creation processes by mainly drawing on Polanyi’s tacit knowing theory. Important complementary ideas were added particularly to the understanding of ‘communication of knowledge’ (access and uses) in order to clarify the processes, concepts, challenges and issues involved in such process.

The main ideas are centered on the fact that the creation and communication of knowledge are processes of meaning creation (sense-reading and sense-giving), highly dependent on the knower, situational, and involving the individual as a whole. Significantly, the communication of knowledge as sense-giving is a communication of both dimensions of knowledge, rather than a tacit-explicit conversion process. Different methods are therefore needed in order to allow the access to the interdependent dimensions of knowledge. Equally important, the communication of knowledge aims to help the other individuals to understand, interpret, and apply such knowledge to experiences relevant to them.

The situational nature of knowing, which largely affects knowledge communication will be detailed in Chapter 3. The situational, emergent, unplanned and complex nature and dynamics of knowing work were presented, evidencing how this kind of work demands approaches beyond the current ones used to support it.

Central to the purposes of the current chapter was to evidence the complexity of knowing, communicating and accessing knowledge, and the knowing work. Importantly, the complexity of knowing and the limitations in communicating knowledge in such practice evidences a need to look beyond knowledge itself and include its uses in practice, its significant instrumentality, and its role in knowing.

PART III – THE METHODOLOGICAL FRAMEWORK

CHAPTER 3: SENSE-MAKING AS A METHODOLOGY TO STUDY KNOWING

There is a deep question whether the possible meanings that emerge from an effort to explain the experience of art may not mask the real meanings of a work of art.

Jerome Bruner

3.1 Introducing and Justifying

The current chapter explains Dervin's Sense-Making Methodology (SMM). This methodology conjointly with the tacit knowing theory of Polanyi constitutes the main theoretical framework of the present study. The main purpose of the following sections is to characterize Sense-Making Methodology and explain how its theoretical assumptions can be applied to the study of knowing as situational meaning creation. SMM is focused on actions, more precisely on person-acting-in-situation. It also concentrates on how individuals make sense in time and space by bridging gaps. SMM was used to empirically study knowing as situational meaning creation practice, because in SMM, knowing is a way of sense-making.

The review of SMM was primarily informed by the main literature of Sense-Making Methodology with special attention to the publications from 2006-2008, whereas older publications were referred to if necessary. The main sources for the review of SMM reported here are grounded on the reports of the project 'Sense-making the information confluence' (2006), articles that compound the book 'Sense-Making Methodology Reader: Selected Writings of Brenda Dervin' (2003), a seminal article about the methodology (Dervin, 1999), and a recent article about the interviewing methods (Dervin, 2008).

The present research focuses on understanding knowing work at the level of meaning creation and from a practice-based perspective. Particularly, the focus is on understanding how knowledge workers situationally create meaning in complex knowing by using knowledge (inputs). This understanding informs an approach to attune the communication of needs and knowledge to the situational meaning creation in knowing work.

To accomplish the above there was a need to draw on a practice-based methodology that has a focus on knowing as meaning creation, and on the uses of knowledge (inputs) attached to this practice. Mainly, the methodology should enable knowing to be studied situationally and to understand how individuals situationally act for it. It was necessary to study knowing from a communicative perspective, because it is believed that knowing is essentially a communicative practice composed by the communication of knowledge and needs. Importantly, the present study needed an alternative to the approaches which thematize knowledge uses and the communication of knowledge and its needs in knowing practice as detached from such practice and from the knowers' actions in it.

In addition, the alternative methodology should have interpretive perspective. The methodology should also enable the deep and systematic understanding of the complex experiences of knowing work. Mainly, it should enable the understanding of how knowledge is needed, activated and used to create meaning in knowing practice. The data collection method should allow and facilitate individuals' articulation of deep aspects of their knowing experiences. Most importantly, the research methods should bridge theoretical assumptions to research practice. In this way, results could be used to methodologically inform the creation of approaches for the communication of knowledge and its needs in knowing.

To these ends, the present study was informed by Dervin's Sense-Making Methodology. This methodology has been developed since 1972, in diverse contexts and fields. Both academic and practical studies involved contributions of more than 100 academics and practitioners globally (Dervin, 1999, p.729). It is informed by a large number of research traditions, part of which is considered as in opposition to the other (e.g. qualitative and quantitative, American and European) (Dervin, 2006).

Sense-Making Methodology^{xxxi} is a mature, consistent and empirically validated set of metatheoretical assumptions and research methods that enable the *study of human meaning creation practices on a situational perspective*, i.e. the *sense-making phenomena*²⁸. Importantly, SMM enables knowing to be studied as a situational sense-making phenomenon, and at the level of meaning creation.

The phenomena under study in SMM are the sense-making and unmaking practices, and knowing is one of these practices, i.e. one way of making sense. The making and unmaking of sense or meaning²⁹ are the continuous interpretive actions made by sense-makers in time and space. Sense-making is considered as a communicative behavior. Sense-making is "most usefully conceptualized as *situated communicative practices, internal (e.g. thinking and remembering) and external (e.g. asking and objecting)*" (Dervin & Frenette, 2003/2001, p. 239) (Emphasis in the original).

SMM was simultaneously developed as an approach to study users and non-users, and to the development of responsive systems or approaches to be used in their communication

²⁸ Sense-Making (capitalized) is the approach or the methodology and the term 'sense-making' (lower case) refers to the phenomena studied by the Sense-Making Methodology.

²⁹ In the present study, the terms 'sense', 'meaning' and 'knowledge' are synonyms and they are used interchangeably.

with users (Dervin, 2008, p.3). It aims to “study and design communication communicatively and ultimately to improve communicating – to change systems and procedures” (Dervin, 2008, p. 3).

As a practice-based approach, a distinctive strength of SMM is its focus on actions performed by individuals to make sense in time and space, i.e. on sense-making practices. It concentrates on the *person-acting-in-situation*, rather than on individuals or actions by themselves. SMM studies *how* individuals bridge (cognitively and emotionally) and create meaning. Thus, attention is centrally given to actions, to ‘verbing’ practices (Dervin, 1999; Dervin & Frenette, 2003/2001). This characterizes SMM as a *verbing approach* (Dervin, 2003h/1999, p. 141; Dervin & Frenette, 2003/2001).

SMM is not a model of knowing, knowledge uses, or of information needs, seeking and use; but it is a way of looking, studying and understanding knowing and how individuals situationally use knowledge for it. In this context, it is a “highly abstract methodological tool” (Dervin 1999, p. 740; Savolainen, 2006, p. 1120).

For the purposes of the current research, the main contributions of SMM include the following aspects:

(a) *It enables knowing to be studied at the level of meaning creation.* Knowing is a sense-making practice and SMM enables how individuals use knowledge to create meaning in specific situations, and why they use what they use to be understood.

(b) *It enables knowing to be studied as a situational practice.* It enables how individuals situationally act and use knowledge to create meaning to be understood. Knowing occurs as a response to the circumstances, it is bounded in time-space. SMM studies the knowing experience in time and space, looking at knowing on a finer level of granularity of its constituent actions, bracketing and circling the knowing practice in a smaller breadth of time and space (i.e. micro moments) (e.g. the encounter of an individual with an input when s/he has a specific question in a specific situation).

(c) *It has a focus on the situated sense-making or knowing practice, and on its product (sense, information, or knowledge) within these practice.* Knowing is studied as a situational practice. Knowledge is analyzed as created, mobilized and used in the knowing practice, rather than isolated from it, or as a self-contained product detached from the practice.

(d) *Situationality in knowing and in the uses of knowledge can be systematically understood.* SMM makes possible to systematically account for individuals' diversity and complexity in acting for knowing, without 'babeling'³⁰. The research methods enable to account for human diversity in practices, without generating an unmanageable and non-systematized understanding of informants' knowing experiences. As an effect, the outcomes of interviews reveal sense-making experiences in individuals' own terms, but within a structure that eases the analyses and comprehension of the experiences.

(e) *The conceptualization of variables, data collection and analysis are conducted methodologically.* SMM bridges the distance between theoretical assumptions and research methods. This is rarely found in approaches that attempt to study and explain knowing and knowledge uses in it (Brendlinger et al., 1999; Wang, 1999, p. 57; Dervin, 2003e/1991, pp. 62-63).

(f) It has theoretical assumptions and validated empirical methods to study situational knowing.

(g) Sense-Making Methodology and Polanyi's theory of tacit knowing support each other.

On these grounds, SMM is appropriate for the needs and objectives of the present study. SMM was primarily used in relation to its theoretical assumptions and research methods. It was used to conceptualize variables, and to design and implement the data collection. The data analysis was guided by it at the macro level, and the micro level was scrutinized by focusing on the informants' narratives. However, the present study was not executed with the quantitative focus with which SMM has been largely developed.

The remainder of this chapter characterizes Sense-Making Methodology and explicates how its theoretical assumptions and methods are used to understand sense-making (knowing) practices. Firstly, SMM as a verbing and dialogic approach is discussed. Secondly, its philosophical assumptions are explained. Thirdly, it is explicated how SMM is implemented. Fourthly, the situationality of sense-making is discussed. Finally, knowing as a sense-making practice is explained.

³⁰ The term refers to the process of accounting for human variance but doing so in an undisciplined way, within towers of Babel of "multiple interpretations" (Dervin, 1999, p. 734) or when "diversity degrades to a Babel of voices" (Dervin, 2003, p. 91).

3.2 A Verbing Approach

In Sense-Making Methodology the *central concern is on how individuals create meaning*. It studies the phenomena of sense-making (knowing) with a focus *on actions* that individuals perform to create meaning. The unit of analysis is not the individual itself. Rather, it is the situated sense-making practice, how individuals make or unmake sense in time and space. According to Dervin (1999, p. 731) “Sense-Making refocuses attention from the transcendent individual or collective human unit to the verbing ... by focusing attention on practices rather than persons”. This is a core difference from approaches which are only focused on individuals, practices, or on knowledge by themselves, without any relation among them.

In this context, SMM looks at how individuals move from a state X (e.g. having no focus, not considering A, sense run out) to a state Y (e.g. having a focus, considering A, new sense). The focus is on the movement between, rather than on the states. It concentrates on the moves or actions that individuals make between polarities or states through time-space, rather than on the polarities themselves. Each polarity is a static way of characterizing humans (Dervin, 2003j/1993, p. 107), a polarized view of the world such as domains or tasks, a world of nouns. This polarized perspective assumes “the nature of knowing as absolute *or* interpretive, with knowledge as objective *or* subjective” (Foreman-Wernet, 2003, p. 7) (Emphasis added). Analyses do not concentrate on polarities, because polarities rigidify individuals in states of knowing. Rather, they concentrate on actions or movements between those, on how people connect the polarities, on the actions or practices to create knowledge, on the verbs used to make sense, i.e. on verbings. Verbings are “ways to make sense” (Dervin & Frenette, 2003/2001, p. 239). Verbings reflect internal and external actions that individuals make to move between states. According to Dervin and Frenette (2003/2001, p. 239) these verbings involve “the making or using of ideas or both, cognitions, thoughts, and conclusions; attitudes, beliefs and values; feelings, emotions and intuitions; and memories, stories, and narratives”.

The focus on actions (verbs) *does not disregard the polarities or nouns* (e.g. knowledge). Rather, SMM studies polarities or nouns within the actions, attached to the verbings. In this sense, knowledge (a polarity, a noun) is studied in the actions in which it is created and used, i.e. in knowing, in the practice of sense-making. The attention is not limited

to the product of the knowing practice, i.e. knowledge. Rather, SMM *mandates attention both to the practice (i.e. sense-making, knowing) and to the product in the practice (i.e. sense or knowledge in knowing)*. It is in the movements that the uses of knowledge happen.

The actions or movements between polarities aim to bridge gaps that are inherently faced by individuals, because reality and human beings are naturally changing, discontinuous and incomplete. In facing an ever-changing reality, when individuals feel that their sense runs out, they face a gap. Gaps can be of any nature such as cognitive, physical, and emotional. The movements, actions or verbings employed to overcome gaps are referred to as gap-bridging, which is essentially, the making or unmaking of sense. Therefore, internal or external actions are used to construct bridges and to overcome gaps faced by individuals in time and space (Dervin, 1999, p. 740). Thus, *gap-bridging is sense-making*. The *sense-making phenomena are essentially gap-facing and gap-bridging processes*.

“...theorizing communication as practice, as verbings that humans, collectively and individually, *use to construct bridges across gaps* – self and other, self and community, structure and individual, self at time 1 and self at time 2, one aspect of self at time 1 to another aspect of self at time 1, chaos to order, order to chaos, homogeneity to difference, difference to homogeneity.” (Dervin, 2003j/1993, p. 108) (Emphasis added)

The gap-bridging movements are articulated by verbs, indicating actions instead of states. These verbs reflect how individuals bridge a gap, how they make sense. These verbs include for example, defining, discussing, ignoring, thinking, articulating, combining, consensuing, negotiating, power-brokering, hunching, suppressing, emoting and factizing³¹ (Dervin, 2003h/1999). According to Savolainen (2006, p. 1122) “verbing is posited as a general level category that refers to the practice of ‘making’ of ideas and producing diverse versions of reality”.

In analyzing sense-making at the individual level, gap-bridging is an action controlled by the individuals, because it depends on how they subjectively use inputs (knowledge) to create sense, and on how they assess these uses as being contributive to their sense-making process. These actions are under the individuals’ control. Thus, SMM studies a practice that is internally controlled (Dervin, 2003g/1992, p. 271). However, this does not mean that gap-

³¹ According to Dervin (2003h/1999, pp. 141-142) factizing is “the making of facts which tap the assumed-to-be-real” and it is one of the verbings used by individuals to make sense of their worlds, but it is not “the only verbing that creates what we call knowledge”.

bridging or sense-making is individualistically accomplished, given that sense-makers may use diverse internal (e.g. intuition) and external inputs (e.g. insights of a senior manager) to help them bridge gaps.

As a verbing approach characterized by the focus on situated gap-bridging actions performed by sense-makers, the patterns and differences that SMM enables to be understood are in how they make sense, in how they create meaning by using inputs (knowledge). This is significant because it shifts the focus from explaining how individuals differ in using knowledge for knowing on the basis of characteristics that are external to their own knowing actions (e.g. differences based on topical interests and demographic characteristics). The focus turns to explain differences in needing and using knowledge according to aspects that are anchored in individuals' knowing actions.

Because it focus on actions (verbings), instead of looking at patterns and differences in individuals' characteristics, SMM looks for patterns and differences in sense-making practices, in how individuals bridge gaps, in how people make sense that permit them to proceed in time and space (Dervin, 2003f/1991, p. 303). When facing gaps in specific moments in time-space, individuals try to do something to bridge these gaps, by acting routinely or creatively, and by using or not using inputs, expecting that something contributes to their sense-making.

The steps in collective or individual sense-making movements may be a repetition of a strategy which worked in the past or a completely new strategy. But, these movements are always made “without complete instruction or constraint” and they are at least partially designed (Dervin, 1999, p. 732). Individuals may repeat a known way or a pattern of action in making sense. Despite the fact that individuals may employ a habit, this habitual action is performed in a different situation.

Importantly, *it is in the action of gap-bridging in time-space that differences emerge*. The differences occur in how individuals construct interpretive bridges over situated gaps and how they use knowledge (inputs) for it. It is in the actions and how individuals move between states or polarities that they may exhibit new ways of doing things (i.e. innovation, creativity, diversity). It is in the moves “where the real and interpretive meet” (Dervin, 2003k).

At a high level of abstraction, the focus on verbings (gap-bridging) enables generalizability because the patterns that are identified are related to practices that are common to an engineer or to a doctor: the creation of meaning, sense or knowledge. “Because the categories focus on the making of meaning or sense, they are seen as

generalizable across contexts (e.g. they describe the circumstances of a sitcom viewer as well as those of a database user)” (Dervin, 2003c/1989, p. 55). The attention to actions reflects an analysis of a practice that is common to all persons and simultaneously interpretable in specific situations (Dervin, 2003f/1991, p. 302). According to Dervin (2003g/1992, p. 275) “it is this focus on gap-defining and gap-bridging which is seen as offering a way of introducing order to conceptualization of individual practice. *It is not the individual entity that is seen as ordered but rather the gap-defining and gap-bridging that is ordered*” (Emphasis added). Therefore, the searched patterns are related to a sense-making practice, they are patterns in gap-defining and gap-bridging. As such, they can be generalized to similar practice across domains and contexts.

By refocusing on how individuals bridge gaps and create meaning (verbings), SMM “frees research from the implicit assumption that there is one right way to produce knowledge” (Dervin, 2003h/1999, p. 142). The attention is given to how individuals make and unmake sense in specific time and space (Dervin & Frenette, 2003/2001, p. 236), rather than having a frozen understanding of a problem and its answer (one input, one output). The latter is resulted when the focus is given to polarities independently of actions.

The verbing focus is one of SMM main strengths for the present study. It is what fundamentally makes it possible to look at knowing and knowledge as mutually enabling and constitutive. As a verbing approach to understand the sense-making practices in knowing work, the focus of the present study is on how knowledge workers situationally create sense or meaning by using knowledge-based inputs. It concentrates on understanding how they construct interpretive bridges when they face gaps in their sense, and on how they use knowledge (inputs) for bridging these gaps when they create business-related knowledge for internal or external customers.

3.3 A Dialogic Approach

The dialogic assumption of SMM is based on the consideration of a “two-way of sharing and understanding meanings” (Dervin & Frenette, 2003/2001, p. 236). A mandate of SMM is that the sense-making practice, i.e. knowing, is studied communicatively and dialogically. The dialogic assumption was characterized by Dervin and Huesca (2003/2001, p. 310), as follows:

“Dialogic ideas about communication position communication as dialogue, as a dynamic and complex process through which people create, change, and re-create sense, meaning, and understanding in their interactions with others, media, events, and experiences. A dialogic or communication theory of communication focuses not on homogenising difference but on putting differences into dialogue and, thus, using it to assist human sense-making.”

Basically, it is because of the dialogic principle that individuals’ interpretive world can be accessed and incorporated to the understanding of the knowing practice. According to Dervin (2001a), SMM had a dialogic characteristic since its beginning as an attempt to interact with individuals in a way that they can use their own terms and logic to talk to researchers, and at the same time, that these terms can be interpretable. Basically, the dialogic assumption of SMM is operationalized in the interviewing methods and in the interactions between individuals and technology- or human-based systems.

As a whole, the dialogic assumption of SMM is reflected by the following aspects:

(a) *Knowing (sense-making) and knowledge are conceptualized on the basis of a communication model.* The practice of knowledge creation, i.e. knowing, is approached communicatively, because it is based on a communication model, rather than on a transmission model³². Knowing is considered as a construction and a dialogic practice because it demands interaction between individuals and inputs (knowledge) in order to create new meanings or knowledge. Knowledge is constructed by an individual in a two-way communication, rather than packaged and transmitted as a self-contained object. There should be a communicative interaction between individuals and inputs in order to create new knowledge. Additionally, the uses of knowledge for knowing have been required to be studied as communicative practices since the beginning of SMM (Dervin, 1999, p.729).

(b) *The interface between researcher and informants.* The design of Sense-Making interviews is made to enable maximum articulation by informants, giving them appropriate time to identify and articulate aspects of their sense-making experiences. Researchers need to ask dialogic questions and have the ability to actually listen to how the informants construct her/his concepts, experiences and connections. Researchers do

³² Dervin (1999) highlighted that the transmission theory of communication is the one which is dominant in information and communication systems and practices.

this without contaminating the researched with their own conceptual world and perceptions. The dialogic perspective also requires that the researcher has good skills in listening and in not imposing any limitations or conditions to informants' own world at any moment of the communication.

The dialogic perspective to understand and study knowing is essential for the objectives of the present study. It is by a dialogic approach that the interactions with informants can be potentially more insightful, enabling the researcher to help surfacing and understanding deep aspects of their knowing experiences. Only in dialogic interactions and processes knowledge workers can inform the researcher what really matters to them in their sense-making. Further, the dialogic approach is core to the present research because it enables the understanding of knowing and knowledge uses by individuals' own perspective, reflecting how these processes are performed in practice. Consequently, in applying the results of a SMM-based study of knowing to the communication of needs and knowledge, knowledge workers' voices become incorporated in these communication processes. The communication of knowledge and its needs become rooted in what matters to individuals in their knowing, according to their own terms and worlds.

3.4 Philosophical Assumptions and Fundamental Concepts of Sense-Making Methodology

The philosophical assumptions underpinning SMM originate³³ from diverse research traditions. It is referred to as a methodology 'between the cracks' because some of the philosophical traditions that inform SMM are considered as opposed to each other (e.g. qualitative and quantitative) (Dervin, 2006, p.5). It adopts different kinds of presumptions about reality (ontology), and knowledge (epistemology) than those commonly used in knowing, knowledge uses, and knowledge management research fields. While the prevailing

³³ According to Dervin (2008, p.3), the central theoretical principles were "systematically extracted from premises informed by the writings of a dozen European, and North and South American philosophers espousing theories often seen as competing: chaos, complexity, deconstruction, cultural studies, pragmatism, phenomenology, critical, administrative".

assumptions on the latter fields have been based on a positivistic perspective, in Sense-Making the dominance is of the interpretive paradigm.

According to Dervin (1999, p. 730), at first, Sense-Making was described as a constructivist approach in Dervin (1983). Later it was characterized as a constructivist and post-modernist one. It was then described as a communitarian approach in Dervin (1994). In Dervin (1998), it was designated as a verbing approach, which is how SMM has been currently and most of the time described.

The metatheoretical assumptions of Sense-Making are related to the nature of knowledge, the nature of human use of it, and to the nature of human communicating (Dervin 2003g/1992, p. 270). Within this context, the metatheoretical assumptions are applied to the research practice by the following ways (Dervin, 2003b/1984, pp. 255-256):

- (a) By the use of the Sense-Making Methodology metaphor, which states explicitly what should be identified and measured by the researcher when studying sense-making (it is explained later).
- (b) By the use of the data collection methods, in particular, interviewing methods that are rooted in the concepts and assumptions of Sense-Making Methodology.
- (c) By the conceptualization and operationalization of variables.
- (d) By the data analyses methods.

As the metatheoretical assumptions of Sense-Making are interdependent, their following discussion may be marked by some inevitable overlaps.

3.4.1 Dealing with Discontinuity: the Gap-Bridging

Discontinuity is considered as an inherent aspect of reality and the human condition. This is the core assumption in which SMM is rooted in (Dervin, 2003g/1992, p. 270). According to Dervin (2003g/1992, p. 272) “whatever order is out there, it is potentially discontinuous from time to time and space to space”. SMM assumes that reality and human beings can be equally ordered and chaotic, fixed and fluid, and consequently individuals observe and act in this reality with habits and rigidities, and also with fluidity and creativity

(Dervin, 2003k). Consequently to its intrinsic discontinuity, reality is subject to different interpretations.

Given that reality is discontinuous, individuals' movements through time and space in this reality will never be completely informed. According to Dervin (2003h/1999, p. 143) "no human movement, collective or individual, can be fully instructed or fully constrained a priori". Individuals and their movements towards the construction of knowledge or sense are gappy in themselves and gappy across time and space (Dervin, 2001a). As stated by Dervin and Frenette (2003/2001, p. 237): "gappiness is pervasive both in and between moments in time and space and in and between people". Whatever the characteristics about reality and knowing are, they will change, and human beings will also modify in response to these variations in order to keep moving.

The ever-changing nature of human beings and reality naturally leads to the emergence of gaps in individuals' sense (e.g. get a focus for a market analysis, or adapt it to managers' priorities). Gap-facing and gap-bridging are natural and continuous aspects of life. Savolainen (1993, p. 16) explained that "in contrast to functionalist assumptions, Dervin appears to see continuity (cognitive consonance) as something temporary by nature, not an intrinsic value implying the primacy of homeostasis. Hence, overcoming discontinuities is a natural and recurrent thing in human life". In facing these gaps, individuals seek for new sense because the old sense naturally ran out and they cannot proceed with their actions. This does not mean that individuals are always beginning anew. In creating new sense they may bring their history, memories, and experience. *It is not that SMM does not accept the continuities, but this continuity is considered temporary. Continuity and gaps coexist.*

The faced gaps may be of cognitive, emotional, physical or spiritual realms. They may occur between time and space, experiences, external worlds and internal worlds, language and speech, human mind and communication, people at the same time, people at the same place, collective and individual, and in relation to a single person across time and across spaces (Dervin & Frenette, 2003/2001; Dervin, 2003h/1999).

Drawn upon the assumption of discontinuity and the consequent gappiness, *sense-making and sense-unmaking is a gap-bridging process*. This process is accomplished only by human beings. It is not accomplished by the knowledge that they might access and use as inputs for their knowing, but by the human actions with it. Gaps are overcome by individuals' actions in using inputs to create interpretive bridges over these gaps (Dervin 2003b/1984).

Because of the discontinuity in reality, and of individuals changing across time-space and across their own perception, the interpretations and the individuals' relationships with these alterations and discontinuities are diverse. There are "differences in how humans construct interpretive bridges over a gappy reality" (Dervin, 1999, p.731). How gaps are perceived and the construction of bridges over them differs in time-space. A single knowledge worker may face different gaps and bridge them differently in the same space (e.g. domain, task) and time. Knowledge workers with similar tasks, characteristics, or domains of knowledge may face and bridge gaps differently in the same time.

The discontinuity assumption and the gap-bridging are essential in SMM and for the present study as well. The significance of the discontinuity assumption for the study of individuals' sense-making was pointed out by (Dervin, 2003g/1992, p. 271) as an important one to be activated in the study of knowledge use, especially when it is needed to understand "behavior that is internally controlled". The discontinuity assumption allows the inclusion in the study of knowing the inherent and inevitable aspect of reality and human beings: that they are ever-changing, discontinuous, and incomplete.

3.4.2 Understanding Individuals

3.4.2.1 Based on their own perspective

Another essential theoretical assumption of SMM is that individuals should be understood in their own perspective, in the frameworks that make sense to them, rather than in the researchers', experts', systems', or institutions'. Individuals are studied without introducing and imposing them a specific framework of expertise or structure. Since its inception, SMM is a way to listen to other human beings without imposing the dominant discourse and the researchers' or institutions' worlds and perspectives. According to Dervin (2003d/1989, p. 223) SMM makes available "a systematic approach to listening to the audience - how they see their situations, past, present, and future - and how they move to construct sense and make meaning of these situations".

Considering this, individuals are not conceived as passive individuals or merely respondents, but collaborators and active constructors of knowledge about themselves; they are "dialogic partners" (Dervin, 2006, p.7). In this context, individuals are considered as the actual experts and the theorists of their own experiences. They actually name, interpret,

conceptualize, draw connections and conclusions, and associate their own experiences with the social, cultural or any other aspects involved in their experience in time and space. They are studied and understood as “actors navigating moments of situation-facing”, rather than “users as nouns ascribed with adjectives of our choosing to users” (Dervin, 2006, p. 6). Therefore, individuals’ knowing experiences are designed and articulated in their own terms.

“... when we conduct research defined by our expertises and our systems structures, all we are able to learn is how users see us-looking-at-them. What we need to see is them-looking-at-us and them-looking-at-their-situations in which they actually or might position themselves as users. To do so, we need to break out of even such enclosing boxes as our traditional emphases on information seeking and use, or information behavior.” (Dervin, 2006, p. 5)

The articulation of sense-making experiences in the individuals’ own terms is enabled by the interviewing design and implementation, which mandates dialogic interactions that facilitate to bring to consciousness what may be unconscious. According to Dervin (2003h/1999, p. 158) “articulating one’s world without limiting it to how it can be easily described by dominant discourses requires a process of bringing the unsaid and unarticulated into consciousness that is, conscientizing”. By using a method of interviewing that is rooted in the principle of the ‘conscientizing’, the study of sense-making is accomplished in its “hidden depths” (Dervin, 2003h/1999, p. 158). Conscientizing is a concept based on the critical pedagogy of Freire (1970).

The principle of conscientizing and the theoretical assumptions ground the interviewing methods, making it possible for individuals to be the ones who theorize about their own experiences. Based on a dialogic interaction and its underlying conscientizing principle, the interviewing methods enable the articulation of deep levels of individuals’ experience in their own ‘language’ and perspective. Dervin (1998, p. 43) stressed the significant role of informants as the constructors of their own experiences, and the role of researchers as careful listeners.

“Sense-Making mandates respectful listening to users as theorists and knowledge-makers in their worlds; as actors who if asked can tell you at least something of what they need. Our evidence shows that what users have to say is sometimes hard to hear, but that in fact when the hearing of difference and contest is designed well, designed communicatively, the results can be not only useful, but also fun.” (Dervin, 1998, p. 43)

The opposite way of understanding individuals’ knowledge construction is by considering observers’, systems’, institutions’ or experts’ perspective. Dervin (2001b)

pointed out that ‘context’ has been still defined by the observer’s perspective. According to Dervin (2001b) ‘knowledge domain’ (a field of knowledge), and ‘task domain’ (the professional field in which the seeker sets to tasks, e.g. cancer treatment) are salient illustrations of the experts’ or systems’ perspectives. Because these domains organize the world according to the perspective of experts or systems, dividing into boxes a world by their own perspective, Dervin (2001b) describe them as ‘noun’ domains. Although necessary to design approaches for communicating, these perspectives have not been evidenced as the best explanation of “what people do (cognitively, emotionally, or behaviorally) when using an information system” Dervin (2001b).

In SMM, experts’ and systems’ worlds are not imposed to individuals. Consequently, a group of concepts on which “traditional social sciences erect entire edifices – e.g. attitudes, opinions, knowledge, emotions” are purposefully left undefined and put together (Dervin, 2006, p.6). Despite the fact that Sense-Making studies analyze relations between these conceptualizations, distinctions between them are not imposed on informants and users because in their everyday practices and worlds such distinctions have little meaning, even to the most sophisticated users (Dervin, 2006, p. 6). Given this, SMM has a critical approach to the term ‘information’. It considers that the term has been assumed “as a given, as isomorphic (even if tempered as in critical realism) description of a real world” in most knowledge use studies (Dervin, 1999, p. 740). This perspective privileges the product or outcome (i.e. information, knowledge) over the process (i.e. informing, knowing) (Dervin, 1999). As an effect, “fundamentally, Sense-Making mandates the disappearance of the term information as a static absolute ontological category” (Dervin, 1999, p. 738).

The aim of the present study is to investigate knowing work practice, i.e. as it is actually accomplished. Understanding knowledge workers’ knowing experiences in their own terms and perspectives is essential. It enables their perception of their experiences to be got, freeing the understanding from established conceptual maps and perspectives. The knowledge workers’ interpretive world can then be embedded in the approaches to the communication of knowledge for knowing. As an effect, these interpretive-based approaches can facilitate reducing the current distance between the communication of knowledge and the knowing practice.

3.4.2.2 Individuals wholly involved in their sense-makings

Individuals are understood as wholly involved in their sense-making or knowing process, rather than involved with only their cognitive functions. Individuals' involvement in sense-making is not restricted to individuals' cognitive realms (thoughts, ideas, observations and understandings), but it also involves "emotions and feelings, dreams and visions, pretenses and illusions, connections and disconnections" (Dervin, 1999, p.730). When individuals are involved in a sense-making moment, they are involved in their wholeness, i.e. what Dervin calls as 'body-mind-heart-spirit/soul' (Dervin, 1999, p.730).

SMM requires that attention should be given to internally driven and external forces that are involved in individuals' sense-making, and to both inner and outer individuals' worlds, since they are impossible to separate (Dervin, 1999, p. 730). SMM considers that individuals as a whole move through time and space. Consequently to individuals being wholly involved in their sense-making, their past, present and future are connected when they create meaning. Their sense-making practices include the individuals' history and experience (past), the current conditions in which they are facing the gaps (i.e. the situation) (present), and how they want to put inputs into use or to be helped by the interpretive bridges they construct (future) when they bridge a gap in a specific situation. Each sense-making moment is considered as an interplay of the individual's past, present and movement to a future. As a consequence, the "individual is at the same time, situated and transsituated" (Dervin, 2003h/1999, p. 142). The link between an individual's past, present and future is explicitly considered in the research methods and in the Sense-Making main analytic tool, the Sense-Making Methodology metaphor (Figure 7, on page 134). Similar to Polanyi's assumptions (1969, p. 188), when knowers integrate clues to the meaning these clues contribute to, they also involve their history.

The external forces related to culture or social aspects that play a role in a specific sense-making moment and these forces influence can only be identified by the individuals' articulation of their sense-making or knowing experiences. The active external aspects are elicited by the interviewing methods, by asking, for example, about the barriers that blocked or slowed individuals' sense-making journey, and about the struggles they had.

A common misunderstanding related to SMM is to call it an individualistic methodology. Even though knowing practices can be studied at the individual level with SMM, this methodology does not "rest on an individualistic theory of human action" (Dervin,

2003i/1999, p. 333). *The focus of Sense-Making Methodology is on a person acting in a specific time and space, behaving in context, and not on a person isolated from it.* However, SMM does not assume individuals totally constrained and influenced by the social context. The influence of context can only be understood by concentrating the analysis in the *individual acting in context.* Otherwise there would not be space for their intentions, actions and influence. SMM adopts a balance between external and internal forces.

“[SMM] assumes that structure, culture, community, organization are created, maintained, reified, challenged, changed, resisted, and destroyed in communication and can only be understood by focusing on the individual-in-context, including the social context. Note, however, that this is not the same as saying that the only way to look at the individual is entirely constrained or defined by that social context, which would admit no room for resisting, changing, inventing, or muddling through.” (Dervin, 2003i/1999, p. 333)

Therefore, similar to Polanyi’s assumptions in his tacit knowing theory, individuals are wholly involved when they create knowledge. Other aspects than just cognitive may be present in the moment of creating meaning. These aspects may include the emotional and organizational ones, but which of them is actually influencing the micro moment of meaning creation can only be identified by individuals. Importantly, the identification of which and how individuals’ internal and external aspects is active in a specific sense-making moment is enabled by the conscientizing technique that permeates Sense-Making interviewing methods. However, human beings are never fully conscious of all these aspects and they may be present in such a complex and intricate combination that makes it difficult to completely bring them into consciousness.

3.5 Knowing and Knowledge Uses: a Construction

In SMM there is no distinction between knowledge, sense, and information, because they are all products of and inputs to sense-making and sense-unmaking. Instead, SMM “has referred to the making and unmaking of sense and has defined information/knowledge as product of and fodder for sense making and sense unmaking” (Dervin, 1998, pp. 36). In other words, SMM “instead looks for fodder that informs sense making by whatever name it might be called” (Dervin, 1998, pp. 42).

Knowledge creation and knowledge uses are not considered as an ‘input-output’ system, but rather as a ‘*constructing*’ activity. As the product of knowing, “knowledge is the sense made at a particular point in time-space by someone” (Dervin, 1998, p. 36) (Emphasis added). Knowledge is conceptualized as a construction. According to Dervin (2003a/1980, p. 32) knowledge is “a construction, a product of observer and observation”.

Under the above assumptions, knowledge is what knowers say it is. By understanding individuals in their own terms, SMM assumes that knowledge is what individuals understand and perceive as being, rather than what is conceptualized by researchers’, institutions’, experts’, interviewers’ or by domains perspectives. Knowledge *is a user’s construct*. The implication of this assumption is *a research free of preconceived conceptualizations of what knowledge is*. For example, an insight, a pain on the knee, the smell of a book, the color of a bone, the direction of a car crash, the sound of a computer or a car, and a signal given by a friend, might be considered as knowledge by individuals.

Concerning the uses of knowledge as input to sense-making or knowing, these uses are also a construction. They are a “personal creating of sense” (Dervin, 2003b/1984, p. 255). As such, different users can create different sense from the same input or from the same content (Dervin, 2003b/1984, p. 254). According to Dervin (2003b/1984, p. 255), SMM “looks at how individuals use their own observations as well as the observations of others (that which is usually called information or messages) to construct their pictures of reality and use these pictures to guide their behavior”. The uses of varied inputs and different verbings enable the construction of interpretive bridges (Dervin, 1999, p. 710). In the knowing process individuals may use diverse inputs based on the tacit and explicit dimension of knowledge to construct interpretive bridges over the gaps they face in specific conditions.

The conceptualization of knowledge is associated with the nature of reality that it describes. Reality can be considered as an objective one, which exists independent of human influence and participation; as a reality ready to be captured in knowledge. Reality can be also considered as a product of the “human act of creation” (Dervin, 2003d/1989, p. 217).

When the reality is considered as objective, detached from the individuals’ actions, what are seen in communicating with technology or human-based systems are the

transmission questions. Such questions³⁴ focus on the transmission model (sender-channel-receiver) and focus on the system, rather than on the user's own world (Dervin 2003g/1992, p. 272). Most studies in knowledge uses consider the perspective in which reality is seen as objective, self-contained and describable, resulting in a conceptualization of knowledge as describing the world in an isomorphic way (Dervin, 2003h/1999, p. 152; Tsoukas & Mylonopoulos, 2004). Because of the adoption of a transmission model, most of the studies related to knowledge use have been constrained by the conceptualization of knowledge as a description of how experts (i.e. professions, domains, institutions) observe and conceptualize the world (Dervin, 2003h/1999, p. 149). According to Dervin (2003i/1999, p. 327), the perspective that conceptualize knowledge "as a natural description of natural reality" has been dominant.

According to Dervin (2003h/1999), the current studies of knowledge uses have been focused on the transmission of knowledge or on the model sender-message-receiver, granting a privilege to the product (the reception of information and the effects of it) over the process. By privileging product over process, time and space are fixed, and individuals and knowledge become concepts restricted to "that produced and used by one narrow set of sense-making strategies" (Dervin, 2003h/1999, p. 152). However, individuals are not limited to such a narrow behavior. Historically, a wider group of strategies in using knowledge have been needed and used (Dervin, 2003h/1999, p. 152).

The perspective of knowledge as an objective concept may be related to the paradigm referred to as 'physical epistemological paradigm' in Information Science, which postulates the physical transmission of messages performed by a sender to a receptor. This paradigm explains that the physical objects (messages or signals) reduce uncertainty (Capurro, 2003).

As a consequence of considering knowledge as an objective description of reality, knowledge uses have been looked and considered as an end in itself (Dervin, 1998; Dervin & Reinhard, 2006). However, evidences across the Sense-Making studies have shown that based on users' terms, knowledge is important but it is not an end in itself (Dervin & Reinhard, 2006, p. 77). Conversely, as knowledge is a user construct, it is a means to an end, which is to create meaning.

³⁴ Examples of transmission questions were given in Dervin (2003g, p. 272): "How much information did someone get? Was the information they got accurate? What can we do to be sure that people get more accurate information?"

“One of our main findings has been that *information and knowledge are rarely ends in themselves; they are rather means to ends*. By freeing our interface with the user from the system’s obsession with information and knowledge, we leave users free to define what is informing on their own terms.” (Dervin, 1998, p. 40) (Emphasis added)

When the nature of reality is considered as a product of human construction as in SMM, the design of practices and systems (technology or human-based) focus on construction questions³⁵ and the user’s interpretive world, rather than on systems (Dervin 2003g/1992, p. 272). As a consequence, *knowledge is studied under a communication perspective*. Knowledge is “made and unmade in communication-intrapersonal, interpersonal, social, organizational, national, and global” (Dervin, 2003i/1999, p. 331).

Considering the above, the uses of knowledge or knowledge-based inputs are considered and studied attached to the knowing practices, rather than as isolated and standalone entities. SMM *considers both the knowing practice and the knowledge-in-knowing*. It is distinct from the approaches which consider knowledge as a self-contained product disregarding the practice in which it is created and used. SMM “mandates attention to process, not eliminating attention to outcomes but setting outcomes into process”, emphasizing multiple and contradictory outcomes instead of only ‘the’ outcome as defined by systems, experts or institutions (Dervin, 2003h/1999, p. 152). *Knowledge, information or sense is conceptualized relativistically, not deterministically* (Dervin, 2003a/1980).

A natural consequence of considering knowledge as individuals’ construction is that its usefulness for knowing can only be assessed by knowers, rather than by systems, experts or institutions. Dervin (1999, p. 745) stressed that Sense-Making “does not assume that expert information is either helpful or not helpful”. “Sense-Making does not presuppose impacts of messages but rather lets receivers define how messages impacted them” (Dervin, 2003b/1984, p. 254).

³⁵ Examples of construction questions were given in Dervin (2003g, p. 272): “What strategy did that individual apply that led him or her call that information accurate? How can we design systems that allow people to apply the criteria they want to their information searches?”

3.6 Implementing Sense-Making Methodology

The SMM theoretical assumptions are operationalized by the use of the Sense-Making Methodology metaphor³⁶ (Figure 7, below). This is used for framing research questions, designing and implementing data collection, conceptualizing variables, and analyzing data. The Sense-Making Methodology metaphor is the verbing analytic and it is the main tool with which SMM operationalizes its metatheoretical assumptions.

The core elements of the metaphor are represented by the Sense-Making triangle (Figure 8, on page 141). These two operationalization tools – the Sense-Making Methodology metaphor (Figure 7) and triangle (Figure 8) – reflect the way that SMM studies the sense-making phenomena, i.e. knowing. The understanding of the sense or knowledge individuals make and unmake is reached by applying these tools to design and organize research.

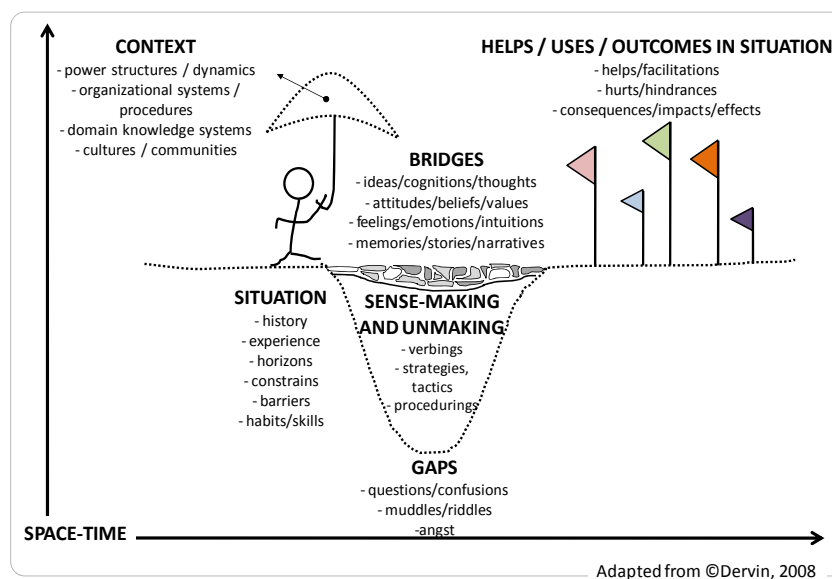


Figure 7 : The Sense-Making Metaphor (Dervin, 2008, p.17).

The metaphor operationalizes the sense-making phenomena and assumes an individual facing stops, and constructing bridges to overcome gaps (Figure 7). The Sense-Making Methodology metaphor depicts a sense-maker moving through time and space. The

³⁶ The figure representing Sense-Making Methodology (Figure 7) was slightly modified for the purposes of the current study. The following components of the metaphor were eliminated because they are not pertinent to the objectives and scope of the present study: ‘relevances’ and ‘sources’.

sense-maker brings with her/him an ‘umbrella’ depicting ‘context’, which moves with her/him in her/his creation of knowledge. Context can be comprised of, for example, the domain knowledge systems, cultures, and communities. How sense-makers relate to this umbrella in time and space varies. The contextual aspects emerge according to the sense-making situation.

In facing discontinuity in reality, individuals’ sense runs out and a gap emerges (the gap-facing moment). The sense-makers then, may bridge this gap with new or traditional ways (creativity or habits), and they may make use of inputs (internal or external to them). Individuals metaphorically construct bridges over gaps by using diverse movements or actions (verbings) and inputs. This gap-bridging is a continuous movement in sense-making and in sense-unmaking. By bridging gaps and creating new sense, individuals get helps which are generated by the uses made of inputs. These helps or uses (also called outcomes) nourish new sense-making moments.

The metaphor (Figure 7) is based on the SMM core assumption of discontinuity and gappiness. The gappiness of reality is illustrated in every aspect of the metaphor by the use of dashed lines, in order to indicate that incompleteness and discontinuity are pervasive and an “assumed ontology” (Dervin, 2008, p. 17). The metaphor is an interface and a framework that abstractly articulates the assumption of discontinuity, which is foundational in SMM (Dervin et al., 1999). The components of a sense-making moment can be specified as follows.

(a) Context

Individuals’ sense-makings or knowings may be influenced by aspects such as the organizational culture, institutional hierarchies, and power structure. The contextual forces can be derived from the domain of knowledge in which individuals are immersed in and are part of, or from cultural and social aspects. Many of the contextual dimensions are outside the actors’ control and some are at least partially in their control, in the sense that their journeys have placed these actors in these contexts. However, from the perspective of the sense-maker (e.g. knowledge worker), some or all of these contextual dimensions may be relevant and influential or may be irrelevant to a given knowing moment in time-space.

In SMM, *context is situated*. Context emerges differently in each situation; it comes into existence in actions in time-space. ‘Context’ is dynamically evidenced by the practice of creating sense or knowledge, and thus, it is situated. According to the sense-

making situation, different components of the context are dynamically brought to life and at play. The SMM focus is on the contextualizing process that occurs in a specific sense-making situation that an individual is in. Thus, it is the sense-making situation that drives which aspect of the context is active on that respective moment, rather than the opposite.

Context is incorporated in the sense-making analysis not as the ‘characteristics of the context’ in themselves, but rather as how these characteristics situationally facilitates or impede the sense-making process. Context is theorized as comprised of aspects which make sense to the sense-maker in her/his own sense-making moment, rather than as generic characteristics of the surroundings that may have no relation or connection to what a sense-maker is doing in a specific situation. The contextual components can be macro in a degree that they may not directly affect the micro-moment in which an individual is bridging gaps and interacting with inputs to help her/him bridge these gaps.

“In fact, from the sense-maker’s stance, the macro may still impact but it may do so unconsciously which is why the SMM pursues conscientizing in interviews. It has to be admitted that these are teased out in the SMM only to the extent that conscientizing works, and there are always limits. No human is fully realized.” (B. Dervin, personal communication, July, 2007).

SMM enables the manifestation of context in sense-making situations to be studied microscopically. The microscopic view of the moment of action in which individuals create meaning and use inputs enables some of the contextual factors that emerge at this specific point of time and space to be identified. The identification of which forces are brought to a situated sense-making practice is enabled by the design of interview questions, which links the informants’ narratives to their experience (history, identity). Informants are asked about the struggles, barriers, and constraints they faced in their sense-making experience, about their perceptions of power structures, culture in the organization or society, and to relate their experiences to these aspects. Informants are also asked what and how anything helped and/or hindered.

Thus, much care should be taken when claiming that contextual aspects affect the creation of knowledge. According to SMM, it may affect the sources or channels used, the time dedicated to the sense-making practice. But it is much less probable that contextual factors would largely affect the very micro and personal moment of creation of meaning in a specific time and space. For example, it is less likely that organizational culture affects the gaps/questions knowledge workers may have, the helps they may need, and how they interpret inputs in a specific sense-making moment.

(b) *Situation*

Situations are understood as the perceived conditions and characteristics of a moment in time and space when individuals face inadequacies, when they face that something is missing in the whole picture. More specifically, situation is conceptualized as the moment “when there is a missing piece in a picture of a situation and old sense run out” (Dervin, 2003a/1980, p. 44), and “as where the informant sees self as moving from - the nature of the situation, its history, its constraints, its links to lived experience, its links to contexts and power structures” (Dervin, 2008, p. 18). Situation is also defined as “the time-space contexts in which sense is constructed” (Dervin, 2003b/1984, p. 256). It is the specific moment in time and space, in which individuals face gaps of any nature.

A ‘sense-making situation’ is different from the element ‘situation’. A ‘sense-making situation’ or sense-making moment is considered as being the intersection of situation, gap/bridge, and helps. Its element ‘situation’ is the background on which the other elements (context, gaps, bridges, and helps) occur, are identified and analyzed. This means that the other elements of a sense-making moment are all situated, because they are looked as being anchored in the element ‘situation’.

Situation is not context. Context stands for the forces and power which situationally facilitates or hinders sense-making in time and space.

Situation is not a task. Situation is conceptualized as a specific *gappy-moment* in time and space. This *gappy-moment* may occur within a task, activity or project, in which individuals’ sense runs out, and they face a discontinuity, inconsistency or inadequacy of any order or nature. Hence, *situations are gappy-micro-moments that may occur within tasks*. For example, an analyst who has a market report to develop (a task) finds himself as needing to understand how products have been used in a specific market and not used in others (a *gappy-moment*), and needing to translate this understanding into a different language in order to communicate the results to Asian managers (another *gappy-moment*). Situations are not a finer granularity of a task, of a process or activity, but a *specific point in it in which gaps are faced*. Tasks can be comprised of multiple and distinct situations, but these situations are not tasks.

Situation is not necessarily a problematic-situation (Dervin et al. 2006b, p. 7). One of the limited uses that is sometimes made of the Sense-Making Methodology metaphor is to consider “all gap situations as having linearity and purpose – in essence that all gap situations involve problems to be solved, or decisions to be made. In SMM, however,

these are but two sub-sets of all the different kinds of gaps humans attempt to bridge in their life-facings” (Dervin et al. 2006b, p. 7).

(c) *Gaps*

Gaps can be understood as any discontinuity, inconsistency, inadequacy or disconnection encountered by individuals in their movements through time and space. According to Dervin (2003b/1984, p. 256), “gaps are where the individual sees something missing in his or her sense. New sense is created when the individual sees a gap as bridged”.

The gap idea is a consequence of the discontinuity assumption and it is not limited to the lack of knowledge or information or to the cognitive realm. This is only one of the varied gaps in sense that individuals may face and have to bridge. Gaps are cognitively constructed (i.e. constructed in the mind), and occasionally physical (Dervin, 2003d/1989, p. 223). However, they are not necessarily cognitively bridged and can involve other spheres beyond the cognitive, such as the affective, emotional and physical (e.g. overcome the frustration of not getting clear feedback, or not getting explanation of someone’s needs).

SMM mandates to look at the gap because it is there where action is found, it is there where inputs such as knowledge are used. When individuals are defining and bridging gaps, they are in movements, and it is in these flows that knowledge (inputs) may or may not be used.

A single gap may be seen differently by different individuals. Gaps can also be seen differently by a single individual. This is because this observance is highly dependent on the characteristics of the moment in time-space, on the conditions in which an individual face gaps, and on how s/he perceives these gaps. This is the situational nature of sense-making. “The gaps seen at a specific moment by an observer will depend on where that observer is in time-space and how he or she sees that time-space. Thus, different observers will see different gaps” (Dervin, 2003b/1984, p. 256). Likewise, if two individuals see the same gap, how they bridge the same gap differs depending on the circumstances in time and space in which they are, in which they have been, and where they are going (Dervin, 2003b/1984, p. 256).

Operationally, gaps are identified and measured with the use of the metaphor. They have been commonly articulated as questions in the Sense-Making studies. However,

some misunderstandings (cf. Dervin et al., 2006a, p. 1) in the use of the gap idea have been evidenced in three ways: (a) *gaps are not necessarily problems to be solved*, (b) *gaps are not necessarily decisions to be made*, and (c) *gaps are not information or knowledge needs*.

Gaps are not problems, and gap-bridging or sense-making is not problem-solving (Dervin et al., 2006b, p.6). Gaps are only a natural condition because they are derived from a natural and inherent discontinuous and incomplete condition of the human being and of reality. The discontinuous nature of reality and human beings is what generates gaps, the need to overcome them, and to make/unmake new sense. Problems solving and decisions makings are solely two different sets of the varied kinds of gaps individuals may face and need to bridge (Dervin et al., 2006b, p. 7). As B. Dervin (personal communication, May, 2007) explained, gaps are not considered as good or bad, they are just there.

Gaps have also been considered as the same as information needs, which also evidences a limiting use of SMM and of its metaphor. In SMM ‘needs’ are conceptualized by the intersection or co-occurrence of the elements of sense-making (situation, gaps, helps/uses, bridges) in a specific point time and space (Dervin et al., 2006b, p. 7). Gaps are only the inadequacies, the inconsistencies, disconnections or questions that individuals have to overcome or find answers in a specific sense-making moment. Therefore, gaps are part of the needs conceptualization, but they are not the need itself.

(d) *Bridges*

The gap-bridging is always performed by the sense-makers, by constructing interpretive bridges using internal or external inputs (e.g. thoughts, ideas, beliefs, memories, emotions, attitudes, and histories) (Dervin et al., 2006e, p.1). Thus, bridges are constructed by different actions (verbings), and with different inputs (the bricks of a bridge). Bridges are what is constructed by individuals to overcome gaps and make sense. Knowledge (tacit and explicit) is one of the inputs used to construct interpretive bridges, i.e. a kind of *bridge*, and knowing is a way of *bridging* a gap, a way of making sense. Dervin and Reinhard (2007a) emphasized that in Sense-Making, ‘emotion’ is also an element of what is called bridges, together with other elements such as intuitions,

thoughts and attitudes. Polanyi (1958, p. 312), and Polanyi and Prosch (1975, p. 186) also suggests that such elements are constitutive of knowledge.

(e) Helps (Uses or Outcomes)

The analysis of the sense-making element helps is a way to look at how inputs (i.e. sense, knowledge or information) are or need to be put into use. Helps are related to how individuals need to put inputs into use for their meaning creation, to help them in a specific sense-making or knowing situation (Dervin, 2003g/1992, p. 279). The element helps is related to the uses made of inputs for the gap-bridging or sense-making process.

While gaps are commonly articulated as questions, helps are conceptualized as how an individual's meaning creation is contributed or supported by the answers s/he got for these questions, or how s/he put the answers into use in relation to her/his meaning creation (Dervin, 2003g/1992, p. 279). The helps or the uses of inputs (knowledge) are studied as "how the individual applied answers to gaps, that is, how they were helped" (Dervin, 2003g/1992, p. 283). Helps are also defined as how individuals put "the newly created sense to work in guiding his or her behavior" (Dervin, 2003b/1984, p. 256). Furthermore, helps, uses or outcomes may refer to "functions and dysfunctions, as well as consequences, impacts, or effects" (Dervin & Frenette, 2003/2001, p. 238).

Varied helps can be needed and got in a single sense-making moment. According to Dervin (2003l/1981, p. 205), in SMM "there are a variety of different ways in which respondents put messages to work for them".

Operationally, helps or uses have been measured with interviewing questions that exploits "the ways in which people have believed the answers to questions or new ideas helped or hurt them" (Dervin, 2003b/1984, p. 261). Empirical examples of helps would include: get ideas, get directions, get started, get resources, and get support (Dervin et al., 2006c, p. 9).

The situation, gap/bridge, and help are the three core categories of variables that are measured in a Sense-Making study. These categories are measures of the sense-making or knowing practice (namely situational measures) in time and space. *They are not measures of the sense-maker, but of the sense-making actions.*

The core of the metaphor is encapsulated in the Sense-Making triangle, which is illustrated in Figure 8. The triangle presents the metaphor's elements as the three points of a

triangle, which are the situation, the gap/bridge, and the help (Dervin, 2003i/1999, p. 333). Equal to the meaning of the metaphor, the triangle represents “a human (individually or collectively) moving from a situation (time-space) across a gap making a bridge, and then moving onto the other side of the bridge” (Dervin, 2003i/1999, p. 333).

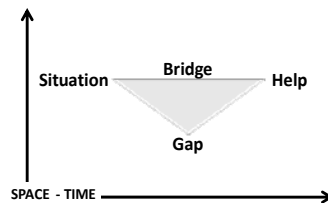


Figure 8 : The Sense-Making Triangle (Dervin, 2008, p. 18).

The Sense-Making triangle mirrors a sense-making moment. “The sense-making and sense-unmaking moment is seen as at the intersection of all parts of the triangle” (Dervin, 2008, p. 18). Each sense-making moment is defined as a “step-taking across gaps” (Dervin, 2008, p. 17). But this does not imply that gap-bridging is necessarily linear or purposive (Dervin, 2003i/1999, p. 333). In some cases individuals draw on understandings constructed, or employ definitions and actions that worked sufficiently well in previous and similar situations (Savolainen, 2006, p. 1119).

The triangle is used as a tool for the conceptualization of variables, design and implementation of in-depth interviews, and data analysis. It also works to guide the interaction in the interview, functioning as a dialogic interface between interviewer and interviewee (Dervin et al., 1999).

The Sense-Making Methodology metaphor and triangle tools (Figure 7 and Figure 8) *are not literal maps, models or recipes, but metaphorical frameworks* (Dervin, 1998, p. 39), *a way of understanding a knowing practice*. “The metaphor is not intended as a literal description of human sense-making ... the metaphor is intended as a highly abstract methodological tool, a way of looking” (Dervin, 1999, p. 740).

The Sense-Making Interviewing Methods

Fundamental to all the Sense-Making interviewing methods is that the researcher interacts with the researched in a dialogic way, carefully working as a listener. It is mandated

that the researcher listen to the informants' descriptions of their sense-making experiences, "of how he or she moved through time-space" (Dervin, 2003d/1989, p. 224). In this context, the interviewing methods were designed to achieve two main objectives: to hear informants in their own voice, and to hear them in such a way that the resulted narratives may be used for qualitative and quantitative analysis (Dervin et al., 2006b, p. 2).

The framing of the interviewing questions is based on the Sense-Making metatheoretical assumptions and metaphor. All the interviewing methods informed by SMM bracket time and space and stress one of the elements of the sense-making moment (one of the elements of the triangle, e.g. help) in different ways. Resolutions regarding this depend on the research purposes and context. The triangle and its set of Sense-Making questions (c.f. Dervin, 2008) are used as a tool to design the questions according to the time-space bracket needed in a research project.

The core method of interviewing is the 'Micro-Moment Time Line Interview'³⁷. In this method informants are asked to describe sense-making and sense-unmaking moments as they happened in the "time-line steps" of a specific situation (Dervin, 2008, p. 23). Then, the informant is requested to describe each step thoroughly. The focus of this description is guided by the Sense-Making triangle, which is applied to each time-line step, by focusing on specific points in time (Dervin, 2008, p. 23). The use of the triangle enables the sense-making micro-moment to be circled, in terms of "how the actor saw the situation, the gap, and the help he or she wanted – that is, where he/she wanted to land after crossing the bridge" (Dervin, 2003g/1992, p. 279).

The interviews have a naturalistic approach, a dialogic process, a repetitive nature of questioning, and they use the conscientizing strategy. The Sense-Making triangle and the series of questions for each of the elements of a sense-making moment are used repeatedly, because redundancy is a research premise. This redundancy varies according to how the interview design bracketed time and space.

Importantly, in implementing Sense-Making by its interviewing methods, researchers do not impose nouns or expertise-based conceptual maps on informants. Informants are assumed to be capable of identifying the nouns of their own experiences, and the connections

³⁷ The other interviewing methods are the Abbreviated Time-Line Interview, Time-Line Interview, Helps Chaining Interview, Message Q/ing, and the SMM Focus Group Interview. Details of these methods can be seen in Dervin (2008).

between these nouns in their experiences (Dervin, 2008, p. 11). The key is to enable and create space and appropriate environment for the informants' constructions and connections-making. Researchers are greatly challenged in their own nouns structures. The interviewing methods "mandates researchers to silence their own nouns and instead focus on the universals of human movement through time-space" (Dervin, 2008, p. 13). Common to all the interviewing methods are the focus on real experiences (Dervin, 2003g/1992, p. 281).

In conducting any of the Sense-Making interviewing methods, there are some essential mandates that should be considered by the researcher (Dervin et al., 2006b, pp. 2-5). These mandates include the following:

(a) Minimal intrusion by researchers' or institutionalized concepts, credentials and expertise.

(b) Allowing, enabling and facilitating for informants not being system users.

(c) Being aware that informants do not have the answers on the tips of their tongues, or very well articulated in their minds. "People need what we call intra-personal time, time to think about what they 'really' think, want, feel, experience". When appropriate time is not given to informants' articulation during the interview, what is gained as responses "reflects more the stereotypes of our society than the actualities of informant lives. The need for thinking time in all Sense-Making interviews is accomplished by what we call the 'sense-making surround' or 'dialogic surround'".

(d) Having informants talk only about situations that are real to them, that they have actually experienced. To understand users by asking what they would do if the system would provide this and that is not very effective. Thirty years of Sense-Making studies have shown that "informants can tell us what they need based on past experiences – i.e. what they struggled with, and what they hoped for while struggling but did not get".

(e) Building trust and willingness to disclose. It was found that "when people are asked to talk about real situations that are important to them on their own terms, their recollections are quite accurate in those cases where accuracy matters". More important than to ask precise questions, it is to construct approaches that guarantee informants that "whatever they say they will be heard and they will not be evaluated. One strategy is to always give informants permission to be less than perfect".

(f) Allowing informants to be different as they move from situation to situation.

(g) Permitting informants to be confused and at the same time intelligent and strategic.

(h) Allowing informants to see situations and articulate their experiences outside the boxes of our frameworks. For example, “a great many studies dealing with user use of information and communication systems assumes, often implicitly, that what people are doing with system resources is making decisions or solving problems” (Dervin et al., 2006b, pp. 2-5).

(i) Giving permission for informants to be the creators of their worlds, expressing with their own words how they constructed their observations, experiences and how they made their own connections.

(h) Being aware that precision in asking questions is less important than building trust and to consider informants as sense-makers.

(i) Using redundancy in the interviewing. This is an important way to build bridges between the informants’ experiences and the researcher’s understandings. It is necessary that informants know that their stories are being heard as they describe and explain them. To accomplish this, they need thinking time to be able to articulate their deep thoughts. The multiple applications of the Sense-Making triangle also aim to help with this.

In implementing Sense-Making studies the units of analysis are commonly smaller than a person. Multiple units can be used such as the situation, the question asked in situation, the source-using-encounter, and input-using-encounter (Dervin & Reinhard, 2006, p.11; Dervin, 2008, p. 23).

3.7 The Situationality of the Sense-Making Phenomenon

The situationality of sense-making means that the ways individuals create meaning is considered as emergent from and contingent on the gap-facing moments in time and space, on the characteristics of these moments in which the gap is faced, perceived and defined by individuals. Situationality of sense-making or knowing is the designation of the aspects of a gap-facing moment in time and space that explain the differences of how meaning is created, how the actions to create meaning and to use knowledge for it differ. Situationality was defined by Dervin and Reinhard, (2007b, p. 9) as the idea that the characteristics of situation

explain better the uses of knowledge, than the characteristics of an individual (e.g. socio-demographic characteristics). Additionally, Dervin and Frenette (2003/2001) characterized the situationality of sense-making as follows:

“Sense-Making is anchored in time-space. Each moment of sense-making is *anchored in its own time and space*, moving to another time and space. Sense-making is most usefully conceptualized as *situated communicative practices*.” (Dervin & Frenette, 2003/2001, p. 239) (Emphasis added)

Sense-making, knowing, or the creation of meaning is a situational practice because it differs according to the characteristics of the situation in which gaps are faced (the situation element in the metaphor and triangle). Dervin (2003b/1984, p. 255) explained that “Sense-Making assumes that sense-making behavior is responsive to and mandated by changing situational conditions”. The way individuals act in order to create new sense or knowledge *is responsive to the conditions in which the old sense run out, to the circumstances in which the gap was faced*. Individuals are then, “situated meaning-makers” (Dervin, 2003h/1999, p. 134) who create meaning in response to a situation. SMM is a *situationally-bound approach*. It circles and explains the individuals’ knowing or sense-making experience in time-space.

The situationality of sense-making explains how meanings are differently created across time and also across space (Dervin, 2003j/1993, p. 107), how knowledge (inputs) is differently used to create new meanings, and how the helpfulness of inputs to sense-making is needed and assessed by individuals. The definition of the gaps individuals may face in a specific sense-making situation, the ways they bridge these gaps, and the helps they need by using inputs to overcome these gaps vary according to how they perceive the characteristics of the situation in which these gaps occur.

The situational sense-making is studied by turning the attention and analysis to the conditions and characteristics of a sense-maker-acting-in-situation in time and space (sense-making, gap-bridging). In SMM, individuals’ actions to create sense are not understood by who they are or what they do in time and space as individuals. SMM explains knowing and the uses of knowledge as contingent on the characteristics of the gap-facing situation, rather than on the individuals’ characteristics (e.g. socio-demographic or life style characteristics). According to Dervin (2003a/1980, p. 39) such characteristics are cross-situational and “too far removed from the actual situations in which information use occurs”. *Individuals’ knowing actions are understood by how they face, respond to the gaps faced, and how they bridge them*. Foreman-Wernet (2003, p.7) emphasized that Sense-Making “conceptualizes

difference not according to demographics or other static categories but rather according to how people attend to phenomena differently. The focus is on how people connect: how they construct bridges and what accounts for differences in observations”.

Individuals can even face similar gaps, but their gap-bridging differs, the way they interpret inputs to bridge gaps and create meaning differs. The sense-making or knowing practice differs within and between individuals. The fact that two individuals are of the same professional class does not indicate that they need, use inputs and create meaning with these inputs in the same way. Knowing also differs within and between domains, because the fact that two different individuals needing to know about the same topic do not indicate that they will need and use inputs in the same way for their meaning creation. Further, the knowing practice differs in relation to tasks as well. Two individuals who have identical tasks (doing the same kind of strategic planning) do not indicate that they will need, use inputs, and create knowledge in the same way. Gaps and a gap-bridging may be seen as accomplished differently by a single individual at different times, by different people at different times, and between varied people at the same time, depending on how they perceive the situation they are in time and space.

In SMM, the focus of analysis is on micro-moments of sense-making. It is a microscopic looking to a specific point in time and space in which individuals act to construct meaning, when they access, interact, and use inputs for it. The more microscopically is the analysis of knowing and knowledge uses, the closer it is possible to get to the moment that these processes takes place in time and space, to the point in which gaps are overcome (Dervin et al., 1981). What follows is that narrower analytics are identified and used to explain knowing and differences in it. How these micro-moments of meaning creation differ according to the characteristics of the gap-facing situations shows how situational sense-making or knowing is.

The possibility of methodologically and systematically studying the situationality of knowing is one of SMM strengths for the present study. It was found helpful to extend the understanding of Polanyi’s process of knowing with SMM. SMM provides the conceptual framework and the research methods to empirically study how the creation of meaning is situationally accomplished. The understanding of how the situational meaning creation manifests itself in the knowing work generates directions of how the communication of knowledge can support this practice.

3.8 Knowing as a Sense-Making Phenomenon

Knowing or the act of meaning creation theorized by Polanyi can be researched as sense-making phenomena by SMM. Knowing is a kind of sense-making practice. Similar to Polanyi’s theory, SMM approaches and thematizes knowing at the level of meaning creation.

SMM and Polanyi’s tacit knowing theory support each other in the understanding of how individuals create meaning or knowledge. SMM adds considerable value for the study of knowing, by providing a situational, verbing and methodological approach to its empirical study.

SMM enables the study of knowing as a situational creation of meaning in a systematic way, generating outcomes that can be used to improve the communication of knowledge for knowing (highlighted with stars). In this sense, the results of a study of knowing as sense-making can be used to help improving the communication of needs by individuals who try to access the articulate knowledge for their knowings (the thirds act of meaning in Figure 9). In addition, the results can be used to improve the communication of knowledge as defined by Polanyi (1969) as sense-giving (Figure 9).

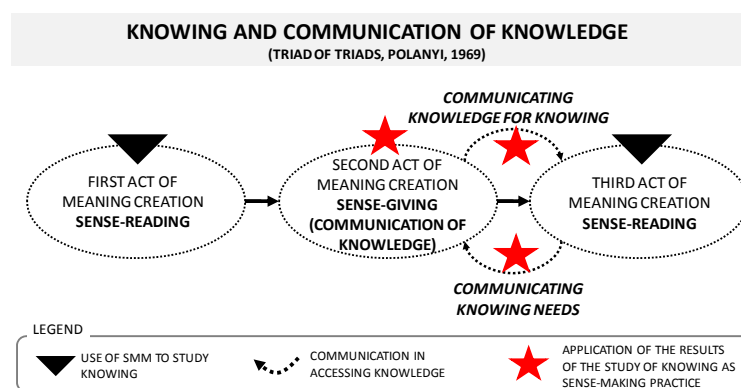


Figure 9 : The application of SMM to study Polanyi’s concept of knowing.

Polanyi’s theory and SMM emphasize actions of making sense or meaning creation. Since its beginning, SMM “conceptualized and focused on knowledge and information as a verb” (Dervin, 1998, p. 36). Thus, both perspectives are rooted in action, they have a practice-based perspective and concentrate in understanding how knowing is accomplished.

In SMM and Polanyi’s TKT, knowing and knowledge uses are constructions. Gap-bridging is an interpretive and constructive action performed by sense-makers. The

interpretive and constructive actions are related to the integration of clues explained by Polanyi. Common is also that knowing is assumed as a personal construction, a personal creation of meaning, but not an individualistic one. As stated by Dervin (2003b/1984, p. 255) the uses of knowledge to help creating new knowledge are a constructing activity, the personal creation of sense. In addition, knowers or sense-makers are wholly involved in the creation of meaning: their mind, intuition, body senses and emotions are conjointly used in the processes of internal interpretations (Polanyi, 1969, p. 183, 188; Polanyi, 1966; 1969; 1958, p. 312; Polanyi & Prosch, 1975, p. 186).

The bricks of the interpretive bridges that are constructed over gaps or the knowledge-based inputs in SMM are what Polanyi's referred to as clues or particulars for knowing. They are integrated, interpreted, combined to get the meaning they contribute to, i.e. to form interpretive bridges in a sense-making practice. In SMM and TKT these inputs to the creation of meaning may be based on the tacit and explicit dimensions of knowledge. Importantly, both theories consider the instrumentality of knowledge.

Similar to Polanyi, knowing as sense-making is a practice based on a communication model, rather than on the transmission-receiving of information resources (sender-channel-output). In both SMM and Polanyi's theory, meaning is not packaged into a message and transmitted to an individual, because meaning is constructed by the knower. The meanings endowed to articulate knowledge by a knower are different from those endowed by the writers or speakers. Therefore, inputs (knowledge) have no meaning in themselves because their meanings are constructed by the knower.

Inputs contribute to the construction of meanings (they are subsidiaries, clues) that is made by knowers (integration in Polanyi's theory and gap-bridging in SMM). The importance and active role of the sense-maker who creates meaning, rather than being a passive recipient of knowledge is a common assumption of SMM and Polanyi's theory.

The values that SMM adds to the study of Polanyi's knowing are considerable. A very significant added value is that the former makes it possible to understand and empirically study knowing. Most importantly, SMM enables knowing to be studied as a situational practice. In other words, SMM allows an understanding of how knowledge workers situationally create meaning, and how and why knowledge is needed and used for the creation of meaning. This adds substantial value to the understanding of the knowing process elaborated by Polanyi.

The SMM gap assumption substantially adds to Polanyi’s theory, because the former incorporates the premise that knowing is made in a reality and by human beings who are ever-changing, discontinuous and incomplete. Another considerable benefit of using SMM to study knowing is that it makes it possible to identify the simultaneous occurrence of patterns or habits in knowing, and the differences in it.

Figure 10 summarizes the synergy between SMM and Polanyi’s theory (left side of the diagram), and how SMM adds value to Polanyi’s TKT (right side of the diagram) in the study of knowing.

BOTH SMM AND POLANYI’S TKT CONSIDER	HOW SMM ADDS VALUE TO POLANYI’S TKT
<ul style="list-style-type: none"> •KNOWING AS MEANING CREATION •FOCUS ON PRACTICE, ACTIONS, MOVEMENTS (INTEGRATIONS) TO CREATE KNOWLEDGE / MEANINGS •PERSONAL CREATING OF SENSE; SUBJECTIVE CONSTRUCTING •INSTRUMENTALITY OF KNOWLEDGE. IT IS A MEANS TO AN END, TO NOURISH KNOWING OR MEANING CREATION •KNOWERS: MEANING IS CREATED BY THEM (THE INTEGRATION AND THE GAP-BRIDGING) RATHER THAN ‘DELIVERED’ BY INPUTS •KNOWERS WHOLLY INVOLVED IN MEANING CREATION, NOT ONLY THEIR MIND •USE OF DIVERSE INPUTS / BRICKS TO GAP-BRIDGING OR INTEGRATE CLUES •COMMUNICATION MODEL / COMMUNICATIVE APPROACH UNDERLYING THE INTERACTION WITH INPUTS 	<ul style="list-style-type: none"> •METHODOLOGICAL APPROACH TO EMPIRICALLY STUDY KNOWING (POLANYI’S KNOWING OR SENSE-READING) •ENABLES TO STUDY KNOWING SITUATIONALLY, AT THE LEVEL OF MEANING CREATION •INCORPORATES THE GAPPY REALITY AND HUMAN BEINGS, STUDIES KNOWING AS AN ACTION IN A EVER-CHANGING REALITY •GENERATES OUTCOMES THAT CAN BE USED TO IMPROVE THE COMMUNICATION OF KNOWLEDGE (POLANYI’S SENSE-GIVING) •ENABLES TO IDENTIFY PATTERNS/HABITS AND DIFFERENCES/CREATIVITY IN KNOWING •ENABLES TO STUDY THE ‘HOWS’ AND ‘WHYS’ OF THE CREATION OF MEANING AND OF THE USES OF KNOWLEDGE FOR IT

Figure 10 : The synergy between SMM and Polanyi’s theory of tacit knowing.

For the purpose of this research the workable definition of knowledge creation or knowing is the one given by SMM and Polanyi, i.e. as *situated acts of meaning creation or sense-making*. The definition of communication of knowledge involves the one given by Polanyi (1969) and Eppler (2005; 2007).

The background for the present study are the ‘triad of triads’ or the two directions of creating meaning that Polanyi’s referred to as the sense-reading or knowing, and sense-giving or the communication of knowledge. Knowing is studied to help improve the communication of knowledge (sense-giving) and the communication of needs in it (Figure 9).

In the present study, theoretical aspects regarding knowing are considered as those explained by Polanyi’s TKT and Sense-Making Methodology. The knowing process elaborated by Polanyi’s theory is approached and empirically studied as situational sense-making, by using the theoretical assumptions and research methods of Sense-Making Methodology (highlighted with triangles in Figure 9). Both theories constitute a consistent practice-based perspective for the understanding of knowing, compounding a useful starting-

point for studying knowing and the uses of knowledge. Knowing as a work practice was studied as a sense-making phenomenon and the results were applied to address the main research issue, which essentially concerns the communication of knowledge. Empirically, SMM guided the data collection, variables conceptualization and data analysis. The qualitative analysis of the data was also informed by Polanyi's tacit knowing theory.


3.9 Summarizing

The current chapter characterized SMM main theoretical assumptions of Sense-Making Methodology. Attention was mainly devoted to the core theoretical aspects that show how the methodology is centered on situational practices of making sense as gap-bridging in time and space. This was accomplished by drawing on the most recent literature of SMM for the purposes of the current research. The chapter attempted to evidence the value added by SMM to the understanding of knowing as a situational meaning creation practice.

The essential contributions of SMM to study knowing work practices in the present study can be summarized as follows. First, SMM enables knowing as a situational meaning creation practice to be studied. Secondly, it enables this to be accomplished methodologically and systematically, generating outcomes that can be used to improve the communication of knowledge and its needs in knowing. Thirdly, a significant feature of SMM that allows the present study to accomplish its objectives is its simultaneous study of individuals' actions in knowing situations, and of knowledge uses in these situated knowing actions, i.e. knowledge in knowing. Fourthly, SMM research methods enable the understanding of deep aspects of individuals' situated knowing experiences in their own terms. Further, this is enabled by its interpretive perspective. All in all, SMM is appropriate for the study of knowing as situational creation of meaning, enabling the deep understanding of how this phenomenon unfolds in knowing work practices.

PART IV – RESEARCH DESIGN

CHAPTER 4: EMPIRICAL RESEARCH DESIGN



A journey of a thousand miles
begins with one step.

Confucius

4.1 Introducing

The present chapter presents how the study of knowing work was designed in order to reach its purposes. It explains how data were collected and analyzed as informed by Sense-Making Methodology. This chapter also specifies the sampling procedure and reviews how the validity and reliability of the study were ensured.

The core phenomenon under investigation is how knowledge workers situationally create meaning or knowledge as a sense-making practice, within knowing work in for-profit business organizations. To accomplish this, Polanyi's tacit knowing theory, and Sense-Making Methodology informed this study theoretically. In addition, SMM was used to develop variables, and collect and analyze empirical data. In the data collection, a specific Sense-Making in-depth interviewing method was employed.

Because this particular use of SMM was made in a micro-level context (knowing work in for-profit business organizations), and the objective was to deeply understand it with a more qualitative approach, the pre-defined categories for situations, gaps, helps and bridges of previous Sense-Making studies were not used. On the highest abstraction level of analysis, Sense-Making theoretical assumptions guided the conceptualization of variables. However, on the lowest level of abstraction, the categories of situation-gap/bridge-help were derived inductively from informants' narratives.

In the context of the present study, knowing as a practice was the entrance to understand how and why knowledge (inputs) is needed, mobilized, and used for the creation of meaning or new knowledge. Knowledge was simultaneously studied as the product of knowing, and as the inputs used to nourish knowing. In both perspectives, knowledge was understood attached to its practices of creation and use.

The units of analysis were the informant-in-situation (i.e. the informant in a knowledge creation situation), and the input-encountering moment (when an informant with a situated question use an input) in sense-making situations. There were 36 informants-in-situation and 100 input-encountering moments experienced by these informants-in-situation, resulting on an average of 2.8 input-encountering movements per informant-in-situation.

The empirical study has a cross-sectional design, because it collected data at one point in time (De Vaus, 2001). Additionally, this study was field-independent because it did not depend on the physical settings of knowledge workers (Baxter & Babbie, 2004). Thus, the

focus was on their intellectual interaction with knowledge-based inputs in the knowledge creation work.

The empirical questions of the present study were detailed in Chapter 1. Essentially, the findings of the empirical study provided the understanding of the characteristics and dynamics of knowing work practice, how this knowing work occurs situationally, how the creation of meaning can be structurally identified and communicated, and how the main knowing situations are shaped (the patterns of meaning creation), i.e. their configuration. The constitutive elements and the patterns of each knowing situation were identified. These elements and patterns were used to propose a communication of knowing needs and of knowledge for knowing in consonance with situational meaning creation.

In the remaining sections of this chapter, ‘sense-making situations’ are referred to as ‘knowing situations’ and all the variables are written with capital letters.

4.2 Sampling Procedures

The aim of the present study is not to generalize by making statistical inferences about a specific group, population or individuals (i.e. knowledge workers), but to make a *generalization about a practice* (knowing work) and its nature. The present research generates inferences to practices, and as such, its results can be applied to similar practices, i.e. knowing work practices in for-profit business organizations. This means that the study focused on the knowing practice and experience, rather than on individuals.

The generalization about a practice or the nature of it (a process inference) was explained by Lincoln and Guba (1985, p. 77), Hayes (2005), and Gobo (2006, p. 421). The aim of the sampling was to achieve representativeness of the practice under study, and as a consequence, sampling requirements and the sample representativeness are different. As explained by Hayes (2005, p. 41):

“If the intent of the researcher is not to make a population inference (such as females are 2.3 units more shy than males on average), then the question of whether the sample is random or not becomes moot. If the intent of the researcher is not to make a population inference but instead a process inference, then the origin of the sample should loom less large in our evaluation of that research.” (Hayes, 2005, p. 41)

The appropriateness of the sampling logic and of the sample structure used in the present study is related to the aim of making inferences and generalizing aspects of the knowing practice in the knowledge creation work context, rather than of making generalizations related to the population (knowledge workers).

According to Hayes (2005, p. 43), if the goal is to make inferences about a process rather than the size of an effect on a population, then “process inference does not require random sampling process”. The sample should be representative of the process or practice under investigation, rather than of the population of individuals who perform this practice. Thus, the sample of the present study represents the knowledge creation work practice, within the for-profit business context.

Additionally, according to Gobo (2006, p. 414), if the focus of the research (the unit of analysis) is on practices, the representativeness of a sample is got by considering the variance of the specific practices within its population of practices, instead of the variance of organizations or of the individuals who perform the practices. Thus, “the reference is not the variance of call centre but the variance of ‘customer relationship management’ practices within the call centres” (Gobo, 2006, p. 414).

Therefore, the sampling method used in the present study was a nonprobability sampling, which was defined by Hayes (2005, p. 36) as the one “of recruiting or obtaining units for analysis in which inclusion in the sample is not determined by a random process”.

Within nonprobability sampling strategies, the purposive sampling was employed. According to Gobo (2006, p. 415), purposive sample is related to identifying cases within certain characteristics. This strategy was chosen because the selection of participants needed to be formed based on specific criteria that characterize it in a predefined group.

The primary purpose of the purposive sampling was to identify knowledge workers whose *primary and main* work activity was *creating knowledge* for internal and external customers. More specifically, the participants should be professionals who think for a living (e.g. market analysts) and who create knowledge to be used in grounding business strategies, actions, innovations, or changes.

4.2.1 Study Informants

The target population was composed by the so called knowledge workers³⁸ who were active in the knowledge-intensive sectors in England (UK). Regarding the work experience, the participants should have at the time of the interview at least more than one year's work experience of the knowing work they were involved in.

The population should include knowledge workers who were involved in complex knowledge creation or knowing work. They should be responsible for creating complex knowledge, which demands a high level of analysis and interpretation. The focus was on knowledge workers who were primarily involved with the creation of business-related knowledge for internal and external customers. According to Davenport (2005, p. 28), the knowledge creation work involve those whose focus is on creating new knowledge, such as researchers, consultants, analysts, creative people, and authors.

In addition, for the sampling, the knowledge workers should be working in for-profit organizations in the knowledge-intensive sector. This sector is comprised of 'knowledge intensive services' and 'high-technology knowledge intensive services'. The 'knowledge intensive services' were defined by the Eurostat (Laafia, 2002) as being those in the telecommunications, education, health, recreational, cultural and sporting activities (Laafia, 2002). The 'high-technology knowledge intensive services' were defined as being comprised of the computer and related activities, and research and development.

The exclusion and inclusion criteria for sampling were primarily based on the following: (a) the nature of the work activities, which should be exclusively the creation of complex knowledge (not focused on, for example, organization, distribution, codification), (b) the amount of time dedicated to knowing work, which should very high, reflecting that this was their main work duty, and (c) the industry and kind of organization in which these knowing work activities were developed, which should be in for-profit business organizations, within knowledge intensive sectors in England (UK).

It is supposed that these purposive selection criteria produce a sample of practices, variance of which covers the main characteristics of these practices. It is difficult, however,

³⁸ Knowledge workers and knowledge work were defined in the Literature Review, Chapter 2, on page 98-173.

to assess the representativeness of the sample with regard to knowing work practices within for-profit business organizations.

4.2.2 The Sampling Frame

The target groups were obtained by the following procedures:

(a) Identification of potential organizations with more than 100 employees in the knowledge-intensive sectors, which could attend the population characteristics requirements.

(b) Identification of potential business events and publications in the target sectors, that included the kind of professionals needed for the present study (e.g. career center workshops with consultancy firms and business meetings organized by the university).

(c) Identification of potential participants by direct contact in organizations and business events and meetings. This was accomplished by sending emails to identify professionals as a first contact, and by contacting participants of events in person, with explanatory material and a personal approach. In the events, the researcher contacted potential participants, explained the research, gave explanatory material, and engaged them. It was checked if potential participants actually fit the sampling criteria and their willingness to participate. If they did not fit, they were asked to indicate potential participants.

The procedures to contact each potential participant included the following instruments:

(i) An initial invitation email was sent to the already identified or indicated as potential participants. In this invitation the following was explained: the research proposal, the requirements to participate, how the individual could participate and contribute, and the counter offer made by the researcher, which was an executive summary of the results at the end of the research (2009).

(ii) If the potential participant confirmed attending the requirements and agreed to participate in the interview, the negotiation of a convenient date and time began.

(d) Getting of the formal agreement on participating and setting of the date and time for the interview.

(i) The interview dates and times were agreed by the researcher and the participant by email.

(ii) The interview was always conducted in the participant's work place, in isolated and reserved rooms, where there would be only the researcher and the participant. These arrangements were always previously agreed and arranged.

(iii) After the interview, the participants received an email thanking them for their collaboration and contributions. This email stressed that the channel of communication with the researcher was totally open (the mobile number and email were given again to the informants), in case they have doubts or remember something related to their interviews.

(e) Informants who have already been interviewed were contacted and asked for indications of new potential participants.

4.2.3 The Sample

Following the strategies and criteria explained previously, a sample of 36 informants was obtained among knowledge workers in England (UK). The sampling aimed at obtaining a sample that would be representative of the practice of knowing work, rather than of the population of knowledge workers or knowledge intensive organizations.

For all informants, the primary focus of their jobs at the time of interviewing was the creation of business-related knowledge for internal and external customer actions, such as the creation of analyses, plans and strategies. The customers' actions included whatever outcomes customers needed and demanded, e.g. launching a new product, assessing a new market, sizing up competitors, evaluating competitors, investing in technologies in alternative ways. Informants included business analysts, management consultants, market and competitive intelligence analysts and consultants.

The 36 informants reported 36 knowledge creation situations, which were the base for the composition of the sample. Some of the characteristics of the *36 knowledge creation situations* reported by the participants included the following:

(a) 58.3% of the knowledge created was for internal customers, and 41.7% was for external customers.

(b) The objectives of the knowledge creation situations reported by the informants were distributed as follows (each unit of analysis was coded to only one kind of objective):

- 22.2% of the knowledge creation situations aimed to generate knowledge to ground decisions, investments, launchings, acquisitions, improvements, strategies and actions related to products, services, and technologies.

- 22.2% of the knowledge creation situations aimed to generate knowledge to guide business strategies and design (joint venture, policies design, modernization of practices, business plans, km, and investments/privatization).

- 19.4% of the knowledge creation situations aimed to generate knowledge to ground and enable customers to run their processes or more operational activities.

- 13.9 % of the knowledge creation situations aimed to generate knowledge to ground and to guide strategies, investments, changes, decisions and actions related to markets (e.g. invest in new markets, enter in new markets, and eliminate markets that are currently served)

- 13.9% of the knowledge creation situations aimed to generate knowledge to evidence results, changes in the organization and in the performance of the business as a whole.

- 8.3% of the knowledge creation situations aimed to generate knowledge was to ground strategies related to the sales processes.

Some key *characteristics of the knowledge workers* are given below with the only purpose to create an overall picture (each unit of analysis was coded to only one characteristic). Their characteristics were not used in the data analysis, because the unit of analysis of the present research is not the knowledge worker, but the knowledge-worker-acting-in-situation.

(a) 38.9% were in job occupations or functions such as market, business, and competitive intelligence analysts, 33.3% were consultants (mainly management

consultants), 16.7% were researchers in business or corporate context, and 11.1% were involved in business planning and management.

(b) 55.6% of the knowledge workers were males, and 44.4% females.

(c) They had worked an average of 6.6 years in the activity at the time they were interviewed (in 2007).

(d) They were on average 40.4 years old.

(e) 38.9% of the knowledge workers had higher education degree, 36.1% had post-graduation diplomas, and 25% had doctoral degree.

(f) The knowledge domain or the field that they have been working in during the last 5 years (in 2007) was distributed as shown in Table 1.

KNOWLEDGE DOMAIN OF WORK (n=36)							
MANAGEMENT AND KNOWLEDGE MANAGEMENT	INTELLIGENCE (MARKET, COMPETITIVE, BUSINESS)	INFORMATION TECHNOLOGY	EDUCATION, FINANCIAL AND OTHERS	ENGINEERING, ENERGY	PUBLISHING	PHARMACEUTICALS, HEALTH	TOTAL
25.0%	19.4%	16.7%	11.1%	11.1%	8.3%	8.3%	100.0%

Table 1 : The knowledge domain that informants have worked during the last five years (base year: 2007) (n=36)

(g) The distribution of the informants' academic majors is those presented in Table 2.

ACADEMIC MAJORS (n=36)						
ENGINEERING, COMPUTER SCIENCE	OTHERS (ECONOMICS, PHYSICS, LITERATURE, HISTORY)	BUSINESS, MARKETING	BIOMEDICINE, BIOCHEMISTRY, BIOLOGY	PSYCHOLOGY, SOCIAL PSYCHOLOGY, SOCIAL SCIENCE	INFORMATION TECHNOLOGY	TOTAL
27.8%	22.2%	19.4%	16.7%	11.1%	2.8%	100.0%

Table 2 : The informants' academic majors (n=36).

4.3 Data Collection

The data collection method was an in-depth interview developed in Sense-Making Methodology. The following sections describe the interview design and the performance.

4.3.1 Designing and Performing the Interview

The approach to interviewing was one of the most complexes of Sense-Making Methodology. Most often described as a ‘micro-moment, micro-element’ interviewing approach it is one of the interviewing forms intended especially for complex, highly involving sense-making situations.

The researcher as interviewer was trained in the articulation styles required by Sense-Making. These included: achieving an interested but neutral detachment, never inserting nouns that had not been put on the interviewing plate by informants, allowing informants time to think deeply and articulate their experiences, and adapting questioning to the experiences and styles of informants in each interviewing segment. Intent was to cover the interview protocol as flexibly as possible. The questions used in the interviews invited informants to describe essences of their sense-making practices, and the connections that the flexible questioning allowed. Informants did not distract to non-essentials yet at the same time it was informants and not the interviewer who controlled the interviewing content.

In line with the mandates of Sense-Making Methodology, interviewing addressed a series of smaller units of analysis. The interview started with identifying a potential knowledge creation situation in informants’ knowing work experiences. This situation-entry should have the following characteristics:

(a) Informants were asked to describe a situation of knowledge creation in their work activities in which they used inputs to create knowledge and, as a result of the knowledge creation, they generated a knowledge-based product (e.g. a report containing the analysis, a plan). In this situation, the knowledge created by her/him should be in conformity with the following requirements:

(i) The knowledge should have been created for an internal or an external customer (in relation to knowledge workers’ organization).

(ii) The knowledge created should have been adopted or used by the customer.

(iii) The knowledge worker should have learned something in the creation practice.

(iv) The knowledge created should have added value to the knowledge worker’s organization as a whole.

The above characteristics for the situation-entry implied that all the knowledge creation situations described by the 36 informants were then, situations in knowledge creation practices that constituted their work activities in a business context.

The situation was then explored by the questions of the interview protocol (Appendix V). The interview itself followed in the following steps that involved identifying and describing even smaller units of attention, as explained below.

(a) *One important knowledge creation work situation.* Informants were asked to select a knowing work situation in which they created knowledge for an internal or external customer, and according to specific characteristics that are explained further. They were asked to describe what happened, what the situations involved, and how they saw their journeys through these situations as stopped or blocked. The unit of analysis was informant-in-situation.

(b) *The critical understandings in the selected situation.* Informants were asked to describe the core understandings they needed to construct in the situation selected by them. They could describe more than one understanding.

(c) *The critical questions needing answers for each critical understanding.* Informants were asked to describe for each critical understanding, the most critical and demanding questions (how gaps were articulated) they needed to answer when they were trying to construct each of the understandings. They were also asked how critical each question was to getting to that understanding.

(d) *The inputs used to try to answer each question.* Informants were asked to describe what inputs they used to try to answer each critical question. The helpfulness of the uses of each input was explored and evaluated. The unit of analysis was input-encountering moments.

At the end of the interview, it was identified informants' socio-demographic measures, such as their levels of education and expertise (see Appendix VI).

The units of analyses used for the present research were the informant-in-situation (item 'a' above) and the input-encountering moments (item 'd' above). The Sense-Making studies have used a wide variety of units of analysis smaller than the person and the person-in-situation.

In Sense-Making Methodology the structure of the data collection has always been designed to allow systematic analyses, qualitative and quantitative. The intent was to allow informants to describe the “hidden depths” (Dervin, 2003h/1999, p. 158) of their knowing practices as sense-making practices. In the present study this was the primary aim. The aim of the research was to investigate deeply the gaps knowledge workers saw and how they acted to bridge them, i.e. how they situationally create sense, meaning or knowledge. These methodological lenses were designed to microscopically focus on informants’ gaps in specific situations without losing the aspects of the whole.

4.3.2 Conducting the Interview

The same interviewing protocol was applied in all interviews, adapting the sequence of queries to the specific contexts, experiences, and to each informant’s articulation style at a particular interviewing moment. As mandated by SMM, all interviewing questions referred back to specific situations, although in different breadths of time-space. Similarly, in the present study the interviewing questions referred back to knowing work situations that had specific characteristics, which are explained later.

Despite the fact that the aim of studying knowing work is to inform how communication of knowledge and its needs can occur in consonance with situational meaning creation, the interviewer questions never focused on the existence or use of ‘information’, ‘knowledge’, ‘technologies’ or ‘information systems’ of any particular kind unless these were introduced by informants. Informants were invited to explain which inputs they used; these inputs could be anything (e.g. insights, experiences, texts, database systems). Even when informants asked the researcher “Inputs...like information?” the answer was always “Any kind of inputs”. This was done purposively because Sense-Making studies have found that focusing user research on “information” constrains users to describing “information” as it is currently organized by researchers, systems, institutions, and domains.

All interviews were focused on knowing work experiences as perceived by informants. These *experiences were explored situationally*. Within knowing situations, informants were invited to talk about what the situation involved, what helped and what they struggled with. By focusing both on failures and successes - another mandate of SMM - the result was comfortable interactions in which informants felt able to display themselves at

different moments in their knowing experience as intelligently and strategic, or constrained and struggling, or even confused.

Because the goal was to elicit quality interviews, 16 different pre-tests were executed. In addition, the researcher worked directly with Professor Brenda Dervin for the design of the interview protocol to be used by the present study.

All the interviews were conducted in 2007-2008. In interviewing informants, an average individual in-depth interview took 1.5 hours, with a range from 1.2 to 2.5 hours. All the final interviews were conducted by the present researcher in rooms reserved at each informant's workplace. All interviews were recorded with informants' permission.

An important aspect of the interviewing approach is Sense-Making's emphasis on bringing to one's consciousness and thus to articulation of understandings that were unarticulated, embodied, and/or unconscious. In the interviews for the present study, the effects of this emphasis were evidenced by long time periods taken by informants to answer the questions as they reflected. This occurred mainly in those questions that explored deeper aspects of their knowing experiences (e.g. questions 2, 3 and 10 to 15, cf. Appendix V). Informants clearly exhibited that they did not have well-structured answers on the tip of their tongues. In addition, they voluntarily moved from possibly shallow and stereotyped thoughts and ready-made answers and dove deeply into their interpretive selves in what were genuine attempts to articulate their own experiences. One event illustrating this conclusion was an informant who was asked about constraints and barriers in a specific situation, and then said that the barriers were related to the "group...working on it...I could describe vaguely some ideas to X or...anybody else in the group, but they didn't really know what I was looking for... So...the constraints and barriers were...I had to do all the search myself.... was I looking in the right directions?" (Informant # 12). This deep digging was also evidenced by comments about the interview that were made by the informants after it. For example: "Your method of relating the question to different... [situations]...makes you think about...it did help me" (Informant # 23).

4.4 Data Analysis

The data analysis process reported in the following sections focused on the informants' narratives in relation to the Sense-Making Methodology metaphor (Figure 7, on

page 134). In the coding process, the intracoder reliability used (Krippendorff, 1980) was presented as an average that was calculated between the rounds of coding (e.g. second against first, third against second round).

The content of all the categories of each variable are presented in the 'Findings Chapter' (Chapter V).

4.4.1 Unit of Analysis

Commonly, studies based on Sense-Making Methodology have more than one unit of analysis, and particularly, the units of analysis are smaller than the person (Dervin, 2008). These units are not the informant, but informants-acting-in-situation. The focus is then, on the moments of action, which is a core approach of practice-based studies.

In the present study, the units of analysis were the following two:

(a) *The informants-in-situation (n=36)*. This unit of analysis is related to the 36 knowledge creation situations that the 36 informants experienced (Figure 11).

(b) *The input-encountering moments*. The input-encountering moment is the moment when an informant-in-situation used a specific input (the 'best' inputs) to help her/him answering a single critical question (how gaps were articulated). There were 100 input-encountering moments in the 36 informants-in-situation, generating an average of 2.8 input-encountering moments per informant-in-situation. These are the micro-moments that occurred within each of the 36 informants-in-situations, and thus, *these units are smaller than the informants-in-situation* (Figure 11). In these 100 input-encountering moments, there were 100 critical questions and 100 'best' inputs respectively used.

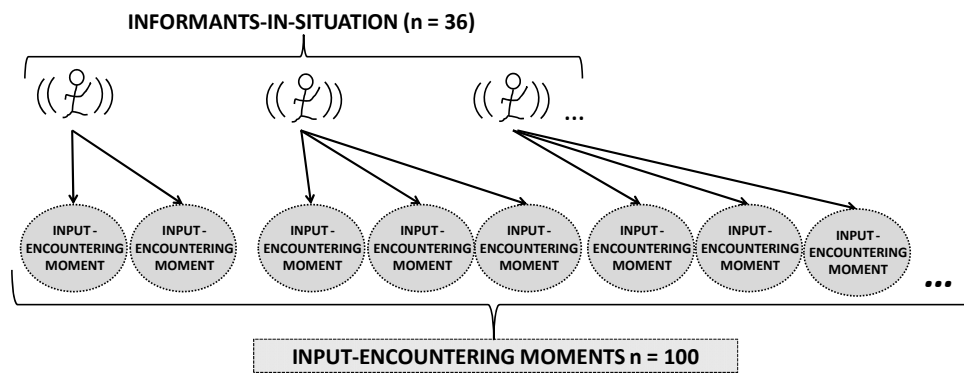


Figure 11 : The units of analysis used in this study: the informants-in-situation (n=36), and the input-encountering moments (n=100).

4.4.2 Qualitative and Quantitative Analysis

Coding and the variable categories were guided by Sense-Making Methodology and its analytics, the Sense-Making Methodology metaphor. On the highest abstraction level of the sense-making practice, the codification was made deductively, guided by the macro categories of situation-gap-help. On the lowest abstraction level of the situation-gaps-uses categories, the codification was made inductively, entirely guided by the informants' sense-making situations (i.e. the existent categories of situations, gaps and helps in Sense-Making Methodology literature were not used).

The coding consistency was assessed by performing different coding processes in different times by the same coder (i.e. the researcher). The consistency was measured by the intracoder reliability explained as the stability type by Krippendorff (1980, pp. 130-131, 2004, p. 216). Stability is “the degree to which a process is invariant or unchanging over time”. Intracoder consistency figures were given when introducing the variables of the study.

The quantitative analysis was mainly performed using descriptive statistics to evidence the configuration of each knowing situation. This was accomplished by the distribution of variables across the units of analysis, and by the analysis of co-occurrences between the main variables.

4.5 Variables

The sense-making situational variables describe the knowing practice as a sense-making phenomenon. They are related to a sense-making situation in time and space, which is mainly comprised of: situation, gaps, bridges and helps. These variables have been also referred to as ‘situational variables’ because they refer to the measures of the components of a sense-making situation. Situational variables were defined as follows:

“Situation measures, assumed to describe sense-making activities of users in specific life situations involving the phenomenon, typically assessed with such measure as how users saw their movement blocked, and the nature of questions asked and ways users saw themselves as helped.” (Dervin & Shields, 1999, p. 407)

The 43 measures used to describe the knowledge workers’ knowing practice are shown in Table 3. All the 43 analytic measures were qualitative. They were derived by the content analysis approach. These variables are introduced and explained in the next sections. Their categories are presented in the next Chapter (Chapter 5).

VARIABLES	BRIEF DEFINITION OF VARIABLES	# OF MEASURES
SITUATION: HOW SENSE-MAKERS PERCEIVED THEIR KNOWLEDGE CREATION SITUATIONS		
DESCRIPTIVE FOCUS OF SITUATION	The main focus of the knowledge creation practice, in the knowledge creation situation experienced by informants	5
GAPS (ARTIULATED AS CRITICAL QUESTIONS): CRITICAL QUESTIONS SENSE-MAKERS ASKED IN THEIR KNOWLEDGE CREATION SITUATIONS		
CRITICAL QUESTIONS ENTITY	Human or non-human entities that informants-in-situation focused on in their critical questions	7
CRITICAL QUESTIONS ATTRIBUTE	Attributes of entities that informants-in-situation focused on in their critical questions	11
CRITICAL QUESTIONS INTERROGATOR	The interrogators (what, how, why, who, when, where) that informants-in-situation focused on in their critical questions	6
HELPS: THE HELPS THAT SENSE-MAKERS NEEDED, WANTED, MAY HAVE GOT OR NOT BY USING INPUTS IN THEIR KNOWLEDGE CREATION SITUATIONS		
HELPS	How informants were, or needed to be helped in their knowledge creation situations	8
BRIDGES: THE INPUTS SENSE-MAKERS USED TO HELP THEM ANSWER THEIR QUESTIONS IN THEIR KNOWLEDGE CREATION SITUATIONS		
INPUTS COMMUNICATORS	The human and non-human entities that communicated the inputs that informants-in-situation used to help them get answers to their critical questions	2
VERBINGS: THE MOVEMENTS OR ACTIONS THAT SENSE-MAKERS MADE TO CREATE KNOWLEDGE		
VERBINGS	The internal and external movements or actions informants-in-situation made to get answers to their critical questions, to get the helps they needed and to create knowledge	4
TOTALS COUNTS		43

Table 3 : The definitions of the variable groups used to describe knowing practice as a sense-making phenomenon.

By mapping the variables used in this study on the Sense-Making triangle (Figure 12) it is possible to have an overview about how the knowing practice was studied as sense-making phenomena and how this study approached it.

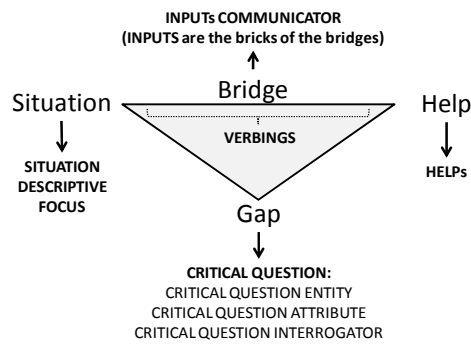


Figure 12 : The specification of variables (in capital font) in relation to the Sense-Making Methodology metaphor.

In explaining variables and analysis procedures, the following aspects will be specified: (a) how the variable is used in Sense-Making Methodology studies and how it was used in this study, and (b) the aspects measured, and the analysis approach and procedures.

4.5.1 Situations

4.5.1.1 Situations in Sense-Making Methodology and in this study

Situations are the moments in time and space in which individuals face inconsistencies, incongruencies, or gaps of any nature (cf. Figure 7 on page 134). Situations are the moments when individuals perceive that something is ‘missing in the picture’, when they feel that the current sense runs out and that it is not applicable to the new circumstances that they willingly or unwillingly face. In relation to the Sense-Making Methodology metaphor, situations are located on the left of its representation (cf. Figure 7, on page 134).

The situations described by informants were those that had occurred in knowing work in business environments, when they created knowledge to attend an internal or external customer’s needs. Thus, the situations described by informants were naturally related to situations in which they were creating business-related knowledge.

The specific kind of ‘business-related knowledge creation’ situations was the entry point to elicit the informants’ specific knowledge creation situations. The situation described by each of them was the context for subsequently understanding the gaps they faced (articulated as critical questions) and the helps they needed when they were creating knowledge. When knowledge workers were asked about the critical questions they had, the inputs they used, and the helps they needed, the informants’ respective answers and their

analysis were always done in the context of the knowledge creation situation reported by them, i.e. in the context of the situated knowledge creation experiences informants had. Therefore, the knowledge creation situations described by informants were the background on which the knowing practice was investigated and analyzed situationally.

4.5.1.2 Aspects measured

Tapping the qualitative nature of situations the following dimension was analyzed:

(a) Situation Descriptive Focus (SDF) – in the Sense-Making studies the SITUATION DESCRIPTIVE FOCUS (SDF) was defined as the time-space contexts in which meaning is constructed (Dervin, 2003b/1984, p. 256). Dervin et al. (2006d, p. 3) also defined it as “the nature of the material conditions or circumstances informants saw themselves as facing - in essence what kind of real world situation they were dealing with”.

In the present study, SDF has the same meaning as above, but the present study focused on situations on a more micro level because it was concerned with very specific work situations: knowledge creation work situations, in which individuals create business-related knowledge as a work practice. In this case, knowledge workers deal with situations in which they need to create knowledge with a focus on a specific business aspect, e.g. competitor B, market X, process D. Thus, at the micro level of situations characterized in the present study, the SDF is related to the focus of the creation of knowledge, to the meanings that informants were essentially and primarily focused on creating, or to the kind of knowledge creation situation they were dealing with.

4.5.1.3 Analysis Approach and Procedures

The analysis approach to SDF was based on the unit of analysis informants-in-situation (n=36). Each informant-in-situation was coded into one SDF category only.

The entry to elicit the variable SDF was the descriptions of informants' particular experiences in creating business-related knowledge. The focus of the creation of knowledge (SDF) was identified by means of content analysis. The descriptions of these knowledge

creation experiences were elicited by a specific situation-entry that was used to aid informants identifying and focusing on one of their experiences.

The analysis of the informants' descriptions to identify the SDF of their knowledge creation situations aimed to answer which knowledge the knowledge workers were fundamentally focused on creating.

In order to answer this, content analysis was used to scrutinize informants' narratives and descriptions of their knowledge creation situations. The descriptions were given to the question number (1) of the interview protocol (Appendix V). The descriptions were mainly comprised of what the knowledge creation was focused on. The analysis to identify the SDF emphasized the understanding of what the practice of creating knowledge was focused on.

Each description was carefully read and analyzed in order to answer 'What is the knowledge creation practice focused on? What knowledge is s/he fundamentally trying to create? What kind of knowledge creation situation are they dealing with?' The SDF was determined inductively by drawing on the most emphasized focus of the knowledge creation situations described by informants.

The coding of SDF was based on the identification of the conceptual similarity of the focus of the informants' knowledge creation practices. Each unit of analysis (the informant-in-situation) was coded into one SDF category only. Each measure assessed whether the knowledge workers' situations had a specific focus or not.

The coding process involved 10 distinct rounds of analysis and collapsing processes by the researcher in different points in time. The average intra-judge reliability of this variable was on average 96%.

SDF guided the elicitation and analysis of the gaps – critical questions – that knowledge workers faced, how they used inputs to overcome these gaps, the helps they needed by using inputs, and the movements for their gap-bridging (verbings). SDF provided the perspective from which the entire knowing practice was described by informants and analyzed by the researcher.

Descriptive statistics were used to show the distribution of the 5 final categories of SDF across all the units of analysis.

4.5.2 Gaps (Critical Questions)

4.5.2.1 The Variable Gaps in Sense-Making Methodology and in this Study

Gaps are defined as the inconsistencies or incongruencies that sense-makers face in situations. How gaps are depicted in the Sense-Making Methodology metaphor representation is shown in Figure 7 (on page 134).

For the purpose of the present research, gaps were articulated as the critical questions that knowledge workers had in specific knowledge creation situations. The articulation of gaps as questions-answers has been a common procedure in Sense-Making studies (Dervin et al., 2006a, p. 1). The present study was designed to identify and articulate gaps as the most critical questions knowledge workers had when they were trying to understand something during their situated knowledge creation.

4.5.2.2 Aspects measured and analysis approach

The analysis of the critical questions was based on the unit of analysis input-encountering moments (n=100). Each unit of analysis was coded into one category only. Accordingly, analyzing the qualitative nature of critical questions the following dimensions were analyzed:

(a) CRITICAL QUESTION ENTITY (CQENT) – this dimension assesses who or what knowledge workers were questioning about or the nature of the entities that were the focus of their critical questions (Dervin et.al, 2006a, p.3). These entities may be human or non-human, such as objects, conditions, events, processes, and situations. Examples include customers, technologies, organization A, service B, manufacturing process, disputes/crisis.

(b) CRITICAL QUESTION ATTRIBUTE (CQATTRIB) – this dimension assesses which aspects, states or characteristics of the entities that were the focus of knowledge workers' critical questions (Dervin et.al, 2006a, p.3). This dimension is focused on what it was about an entity or what characteristics of an entity that the knowledge worker needed to know. E.g.: needs, operation, problems, drivers and causes.

(c) CRITICAL QUESTION INTERROGATORS (CQINT) – this dimension assesses the nature of questioning regarding the interrogators informants were mostly focused in their questionings, e.g. who, what, when, where, why, how (Dervin et.al, 2006a, p.3).

To identify the critical questions knowledge workers had, they were firstly asked about the core understandings that they needed to construct in their knowing situations. The core understandings were used as the entry-point to ease the questioning and the articulation of their critical questions, composing the background in which these critical questions occurred.

Subsequently to the explanation of the core understandings knowledge workers were asked to describe the most critical and demanding questions they needed to answer when they were trying to construct each of the understandings, in the given knowing situations. After this description they were also asked about how critical each question was (the criticality level) for the creation of knowledge.

The procedures applied to identify the critical questions and its qualitative dimensions were the following:

(a) Reading and analyzing the meaning of each ‘core understanding’ and its respective ‘critical question’ in each of the 100 input-encountering moments. Then, they were re-analyzed in the context of the whole knowing situation.

(b) Checking³⁹ if each of the ‘core understandings’ mentioned by informants had a meaningful impact, if they extended or narrowed somehow the meaning of their respective critical questions, i.e. if a core understanding somehow modified the meaning or the focus of a critical question. If so, a checking of the degree of the influence or of the effect was also performed.

The analysis showed that the ‘core understandings’ did not modify, extend or narrow the meaning of the ‘critical questions’ in any of the input-encountering moments (n=100). None of the core understanding was strongly and deeply influential or had

³⁹ To check here means to iteratively read, analyze, return to interviews transcriptions, return to previous analysis made, re-read and see if there was any inconsistency.

affected the meaning of its respective critical questions. The analysis showed that in all the input-encountering moments (n=100), the ‘core understanding’ fully played its role, which was the role of just being the entrance, or to generate the background for a critical question to be articulated by informants. All the critical questions had embedded in themselves the broader context that the ‘core understandings’ brought to the informants’ questionings.

After knowledge workers described their critical questions in situation, these questions were assessed by them on their criticality level in relation to the creation of knowledge. This criticality level had the purpose to reveal how critical it was to have specific critical questions answered in specific knowing situations. This was made with a 10-point scale, in which the rank 1 meant that the question was not critical at all, and the rank 10 meant that the question was critical at the maximum level. The criticality level was identified by the ranks given in answers to the question 7.1 in the interview protocol (Appendix V).

This criticality assessment of knowledge workers’ questions had the function to generate guidance for the researcher in performing the subsequent questions of the interview protocol (questions 10 to 15). Then, only those questions with criticality equal or greater than 7 formed the sample from which the researcher conjointly with the informant would choose the specific questions to be explored.

The analysis of the knowledge workers’ critical questions aimed to answer what was critically needed to be known in order to construct the knowledge or meaning they needed to in their specific knowing situation. In order to answer this, content analysis was made of the critical questions knowledge workers described as having in their knowing situations. The analysis of the critical questions identified their entities, attributes and interrogators.

The CRITICAL QUESTION ENTITY focused on what the informants were asking questions about, being it a human or a non-human entity. The analysis of the CRITICAL QUESTION ATTRIBUTE focused on the characteristics of the entity that were being questioned. The analysis of the CRITICAL QUESTION INTERROGATOR focused on the interrogator that was most represented by the questions the informants asked.

The coding scheme for each of the dimensions above was made separately without influencing the categorizations of each other. Despite entity-attribute form a coherent and meaningful combination of elements, the coding of one did not determine a specific code to the other. In coding the CRITICAL QUESTION INTERROGATOR, the researcher did not

only count on the wording made by informants, since the description of their questions could take different forms.

The analysis of the three qualitative dimensions of critical question was focused on the informants' own articulation. If the articulation of the informant's critical question was not made in a question format or with the qualitative dimensions needed to perform the coding (entity + attribute + interrogator), the researcher carefully reworded them without changing the meaning of articulations, in order to understand what informants were asking. As a result of the interview design, most of the informants' articulation of their critical questions was in a question format, and in very few cases the researcher needed to slightly reword their own articulations. Informants' wording was used for labeling the categories. It was also checked if the informants' descriptions of their critical questions in situations did not include more than one question. This did not happen in any of the input-encountering moments (n=100).

The CRITICAL QUESTION ENTITY, ATTRIBUTE AND INTERROGATOR categories were determined inductively, by analyzing the informants' descriptions and answers that were given to question 7 in the interview protocol (Appendix V). The coding of the CRITICAL QUESTION ENTITY, CRITICAL QUESTION ATTRIBUTE, and CRITICAL QUESTION INTERROGATOR was based on conceptual similarity. The coding process involved 10 different rounds of analysis and collapsing for each of the CRITICAL QUESTION ENTITY, CRITICAL QUESTION ATTRIBUTE categories and 5 different rounds of analysis and collapsing for the CRITICAL QUESTION INTERROGATOR categories. These analysis and coding rounds were performed by the researcher in different times. The intrajudge reliability for CRITICAL QUESTION ENTITY and CRITICAL QUESTION ATTRIBUTE codes was on an average of 91% over 10 coding rounds, and 97% for the CRITICAL QUESTION INTERROGATOR categories over five coding rounds.

Additionally, to help show how the critical questions occurred in the knowing practice, descriptive statistics were used to show the distribution of the CRITICAL QUESTION ENTITY, ATTRIBUTE AND INTERROGATOR categories across the input-encountering moments (n=100) and in each of the knowing SITUATIONs (n=5).

The design of the interview was made to make the CRITICAL QUESTIONs as the entry-point for the deeper and more detailed descriptions of the informants' knowing experience as sense-making. The more detailed descriptions were made by answering the set of questions from 10 to 15 in the interview protocol (Appendix V). In this context, the

CRITICAL QUESTIONS with criticality assessment equal or greater than 7 were the entry-point for the exploration of the uses of INPUTs in knowledge workers' situated questions.

4.5.3 Verbings

4.5.3.1 Verbings in Sense-Making Methodology and in this Study

In SMM and in the present study, verbings are conceptualized as the actions made by sense-makers to get answers to their critical questions, to bridge gaps, and get the help they need for their meaning creation in a specific knowing situation, and consequently, to make or unmake sense in specific situations in time and space. Verbings indicate how informants created meaning, modes or ways of meaning creation. They can be pictured in the center of the Sense-Making Methodology metaphor representation (cf. Figure 7, on page 134).

As the context of the present study is knowledge creation work, the verbings are naturally related to interpretations or interpretive constructions by using inputs based on the tacit (e.g. intuition) and explicit dimensions of knowledge (e.g. a book).

Verbings are not inputs. Verbings are actions and movements; inputs are not. Verbings are actions of gap-bridging or sense-making, in which knowledge workers apply and use the inputs to construct the interpretive bridges over gaps and create meaning.

4.5.3.2 Aspects measured and analysis approach

Verbings are performed to bridge gaps and create meaning in an input-encountering moment. An input-encountering moment was defined in the present study as the encounter with a single 'best' input to a single critical question, in a knowledge creation situation. In these input-encountering moments, knowledge workers move or act to create meaning by using the 'best' input, and this action or movement is referred to as the 'main movement'.

When an input-encountering moment was explored during the interview, informants spontaneously described other actions they performed to create meaning in the same input-encountering moment. Thus, in an input-encountering moment, additionally to the movements related to the 'best input', knowledge workers performed other movements by using other inputs, which were complementary to the 'best' one. These movements are referred to as the 'complementary movements'. They are anchored in the same input-

encountering moment. Both main and the complementary movements were considered in the analysis of verbings.

The main movement and the complementary movements were actions related to inputs based on knowledge workers' and on other individuals' knowledge (the tacit dimension of knowledge), and to knowledge that were articulated in documents. The main movement and the complementary movements were synergistic and interdependent. All the verbings used by informants in their knowing work practice were identified as interpretive actions to create meaning.

The analysis of verbings involved identifying and *understanding all the movements or actions (both main and complementary movements) that a knowledge worker made to get the answers and helps s/he needed in an input-encountering moment.*

To tap the qualitative nature of verbings, the following dimension was analyzed:

(a) VERBING – this dimension assesses the movements or actions used by knowledge workers in an input-encountering moment, in order to create meaning. This dimension reflects how they got answers to critical questions, get the helps they needed for their knowing, i.e. the ways knowledge workers created meaning or made sense.

The unit of analysis for VERBINGs was input-encountering moments (n=100). Each unit of analysis was coded to more than one category. This is because in a single input-encountering moment a knowledge worker could perform multiple and distinct movements.

Content analysis was made of all the narratives given to the explored critical questions in each input-encountering moment (n=100). The questions of the interview protocol that generated these narratives were the questions 10 to 15 (Appendix V).

The VERBING categories were determined inductively by *content analyzing an entire input-encountering moment.* The coding of the VERBINGs was based on conceptual similarity of the nature of the actions and movements described on the answers given to questions 10 to 15 of the interview protocol. The VERBINGs categories were collapsed by conceptual similarity into 7 different rounds accomplished in different times by the researcher. The intra-judge reliability was on an average of 96%.

The VERBING category related to interpreting the tacit dimension of knowledge was identified when informants' narratives evidenced that they considered their own intuition,

‘gut-feelings’ and experience. In addition, this category of VERBING was also identified when informants’ narratives included having conversations with other knowledgeable individuals or experts with the aim to access their experience, their perceptions, and insights in relation to an issue or topic. The identification of the tacit dimension of knowledge in informants’ narratives is substantiated by Polanyi’s conceptualization and exemplifications of this dimension of knowledge, which includes personal judgment, assessments and evaluations, personal skills, personal experience (Polanyi, 1966; 1969; Polanyi & Prosch, 1975, p. 30-31), personal knowledge (Polanyi, 1958; Polanyi & Prosch, 1975, p. 31), “previous understanding of similar experiences” (Polanyi, 1969, p. 188), feelings (Polanyi & Prosch, 1975, p. 186), “personal elements of knowledge” (Polanyi, 1966, p. 20), “actual knowledge that is indeterminate, in the sense that its content cannot be explicitly stated” (Polanyi, 1969, p. 141). Therefore, when informants’ narratives indicated that they accessed the aspects above in themselves or in other individuals, the narratives were coded in the following VERBING categories: ‘interpreting and incorporating the tacit dimension of own knowledge’ or ‘interpreting and incorporating the tacit dimension of others’ knowledge’. Other research studies such as Haldin-Herrgard (2005) and McAdam et al. (2007) identified epitomes of tacit knowledge, and Gourlay (2004b), who discussed the main uses of tacit knowledge in empirical research^{xxxiii}, are in harmony with those described by Polanyi.

The sense-making movements related to interpreting the explicit dimension of knowledge were identified when informants’ narratives evidenced that they considered their reports of the “objective” part of knowledge (Polanyi, 1966), that part of knowledge that can be explicitly articulated (Polanyi, 1966; 1969; Polanyi & Prosch, 1975). Polanyi exemplified the explicit dimension of knowledge as that in theories (Polanyi, 1966, p. 20; Polanyi & Prosch, 1975), letters (Polanyi, 1969, p. 189-191), “a manual for driving a motor car” (Polanyi, 1969, p. 144), maps (Polanyi & Prosch, 1975, p. 30), textbooks (Polanyi & Prosch, 1975, p. 31). In the analysis and coding of the VERBING related to interpreting the explicit dimension of knowledge, the present study focused on this dimension of knowledge when it is communicated by documents. If informants’ narratives evidenced that they interpreted an article, a report, a book, these narratives were coded in the VERBING category “interpreting and incorporating the explicit dimension of knowledge”.

Additionally to the content analysis, descriptive statistics were used to show the distribution of the VERBINGS across all units of analysis (n=100) and by each situation (n=5).

4.5.4 Inputs

4.5.4.1 Inputs in Sense-Making Methodology and in this Study

Inputs metaphorically compound the interpretive bridges that informants construct to overcome gaps in a sense-making situation (the bricks of the bridges). Inputs are used by knowledge workers to bridge situated gaps and construct meaning. They are not the bridges themselves, but elements used to construct bridges.

Inputs are not sources, but what are generated by them. Inputs are not necessarily information as commonly defined by outsiders of the informants' world (by experts, systems, or even the researcher). Inputs can be ideas, insights, intuition, body senses, experience, images, histories or even memories. Thus, inputs go beyond what is commonly called 'information'. They are only information if they are defined as such by informants. The inputs are pictured in the center of the Sense-Making Methodology metaphor representation, where the bridges are shown (cf. Figure 7, on page 134).

Similarly, in the present study, the inputs were considered as what informants used to help them get answers for their critical questions and create meaning. These inputs could be based on the tacit and explicit dimensions of knowledge.

The difference between INPUTs and VERBINGs is that inputs are used to make the interpretive movements that are verbings. VERBINGs are the interpretive movements or actions by which sense is made or meaning is created, and in which inputs are used.

4.5.4.2 Aspects Measured and the Analysis Approach

For the purposes of analyzing INPUTs, only the 'best' input used by informants in an input-encountering moment was considered.

The analysis of INPUTs was made based on the unit of analysis input-encountering moments (n=100). Each unit of analysis was coded to one category only.

Tapping the qualitative nature of INPUTS the following dimension was analyzed:

(a) INPUTS COMMUNICATOR (ICOM) – this dimension assesses what or who communicates the 'best' inputs used by informants. Inputs can be communicated by means of documents or artifacts, or by people.

The entry to elicit the ICOM was the CRITICAL QUESTION that informants had in each input-encountering moment. Only those critical questions which had their criticality assessed by informants with a rank equal or greater than 7 served as the entry to explore the ‘best’ inputs informants used to help them get answers. Among these ‘best’ inputs for a critical question, only one was conjointly selected with the informant (a critical-question-input pair), for further exploitation during the interview.

The analysis of the inputs aimed at answering what communicated the inputs to informants. To identify ICOM, the answers that clearly stated the used inputs in question 9 of the interview protocol (Appendix V) were taken into analysis.

The INPUT COMMUNICATOR (ICOM) was determined inductively by analyzing the descriptions informants gave when they answered about the best input they used to help them answering a specific critical question (question with criticality ≥ 7). The coding of the ICOM was based on conceptual similarity of the kind of entity or object by which the input was communicated. The ICOM occurrences across the 100 input-encountering moments were collapsed by conceptual similarity in 4 different rounds on different times by the researcher. The intra-judge reliability was on an average 98%.

Additionally, descriptive statistics were used to show the occurrences of distinct ICOM across all units of analysis ($n=100$) and by knowing situations ($n=5$).

4.5.5 Helps

4.5.5.1 Helps in Sense-Making Methodology and in this Study

In SMM and in the present study, helps reflect how informants need to be helped in their meaning creation by the uses of inputs in their knowing situations. Essentially, helps are the uses knowledge workers need to make of the inputs, how they need to apply inputs to their gaps, to their meaning creation. The helps are pictured on the right side of the Sense-Making Methodology metaphor representation (cf. Figure 7, on page 134).

In the present study, the helps are generated by the uses of inputs in relation to the critical questions that are needed to be answered in a specific knowing situation.

4.5.5.2 Aspects Measured and Analysis Approach

The analysis of helps was based on the unit of analysis input-encountering moments (n=100). Each unit of analysis was coded to more than one HELP category because knowledge workers need that the uses of inputs support their meaning creation in varied ways.

The entry to elicit the HELP variable was the ‘best input’ that was used by informants to answer a specific critical question (question 9 of the interviewing protocol, Appendix V). The interview was designed to explore the helps that informants perceived as needing, and those they actually had or not when they used the ‘best input’ in their knowledge creation.

During the interview, after informants described the ‘best inputs’ they used when they had a critical question, the researcher asked the informant which of the ‘best’ inputs described by her/him s/he would like to be explored. If the informant had doubts about this, the researcher probed in order to help the informant in selecting one ‘best’ input to be subsequently explored with the questions of the interview protocol (questions 10 to 15 of the interview protocol). The selection of the ‘best’ input was made in real time on the basis of the informants’ descriptions of the used inputs, the researcher’s perception of the potential richness of the informants’ experience with specific inputs (perceived by the answers to probing questions), and on the need to not explore similar kind of inputs for the same critical question. After selecting the ‘best’ input to be explored, a final agreement by the informant was sought by the researcher to ensure that the selected input was the ‘best’ one according to the informants’ perspective.

The chosen input was then explored during the interview. The experience with the input was explored in terms of the helps informants needed, helps got or not got by using it. This exploring was accomplished by the questions 10 to 15 of the interview protocol (Appendix V).

Exceptionally, if the informant used two or more distinct inputs for a critical question (e.g. reports and individuals’ experience), and the researcher perceived that the experiences with them were potentially rich for the informant, more than one input to a single unit of analysis (an input-encountering moment) could be explored.

The following dimension of HELPs was measured:

(a) HELP – this dimension assesses how knowledge workers needed to be helped in their meaning creation by using inputs in their input-encountering moments.

In this context, the qualitative dimension of HELP was determined by asking informants the following:

(a) The helps informants needed, had/did not have by using the ‘best’ inputs when informants tried to answer critical questions in situation (question criticality ≥ 7) (questions 11, 12, 13, 13b, 13c, and 13d in the interview protocol, Appendix V).

(b) The helps that they needed but they did not get when they used the ‘best’ inputs (question 13e in the interview protocol, Appendix V).

(c) The helps they needed, had/did not have by getting complete or partial answers to their critical questions from the uses of the best inputs specified by them (question 14, 14a and 14b in the interview protocol, Appendix V).

(d) Other ways that the uses of the ‘best’ inputs helped them (question 14c in the interview protocol, Appendix V).

(e) Other helps they needed and they did not have. This was described in the magic-wand questions in which informants were asked what the best helps would have been in a specific critical question, if they had a magic wand (question 15 in the interview protocol, Appendix V).

Therefore, HELPs were determined by analyzing the answers the informants gave to questions 11, 12, 13, 13b, 13c, 13d, 13e, 14, 14a, 14b, 14c, and 15 of the interview protocol (Appendix V).

The analysis of HELP aimed to answer how knowledge workers needed to be helped in the meaning creation by using specific inputs when they had a critical question in their input-encountering moment. In order to answer this, content analysis was made of the descriptions given to the questions specified above. The helps were understood in the whole input-encountering moment in order to anchor the meaning and the articulation of the helps needed by informants to the meaning creation experience they had in this moment.

The HELP categories were determined inductively, by analyzing the informants’ descriptions of how the uses of the best inputs were needed to or did help them in a specific

knowing situation, when they had a specific critical question. The coding of HELP was based on the conceptual similarity of how knowledge workers needed to be helped. In coding, each unit of analysis was coded to more than one category, because knowledge workers needed to be helped in different ways by using an input in their input-encountering moments. In coding, the codes used were in the present tense independently of the tense that informants used to describe their helps.

The initial helps needed by knowledge workers (n= 961) were continuously collapsed in 11 different rounds of analysis and coding. The analysis and coding rounds were performed by the researcher in different times. The intrajudge reliability was on an average of 91%.

The coding differed from how helps have been commonly coded in the Sense-Making Methodology studies for the following reasons:

(a) Conceptual definitions of HELP categories. There was a need to maintain the meaning of the helps on the micro, business-related and less abstract levels expressed by informants. In doing so, the researcher incorporated the richness of informants' knowing experiences and enabled the clear reflection of the helps they needed by using inputs and how they needed to be helped in their situated meaning creation. The level of abstraction and the conceptual definitions in the categorization were purposefully maintained at a level that could be smoothly associated to business-related knowing work and that could mirror the knowing experiences in this kind of work situations.

(b) Labels of HELP categories. There was a need to label the HELP categories that would be as direct, unambiguous and clear with regard to the communication of their meaning as possible. This is because the context and the results of the present research are to be useful to business people. The labeling aimed to create labels on an abstract level in a sense that could be generalized across domains, but not excessively abstract that would require too much of cognitive effort from knowledge workers in trying to figure out what a specific HELP category means.

To answer how HELP categories occurred across the knowing situations, descriptive statistics were used to show the distribution of the frequencies of HELPS across all units of analysis (n=100), and by knowing situations (n=5).

4.6 Validity and Reliability

The internal validity of the present study was ensured by specifying how the sample was composed and by meticulous data collection design and procedures.

The external validity of the present study was guaranteed by the Sense-Making Methodology focus on the study of the sense-making, knowing or meaning creation phenomenon, which is inherent to human behavior and common to domains and contexts. Dervin (2003f/1991, p. 302) has pointed out that “the gap-bridging analytic as sense-making is understood and interpreted situationally, but it may be generalized because it is related to a natural human behavior”. In other words, the knowing, sense-making or the creation of meaning, are inherent practices of individuals, and as such, the generalization regarding to these knowing practices can be made.

The aim of the present study was to generalize from the results to the processes of knowing, rather than to generalize from the results to population. The study focused on *making inferences related to a practice of knowing in knowledge creation work, rather than make inferences related to a population of knowledge workers*. The aim was to describe practices, their variables and their interrelationships (knowing), rather than to describe a specific population (knowledge workers or organizations), or assess the number of knowledge workers who feature specific characteristics (Gobo, 2006. p. 423). Therefore, *generalizations are restricted to the practices of knowing work*. The degree of generalizability of the findings is restricted to the knowledge creation practices. What can be generalized are the main structural characteristics and dynamics of knowing practice work to other cases or practices of the same kind Gobo (2006, p. 423). The study findings related to these practices can be extrapolated to the practices with the same characteristics, and in the same work circumstances as those researched: knowledge workers who intensively and primarily create knowledge for business, in for-profit business organizations. Gobo (2006, p. 423) stressed that the generalization in social science research is “mainly a practically and contingent outcome related to the variance of the research topic; in other words it is a function of the invariance (regularities) of the phenomenon, not a standard or automatic algorithm of statistical rule”. Therefore, the external validity (Lincoln and Guba, 1985, pp. 290-291) exists because the research findings can be applicable to the same process or practice that was researched.

The reliability of the present study (Lincoln and Guba, 1985, pp. 290-292) was guaranteed by the following procedures:

(a) Intra-judge reliability (test-retest) – it was used the reliability type ‘stability’ (Krippendorff, 1980, pp. 130-131). This reliability assesses the disagreements between codes or the intra-coder inconsistencies. The percentages received from intra-judge assessment were considerably high, ranging from 91% to 98%.

(b) Data collection instrument design – it was made with the creator of Sense-Making Methodology, Professor Brenda Dervin.

(c) Pre-tests of the instrument design (n=16).

(d) Writing full and precise transcriptions of the interviews.

(e) Checking the interviews transcriptions more than one time.


(f) Coding the variables in different moments, at various time, and comparing coding.

(g) Transparency of the data collection and analysis strategies, processes and procedures.

The *objectivity or neutrality of the present study* (Lincoln and Guba, 1985, pp. 290-292) was guaranteed by the use of a sound and empirically tested methodology and methods.

PART V – EMPIRICAL FINDINGS, IMPLICATIONS AND APPLICATIONS

CHAPTER 5: SITUATIONAL MEANING CREATION IN THE KNOWING WORK WITHIN BUSINESS ENVIRONMENTS: A QUALITATIVE PICTURE



Dialogue is the encounter between men,
mediated by the world, in order to name the world.

Paulo Freire

Our task is to broaden our reasoning to make it
capable of grasping what, in ourselves and others,
precedes and exceeds reason.

Maurice Merleau-Ponty

5.1 Introducing

The interviews produced rich data that helped to understand the situational knowing practice and how knowledge-based inputs were used for it. The themes discussed in the following sections are based on qualitative evidence and they specify the key aspects of the *knowing work practices*. Content analysis was used systematically to identify and extract the emerging themes from the transcripts. This involved intersecting a grounded thematic analysis approach for the inductive analysis, and the use of Sense-Making Methodology metaphor for a deductive approach.

The aim of the present chapter is to give an overview of the most salient and significant themes related to the research question: *How are meanings situationally created in the knowing work within business environments?* For practical reasons, the main themes are divided into those more related to the knowing practice and those more focused on the uses of knowledge for this knowing practice. In the first section, the findings are more focused on the knowing practice. In the following section the themes are more closely related to the uses of knowledge in and for knowing.

Concerning the first, the themes are related to the following: (a) synergistic, emergent and leaping characteristics of knowing, (b) how knowledge workers were helped was beyond the content of inputs, (c) the use of the tacit dimension of knowledge, (d) the constraints in knowing and how they affected the knowledge created.

More focused on the uses of knowledge in knowing, the following themes were presented: (a) tapestry of inputs, (b) inputs are what is defined by knowledge workers, (c) similar experiences with inputs are considered in knowing (d) the need to use knowledge that has been already created within the organization, and (e) the need to get integrated inputs for knowing.

The findings are illustrated by taking quotations from interviews. These quotes refer to a specific input-encountering moment that the respective informants had in their whole knowing situation. When there are two quotations from the same informant they refer to different input-encountering moment that the respective informants had. The numbers in parentheses after the quotes refer to informants. The approach to extracting quotes was ‘smooth transcription’ where non-fluencies and other grammatical errors which are common to spoken language were corrected in order to enhance readability. If words or expressions

are found in square brackets within the informant's quote, this was done by the researcher to clarify the understanding of the quote by the reader.

Discussions of the implications of the qualitative results are presented in Chapter 7. The respective discussion is focused on the effects that the nature and dynamics of knowing revealed by the qualitative findings have on the communication of knowledge and knowing needs, and how approaches to this communication can be adapted to such kind of work practice.

5.2 The Knowing Practice

The analysis of the interviews data revealed several pertinent themes that were specifically related to the knowing practice in the intensive knowledge creation work and to its situational nature. They are presented in the following sections.

5.2.1 Synergistic, Emergent and Leaping Movements

In order to answer critical questions (gap-bridging) and create meaning, knowledge workers performed multiple, synergistic, emergent, discontinuous, unplanned, and situational actions or movements in a single input-encountering moment. More than complexity, this finding showed the living aspect of the knowing work practice, which leads to an ad hoc way of using knowledge-based inputs. How knowledge workers' create meaning or knowledge is comprised of actions that are decided in the unfolding of the interpretive actions.

In terms of synergy among actions to create meaning, main and complementary movements to intellectually access and interpret knowledge (inputs) occurred for a single critical question. Main and complementary movements were performed during a single input-encountering moment in which informants used one 'best' input (as considered by them) to help answer a single critical question (e.g. what the main weakness are) in the whole knowing situation (e.g. competition analysis). These complementary movements were spontaneously reported by informants when they were describing and explaining their single input-encountering moment. The main and complementary movements supported each other and jointly collaborated to the creation of meaning. For example, informant 24 explained how he

complemented the use of the input ‘notes taken’ with talks with the note-taker (a colleague) to help answer a critical question:

The notes taken ...it’s not actually, it is not as much the notes taken, but the ability to have a conversation with the other person that was in the room at the time [the note taker]. Because remember, it was he and me in the interview and then we actually seated in the car, and it was there when we have taken notes. (Informant # 24)

Informant 24 made a complementary movement to access and to interpret the note-taker’s perceptions and experience by means of a conversation with him, and to access what was articulated in notes taken after a focus group they developed together. The notes taken and the conversations with the note-taker were used as the ‘best’ and complementary input. One input contributed to the other, and both to the creation of meaning. The simultaneous actions to get connected to the ‘best’ input and to the complementary inputs in one single input-encountering moment synergistically helped knowledge workers with their specific critical question in a knowing situation.

Another example that illuminates the main and complementary movements to intellectually access inputs can be given. Informant 26 connected to his own knowledge and past experience in doing similar projects, in order to identify if a specific input was helpful for the questions he had.

So, it was by knowing that the details of financial transaction were often made available for the stock market to help investors and to help investment funds that led me to really start mining that data, to bring forward to what I wanted from it. So, it’s basically, previous experience of my own. (Informant # 26)

Informant 26 moved herself to access and to interpret her own knowledge in order to activate another action. This illustrates complementary movements that were taken by the informant to help her answer the critical question she had in the respective input-encountering moment.

Informant 24 emphasized that the interpretation of other inputs (from his colleagues’ business knowledge) helped him to confirm if the insights he got from the ‘best’ input would block or direct his customer’s business performance. Thus, the use of a complementary input contributed to confirm or validate the ‘best’ input.

I suppose it helped us to identify where the insights that we’ve taken from the research were likely to be a barrier or a driver of performance, or ultimately, business performance. So, it turns down to ‘well, actually what was the impact of

this?' So, it's not just a thing, not just an idea, but, it has an impact on business performance. (Informant # 24)

Another example is provided by informant 4, who used public documents about other organizations profits and losses. She was trying to answer a question about success of a kind of service in terms of profitability. As the informant explained, the documents did not show the 'softer things' of profits and losses ("such as what do the employees think about it, that sort of thing"). The informant found out about these 'softer things' by word-of-mouth, talking with people, and accessing and using their tacit knowledge.

No, because that was a very specific aspect. It [the best input] didn't tell us the softer things. Such as what do the employees think about it, and that sort of thing. But it told us that financially, it was a profitable enterprise. (Informant # 4)

When the researcher asked her how she found out about the 'soft things', she answered:

Word-of-mouth. So, they weren't published. (Informant # 4)

She made at least one complementary interpretive movement to the one in which she used the 'best' input in order to get answers to a critical question: talking with individuals about what she needed to understand (the softer things of success). Thus, she acted in two directions in order to answer her critical question. First, she acted to get the 'best' input, which was related to the hard aspects of a business success, i.e. profit and losses. Second, she tried to get the softer aspects of this, by accessing and interpreting other individuals' knowledge about the topic.

Additional illustration of complementary and main actions in one single input-encountering moment was provided by informant 5. This informant had an intuition that a specific kind of market was potential and that it would be profitable. He then collected evidence by accessing and analyzing the current products in the market. This showed that he performed two actions in order to confirm the existence of the market. One was the main movement because it enabled him to interpret the 'best' input (the analysis of the current products). The complementary movement was towards using the complementary inputs, which enabled him to access his intuition and personal experience in the business.

Because people had sent me manuscripts in this area, and, you know, I could see it developing. I knew that we needed it. You know, scientists need it ... It's just a gut feeling in the end. If you see those articles coming in, and I spot an area, I say 'ha

ha! Perhaps we should be thinking about launching a journal in this area'. So, then I do some more work in this particular field. (Informant # 05)

In addition, when informant 5 was asked how he identified the helpfulness of the used input to the question he had, he answered: "I guess it is experience. In the end, it is experience" (Informant # 05). He connected to and interpret his own experience in order to assess if the input was helpful or not to his knowing situation.

Therefore, in a single input-encountering moment, *there were other interpretive actions or movements* that enabled the knowledge worker to also use complementary inputs. Hence, the knowing practice was a *synergistic combination of movements* that knowledge workers performed in order to make sense of and use specific inputs that were based on the tacit and explicit dimensions of knowledge. Knowledge that was embedded in people – in the knowledge worker him/herself and in other individuals – and knowledge that was explicitly articulated and represented in documents was used.

This implies that knowledge workers navigated through the intertwined and interdependent movements in order to get answers to their critical questions. What emerged was a sense of knowledge workers constantly navigating between and combining different ways and different movements for handling their critical questions. In addition, the inherent insufficiency of using a single or the 'best' input when they had a critical question was evidenced.

The movements were synergistic and constructive because one movement helped or enabled another to happen. This resulted in subsequent movements carrying the 'energy', i.e. the results of others. In other words, a knowledge worker brought the effects of one movement to another. The synergy between movements was reflected by the changing of one action to another in the same input-encountering moment, one movement benefiting from the results of the other. The resulting synergy helped to get answers to a critical question in an input-encountering moment, enabling the creation of meaning by a combined use and interpretation of the helps derived from using 'best' and complementary inputs.

Emergent and Leaping

The movements performed by knowledge workers in their knowing practice obeyed a rhythm and a pathway that was only determined by the knowledge workers themselves while

they were taking their movements. Most of the time, these movements were taken impulsively, unexpectedly or abruptly because they were decided in action.

The interpretive movements to find answers to a critical question in a single input-encountering moment resulted from the knowledge worker's actions in the respective moment. One main movement to use a 'best' input to a single critical question propelled knowledge workers through other complementary movements (Figure 13 below). Because they did not necessarily analyze options and paths in a rational way before moving towards finding answers, they rather chose to do something based on the meanings they simultaneously created from doing something else (e.g. using the 'best' input). The enactment of knowledge within the action was emphasized by Cook and Brown (1999). According to them, there is "the interplay of knowledge and knowing as a potentially generative phenomenon. That is, for human groups, the source of *new* knowledge and knowing lies in the use of knowledge as a tool of knowing within situated interaction with the social and physical world. It is this that we call *generative dance*" (Cook & Brown, 1999, p. 383) (Emphasis in the original). This generative dance could be evidenced in the findings, because knowledge workers mobilized, enacted and used knowledge in knowing, in an emergent and situated way.

These actions were triggered by the relation between the knowledge worker in situation and what was happening in this knowing situation, leading to unexpected and unplanned actions to help them to get answers to a critical question. The quality of these movements seemed to be more like abrupt actions, because they were produced as a result of internal interpretations of inputs and in relation to what was happening in the moment, and these interpretive actions sometimes remained transparent to the actor (knowledge worker) and to the observer (the researcher). The movements were more like jumps or leaps, rather than gradual movements from one input to another, based on rational analyses of the possible movements in order to select a way and make the movement. Knowledge workers did not display a rational plan of what they would do to answer their critical questions and create meaning. They acted according to what happened at the moment, in the actions' course. From the observer point of view, the movements were more like unexpected 'leapings' to use complementary inputs to get answers and create meaning.

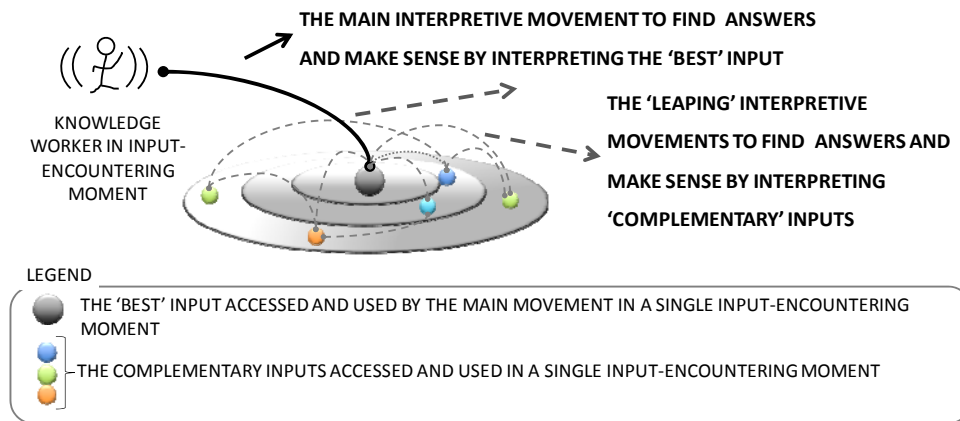


Figure 13 : The 'leaping' and synergistic movements to create meaning in a single input-encountering moment.

The movements performed by knowledge workers at a single input-encountering moment can be illustrated by informant 5. When asked what led him use a specific 'best' input he explained that he made a quick search, got a rough idea about the question he had and then talked to his contacts to check the accuracy of what he discovered. This last movement was made as a result of what he interpreted in the previous movement.

Informant 8 also exhibited leaping movements. When asked about the helpfulness of a specific 'best' input (input from talking with technical directors) to a critical question, he explained that by talking with directors in a target organization he was directed to other contacts. By talking with them he got other inputs which helped him 'build the picture' or get the answers he needed.

...somebody within that trade association, a sort of technical director was aware of what's happening, and then could point us to other contacts. We were saying 'we don't know anything about what's happening', and 'I don't know a certain terminal', or 'what's happening in [company D]', 'what's going to be in the future'. And they said 'ok, good. Go to [a company] and, you know, contact this guy'. You know, and that was basically, then, building up a picture. (Informant # 8)

Informant 10 also demonstrated unexpectedness of movements to help him create meaning in a specific moment. The input generated by an expert in the project he was working with (his 'best' input) made him study some books in order to confirm his own understanding and to get comfortable with the opinion given by the expert in the project.

And the guy said that among the options (a), (b) and (c), he would consider option (a) as the most appropriate. And then, by doing some reading, a bit of background reading to understand what he was talking and then, it did seem, as far as I was concerned, that the option selected was appropriate. So, I was quite confident that

what he was saying was the right way to analyze and I then, got backed up by what I was seeing on the web and in the books. (Informant # 10)

In a specific input-encountering moment informant 32 consulted her colleagues' knowledge to help her understand things and answer questions that arose from the interpretation of the 'best' input, but that it was not able to support.

Well, some things I just didn't understand, so I needed to ask more questions. And that's when I turned to people in the organization. So, then, I was able to understand what was going on, to understand the terminology. (Informant # 32)

The movements explained above are movements for the creation of the bridges to overcome gaps (i.e. to answer questions) in the Sense-Making Methodology metaphor. They are the *verbings* in the sense-making practice, or the movements, actions to gap-bridging and sense-making. Correspondingly to Polanyi's knowing theory, these movements are the integrations of clues or particulars to the meaning they point to and contribute to. These movements are also quantitatively characterized in the next chapter (on page 240).

The interpretive movements enabled knowledge workers to get answers (the bricks of the bridge in the Sense-Making Methodology metaphor) which were based on the tacit or on the explicit dimension of knowledge. In practice, knowledge workers navigated through these different dimensions of knowledge, with the purpose to get answers and to be helped in create meaning. Therefore, complementarily to the best input used by a knowledge worker in answering a question, there were peripheral inputs that were also used to help in the creation of meaning.

In sum, the issues discussed above indicate that knowing work is an 'emergent processes' in which interpretations and actions "unfold unpredictably" (Markus et al., 2002, p. 182). Knowledge workers performed connective and synergistic leaping movements in one single input-encountering moment. The combination of all the movements in such moments contributed to the creation of meaning or knowledge related to a specific critical question. It is this final meaning, a combined or integrated meaning that generated and revived the richness of the complexity, dynamicity, improvisational and bricolage aspects of a knowing practice.

5.2.2 Beyond Content, Towards Meaning

The ways in which knowledge workers explained that they were helped by the uses of inputs went beyond the specific content or the subject domain of these inputs. The uses of knowledge contributed to knowing at the level of meaning creation, rather than at the level of appropriateness of content, topic or characteristics of the needed and used input. How knowledge workers were helped by knowledge was anchored in the knowing practice, attached to the meanings they needed to create by using the inputs.

For example, informant 29 in one of his input-encountering moments was helped by the input he got from experts in his organization in two ways. Firstly, by understanding what had already been done related to a topic (balanced scorecards for technology). Thereby, he was helped to ask questions from other individuals. This means that he was also helped to better access others' experiences. Secondly, informant 29 was also helped to identify and incorporate knowledge and experts' perspectives to the solution he was designing for a customer.

...it allowed me to get a mild understanding to be able to articulate what was possible, to other people. And to be confident that we'd explored that question. (Informant # 29)

...you know, if you are working in a subject area, one of the key things you want to understand is what's been done before; either within the wider world or within your own organization. So, you understand what knowledge and expertise you can leverage. To me, that's just an obvious question in doing something like this. (Informant # 29)

Equally illustrative, informant 16 used reports about a sector when she had a question related to the components, what a specific service is, and how it should be by law (services standards). The use of these reports helped her to understand the required capabilities to perform the specific service – the standards – and how it can and should be accomplished. Consequently, by analysis and comparison of the standards with what competitors were offering, the input helped her to understand what these competitors would do to offer the service, or how they will accomplish the objectives predefined by the standards.

Well, because it was setting the benchmark it then helps us in understanding what competitors weren't offering, also what [her current organization] wasn't offering, and so, in a way, it kind of helped with the 'strengths and weaknesses' section of our own report. (Informant # 16)

A specific input-encountering moment faced by informant 25 also illustrates how knowledge workers were helped by the uses of inputs. This informant used experts' knowledge and experience when he had a question related to the subject scope of a new publication product. The use of the experts' knowledge helped him to integrate different perspectives. This knowledge also helped to understand which scope was more attractive, potential and feasible to invest.

Because they were able to go through and assess, and discuss, and validate, and confirm that certain areas were central, and other areas weren't. So, by having two people from slightly distinct views giving me their inputs separately, and then giving me their inputs together, I was able to finally come out what I thought was the most effective scope. (Informant # 25)

Also illustrative is the input-encountering moment of informant 28. In this moment she had a question related to the driving forces of a market and she used input from materials published after industry events. The uses of this input helped the informant to prioritize and adapt to the internal conditions or requirements of her organization.

The materials from conferences helped me to identify what to focus on in the understanding of the market structure. So, the areas which the materials have been discussed helped me to identify the areas which I need to focus on. ...So, by knowing what the current issues are, I could identify the areas which I needed to do some more work and some more explanation about. (Informant # 28)

The examples above illustrate how knowledge workers were helped in their knowing practice is not entirely based on the content of the inputs (topic of a document, expertise of an individual). Rather, these helps are based on how this content or expertise contributes to answer situated critical questions. Essentially, the helps needed is based on the meaning creation: how knowledge as inputs helped them to create meaning in specific knowing situations.

The used inputs helped knowledge workers to understand, anticipate, evidence, move better, and to construct deeper and develop further connections in relation to their situated questions. Therefore, the relation between inputs and knowing needs, i.e. the knowing-inputs connections, was anchored in the meaning creation process, rather than on the relationship of 'right' content to the 'right' need.

A specific input-encountering moment of informant 19 can illustrate how her needs in relation to inputs were beyond its specific content. As an input, she used the experience of a professional that had worked with the development of the technology her client was trying to

incorporate in a car. She used this individual's experience when she had a question related to the feasibility of the technology she was studying. By surfacing and tapping the other individual's experience, the informant needed to be helped to understand how the specific technology worked in practice.

...on paper people can tell you that this can be done, and you just connect this to this, this to this, and this to this. But finally there's one person that show you that's how you do it, and it can be done easily, and then it works, and it works perfectly, and what the problem is that you will be phasing...they can tell you all this. (Informant # 19)

Similarly, informant 21 explained how the input from observations and comments made by individuals who had worked in a rival organization helped her in constructing meaning about the competitive threats that this rival was worried about. Similarly to informant 19, the input helped informant 21 to understand how the rival firm operates, and how it accomplished things.

I think they indirectly gave us a view of how [company A] operates as a company. So, kind of how they take decisions, how those are executed, what the implications are for the organization, the way they treat people, what they expect of people. All these things were sort of implicit in that discussion, which indirectly gave us a view of how the company...a guess of the company culture, which in some senses is quite important in understanding how they operate. (Informant # 21)

The meaning-based interactions activate a different relationship between knowledge workers performing knowing work and the communicators of knowledge serving the ends of such knowing work. Knowledge workers need inputs that are capable of contributing to meaning creation, rather than only providing content that is precisely suitable for their questions. This finding is entirely supported by Polanyi's tacit knowing theory proposing that individuals are focused on the meaning directed and contributed by the clues or inputs. The present findings are also supported by the results of a study conducted by Dervin and Reinhard (2006, p.77) showing that for the informants, "information, while important, was most often positioned *as a means, not an end*" (Emphasis added).

The way knowledge workers reported having been helped by knowledge in their knowing reflects Polanyi's assumptions, in which individuals keep a subsidiary attention to the clues, i.e. knowledge as inputs, and they devote a focused attention to the meaning these clues direct to and contribute to. In knowing, once the attention is focused on the meaning the inputs contribute to, knowledge workers are not worried about the inputs in themselves. Therefore, the fact that knowledge workers were helped at the level of meaning creation is

also supported by Polanyi's assumptions. The use of SMM to study knowing enabled the identification and understanding of how knowledge workers need to be helped by using inputs in their knowing work practice. These helps are quantitatively analyzed and presented in Chapter 7.

5.2.3 Connecting to Tacit Knowledge: 'Having the Expert in the Room'

The analysis showed that one of the interpretive movements that knowledge workers made in order to answer their critical questions was towards the tacit dimension of their own and others' knowledge. They had conversations with other individuals within and outside their organizations, in order to make use of their tacit knowledge. Tacit knowledge-based inputs were used as the 'best' input and as the 'complementary' input, to make the 'main' and the complementary interpretive movements in a single input-encountering moment.

In this way, knowledge workers concretely had or expected to have conversations with those who created the knowledge they were using as inputs (e.g. reports, articles, books), such as colleagues, experts, authors of papers, and partners in work projects. The conversations with the creators of the knowledge were often articulated by informants by 'needing to have the experts in the same room with them'.

Without a doubt, the interpretation of the tacit dimension of knowledge as an input was a movement used by knowledge workers to help them answer their situated critical questions. This demonstrates that even using the 'best' input that could be based on the explicit dimension of knowledge (e.g. a report, a database), knowledge workers needed to connect with their own experience, or to other individuals' knowledge.

Evidence of the use of tacit knowledge as input in a specific input-encountering moment was given by some informants. They wanted to have a conversation with the authors of articles or reports with the purpose of asking them questions that would help surfacing and accessing their tacit knowledge. This supports Polanyi's assumptions that all knowledge is tacit or rooted in tacit, because informants also needed to have access to the knowledge and experience underlying the explicit knowledge they were accessing. For example, informant 12 and 22 claimed that to have the authors in a room and have a conversation with them would help them in their critical questions.

... if I could have got the author of the paper in the same room and just had a talk to them, said, this paper, you found this, I've got this problem, have you come across it, it's a two-way dialog (Informant # 12)

If I have a magic wand and I have the expert in the room, I have the chance to ask all the questions...so what would, what more would I want if I have a magic wand? That's what I'd be asking! To help me answer that question (Informant # 22)

Informant 14 drew on own experience as the best input to help answering a question related to his customer's constraints in the project in terms of timescale. According to him, experience was the only input that would be useful to answer a question like that.

...experience is the only real way of defining how long you take to produce a piece of software. Even when, the first time you produce some software, that's based on something experienced on doing something different beforehand. And the more experienced, the more experience you get in to produce a bit of software, the better you get in usually estimating what the time scales are involved. (Informant # 14)

Equally illustrative is informant 25, who tapped into his organization experts' knowledge, experience and intuition when he had a question related to the scope of a product. This helped him to construct his own understanding and to evaluate his decisions. Tacit-knowledge-based input was helpful and it enriched his knowledge creation process.

Simply because they are the people that are most involved in the situation. They already had a view of what the scope of such a journal would be. And I needed to tap into that understanding so that I could put it into the proposal itself. So, although it's a subjective view, they still have an expert understanding of what their field would be. Editors every time become attuned to their environment and they intuitively know whether something is right or wrong. So, I needed to tap into their understanding of what the scope of this journal would be to understand for myself whether that's right or wrong. (Informant # 25)

Therefore, the use of inputs based on the tacit dimension of knowledge was shown as a significant aspect of knowing. It is believed that the use and communication of tacit knowledge is an essential constituent of the knowing work practice. Together with the explicit knowledge, the tacit knowledge enabled knowledge workers to get richer understandings and probably, better insights regarding their knowledge creation focus. 'Having the expert in the room' reflects the need that knowledge workers had of connecting to, interpreting and using their own and other individuals' tacit knowledge for their knowing work.

5.2.4 Constraints and their Effects on the Knowledge Created

Knowledge workers recognized that their knowing was impacted on its core aspects: on the depth and comprehensiveness of the knowledge created. Basically, knowledge workers needed to make assumptions and estimations based on what they succeeded in getting as inputs, rather than on what it was necessary to create the knowledge they needed to. These assumptions were made to enable them to proceed with their knowledge creation work.

The quality of the knowledge created was sometimes acknowledgedly affected by the access to inputs or by the pressure of timescales, despite knowledge workers' attempts in finding ways to manage these barriers and to reduce the risks of communicating such knowledge to the customers. It appeared that the lack of *time to make sense* led knowledge workers to create knowledge without a more complete perspective of the issues related to the knowledge they created.

Exceptionally, the illustrative quotations used below refer to the whole knowing situation experienced by informants, rather than to input-encountering moments. This is because the theme of this section is specifically related to the knowing situation of each knowledge worker as a whole.

Informant 1 could not explore other inputs to confirm a solution to a customer's problem because of time constraints. He was only able to consider one way to solve the customer's problem. In doing so, he could not make sure that the solution found was totally correct.

I could only analyze it to one dimension. So, for any problem there are several different methods of analyzing the data and the groove accuracy would then, ultimately mean, you carry on or do further calculations in order to verify your initial findings. We couldn't do that, we couldn't run a second calculation to make sure that what we needed to be found is 120% correct, which is up to us to assume that it was a good estimation on what was available. (Informant # 1)

Equally because of time constrains, informant 9 explained that the inputs he had access to were uncertain, partial and somehow contradictory. He had to proceed with his knowledge creation considering what he got, given time constrains. As reported by him, this affected the final result of his knowing work.

I didn't do enough analysis of the information. I had to go with what I got, I had to do it by a certain date, I had to say 'well I haven't got time to do this; this is what I

have, so therefore...’ Perhaps I was a little unsure of the analysis I did. (Informant # 9)

The time constraints and difficulties in accessing knowledgeable people in her organization affected the knowledge created by informant 22. When asked how these two barriers constrained her in the knowledge creation, she answered “the completeness of the result”. Additionally, the unavailability and inaccessibility of consistent inputs affected the market analysis that was done by informant 28. She explained that at the end, “we have to work with a sort of estimation of the market”.

The knowing practice was frequently carried on with an incomplete understanding about the specific business realities or subjects that knowledge workers were trying to grasp. Basically, this incompleteness and imperfection happened because of some factors⁴⁰ that were blocking or slowing the knowledge creation situations, such as the insufficient amount of time to make sense, the lacking of physical and intellectual access to inputs, and problems in finding relevant people and getting them to help. Consequently, knowledge workers described that the results of their knowing practices, i.e. knowledge, could have been better if they had appropriate time and inputs.

For example, informant 33 explained that given the high cost of some industry reports he simply could not afford them. Thus, he had to proceed on creating knowledge for a business planning with the limited information that he had.

That’s a very difficult thing I found: the cost factor. Because, and this is to do with getting information that otherwise is not available to you, it’s not readily available in the public domain. So, you ended up basically, in having to make a lot of conclusions based on the information they have. (Informant # 33)

Informant 2 had difficulties in accessing inputs because these were not physically accessible for reasons of confidentiality, sensitiveness, and strategic nature. Thus, he had to proceed without the required level of depth in creating the report that he was responsible for. Strategies like playing with the words in the report was used to handle the lack of needed inputs for their knowledge creation work.

... in order to understand, the product which we were looking at, we needed to see the strategy of all the different players within. We can partially capture that information through analyst reports, stuff with the press and things like that. But,

⁴⁰ A quantitative analysis of factors that knowledge workers perceived as blocking or slowing their knowing practices was made but for space limitations, they were not presented in this dissertation.

not to a level of depth that we needed for our paper. So, in the end we weren't able to say with confidence that this is what the banks are doing, this is what the data has reported. In the end, we had to play with the words and say 'based on our market analysis, we see that banks are doing this'. So, it's slightly playing on words. (Informant # 2)

Informant 4 explained that despite trying to get inputs from individuals she failed to contact them. Thus, she had to proceed with her knowing process and make the decisions without their inputs.

If you can't get a contact in time, sometimes you'll go with whatever you've got already, or you'll go with the less of information, or you might have to just put the hand in your pocket and pay for an off-the-shelf report which isn't going to be as good, but better to have something than nothing at all. And if you have to make a business decision by a certain day, you can't say 'well, can I have four days later' because they'll alter the next project by then. (Informant # 4)

Furthermore, the incompleteness of some knowledge-based input was acknowledged by the informants. They knew that even the 'best' input was not able to completely help them creating knowledge. Dervin (1999, p. 732) highlighted this aspect of inputs while reminding the gap-bridging movements are always performed without complete instruction.

... you don't get a definitive answer...you don't get kind of a black and white, yes/no, it's not that kind of question, I suppose. So, you can't, in a way, you can't really expect to get 'an answer', just you know, typing and, there's 'your answer'! You need to kind of look around a little bit more than that and try to put a picture together. (Informant # 37)

Ultimately, underpinning the incompleteness and imperfection in knowing practices and in their results, i.e. knowledge, there was not only the principle of least effort⁴¹, commonly found in the business environments. There was mainly the inherent imperfectness of the available inputs. Even using the input classified as the 'best' by informants, these 'best' inputs were not completely helpful. Knowledge workers were aware that such 'best' inputs are not sufficient to completely help their knowing in an input-encountering moment. Therefore, they used complementary inputs to make the complementary interpretive movements.

⁴¹ The principle of least effort is related to choosing the path of least resistance or of least required effort to perform an activity.

Therefore, the results of a knowing work can be seriously affected by the constraints outlined above. The key issue is whether such constraints excessively affect the created knowledge, increasing the potential risks of business decisions taken on the basis of it.

5.3 Uses of Knowledge for Knowing

The inputs used were based on the explicit dimension of knowledge that was formally articulated in some kind of object, such as a report or an article, and also on the tacit dimension of individuals' knowledge⁴². Therefore, the following themes show how inputs based on tacit and explicit dimensions of knowledge were used to help knowledge workers create meaning in their specific knowing situations.

5.3.1 Tapestry of Inputs

A tapestry of inputs means the set of diverse inputs used by knowledge workers to help them create the meaning in a single input-encountering moment. By 'tapestry' is meant the fact that the diverse inputs were *not only added one to the other, but they were rather interlaced, or interwoven as a complex whole*, one enabling the use of the other and synergizing in the generation of the answers needed for questions. The use of one 'best' input might have led to the use of another, and the meaning constructed in using one input might have led to use another input. This interrelated characteristic of the inputs uses in knowing led more to an analogy of a tapestry than to a combination of inputs. The 'tapestry' characteristic can be evidenced by the informants' quotes presented in Section '5.2.1 Synergistic, Emergent and Leaping Movements'.

The tapestry of inputs results from the main and complementary movements. It is an intricate combination of inputs (the 'best' and 'complementary' inputs) to help creating meaning in an input-encountering moment. Knowledge workers were aware that meeting

⁴² This research did not adopt a dichotomized perspective to knowledge, and it did not consider knowledge as two categories, types or different kinds of knowledge, as it was suggested by scholars such as Nonaka and Takeuchi (1995), Hedlund (1994), Nonaka (1994), Leonard and Sensiper (1998), Pan and Scarbrough (1999), Bolisani and Scarso (2000), and Roberts (2000).

their needs in their knowing situations was more like an intellectual jigsaw puzzle in which they interpreted varied inputs together⁴³. For most of the time, the ‘best’ inputs they used for their situated critical questions could not solely generate the needed answers. When assessing the helpfulness of inputs, it was often related the fact that the ‘complete helpfulness’ was given by a combination of inputs, rather than by just a single one or by the ‘best’ input.

An illustration of this issue was provided by informant 2. To answer a critical question, he used an input from the press. He highlighted that this was only one voice among others equally important for meaning creation.

The press is just one voice, but then several press articles will give you more voices, internal we would have another voice. And then, if you do a survey of voices, you understand what the issue is. So, without press we couldn’t do that as easily, without internal, without our consultants we couldn’t do that as well, and without, us, the brains to put it together, we couldn’t ask that question. (Informant # 2)

Informant 7 also emphasized that the input he used was only a piece of a jigsaw puzzle.

...one piece of each of these puzzles...it is not the whole jigsaw.... they are component parts. They relate to each other which allowed us to refine an appreciation of the overall picture. One piece in isolation doesn’t allow that. (Informant # 7)

The synergy generated by using knowledge-based inputs based on the explicit and tacit dimensions of knowledge was clearly evidenced by informant 24. His ‘best’ input was based on his and his colleagues’ business-related knowledge in a specific input-encountering moment. When asked about what prevented the ‘best’ input to be completely helpful the informant explained that his and his colleagues’ knowledge should be considered together with the psychology theories, and the work methodology developed by his organization. It was important for his knowing to interweave personal, collective and organizational knowledge in order to make meaning in a specific input-encountering moment:

It is not just the business knowledge on its own, but the business knowledge in combination with the other stuff, the psychology and the methodology, that makes that what it is. But, it’s also [mine and my colleagues’] business knowledge that

⁴³ The focus on the ‘best’ input used in an input-encountering moment was a methodological choice in order to explore a specific and significant moment of sense-making by using the most important input for the informant. Despite this, in informants’ narrative they naturally referred to the other inputs as complementary ones in a single input-encountering moment.

makes it different to another piece of research. So, it's what adds the most value in the way it is, but it's not on its own. You know, you need to package. (Informant # 24)

Similar findings of combined uses of inputs were obtained by Werr et al. (1997) and Werr and Stjernberg (2003).

5.3.2 How Inputs are Defined by Knowledge Workers

Sense-Making Methodology explicitly mandates critical attention to the common use of the term 'information', because it has been commonly used "to describe the observations of experts" (Dervin, 1999, p. 738), disregarding the perspective of the users. In this sense, the term 'information' has meant an "absolute information" or "objective information", because it does not consider the users' actions in relation to it. This isomorphic conceptualization privileges the product or the outcome of knowing, rather than the process of its creation by individuals. As such, this approach typically describes and predicts a fixed reality, that can be described *independently of the users*^{xxxiii} (Dervin, 2003a/1980, p. 31).

Given this, Sense-Making studies have constantly evidenced that what individuals consider as 'information' commonly is not what the experts, systems or institutions consider as 'information'. Dervin and Reinhard (2006, p. 9) found that "people use information in many ways that systems have traditionally labeled non-informative".

Considering the above, inputs used by knowledge workers were not necessarily what have been commonly considered as information, i.e. as something that is defined as information by others than its own users. What knowledge workers used as inputs included gut-feeling, others' experience, opinions and insights, own experience, intuition and inputs from documents as well, such as a report or news.

Informant 4 pointed out that she also had to access subtleties related to the issue in her critical question. In this sense, 'information' was something she could obtain by talking with people or 'word-of-mouth':

Because you can get the hard stats on some of them [issues] but not all of them. But for the little softer questions there might be little subtle nuances that you can't get from a document. Also, people don't tend to put the bad things in documents, or to put them in a public place. You need to speak to someone. So, word-of-mouth was probably the only way we could get that information, from learning from each other. (Informant # 4)

The continuous flow of good quality manuscripts on a specific topic together with the informant's experience in the industry triggered the sensing of a business opportunity by informant 5. When asked how he identified that the input would be helpful in explaining the potentiality of a specific market, he explained that he knew the topic by drawing on his own knowledge. Second, he observed the flow of good manuscripts, and he used his experience in the field as well. Thus, what was 'information' for him was not the manuscripts themselves, but rather their continuous flow and their quality, which together worked as the inputs for the creation of meaning related to the potentiality of a new market.

I knew that in order for them [the executive board] to understand how bioinformatics is influencing scientific areas, life sciences, I had to show them. The only way to show them was to find articles where bioinformatics was having an effect.

By talking with her colleagues and identifying their needs in relation to the market report she was developing, informant 28 could use this input to help her prioritize and define a scope for her work. Thus, the input was based on the explanation of her internal customer's needs in a specific point in time.

Because they could provide me what they want to know. They would tell me 'ok, I'm working in the car industry, but what I want to know is this', and 'I want to have it presented in this way, because I don't do it in different way'. So, they would help me to get from the total structure of the market and from all the general information, those problems which interest them in this particular moment in time. (Informant # 28)

The findings showed that the distinction that is typically made by experts in relation to what is and what is not 'information' or 'knowledge' is not reflected in the knowledge workers' world. Information or knowledge for them is anything that helps them to construct meaning, that informs them, and that enables and supports their knowing. Inputs were what knowledge workers defined as being.

5.3.3 Similar and Past Experiences in Using Knowledge

Some of the reasons that led knowledge workers to use one input in favor of the other included their or other individuals' past experience with similar inputs, and the use of similar inputs in similar knowing situations.

The knowledge workers' past experience with the same kind of input was found valuable because:

- (a) They knew that the input was the only one available or usable; they knew by experience that the inputs were useful.
- (b) They knew by experience that the authors of reports were naturally well informed (e.g. industry analysts).
- (c) They had previous experience with the inputs in other work projects, they knew about other individuals' experience in using similar inputs (e.g. by asking colleagues).
- (d) They had explicit feedback from colleagues in terms of their experience in using similar inputs.

An illustration of the current theme is the description given by informant 2 when he was asked about what led him to use a specific input.

Experience. We knew that the bank of international settlements measure the size of products. I mean, we learn that through our degrees, through education, through experience. And, obviously, when I probably joined the company someone told me that, so it's just something that if you're working in industry, you know these names. (Informant # 2)

Similarly, some other informants used their personal or professional experience to identify that a specific input would be helpful for their meaning creation in an input-encountering moment.

Part of it is personal experience, because I used to be an analyst. So, I know very well how analysts' reports work and I know the kind of questions analysts ask, and I know the type of insight that they are privileged to have. (Informant # 21)

The similar experiences in using specific inputs were considered valuable by knowledge workers. At the same time it was found that knowing and knowledge uses are unplanned actions that occur in the unfolding of the sense-making process. Habitual (the similar experiences) and new knowing movements (the unplanned nature) coexist. This is a core assumption in Sense-Making Methodology, which was clearly evidenced by the findings of the present study. The findings are also in line with Polanyi's explanation that in understanding a verbal communication of knowledge, individuals often rely on "previous understanding of similar experiences" (Polanyi, 1969, p. 188).

The access to similar experiences related to knowing and use of knowledge (inputs) situations was shown to be important for knowledge workers in their knowing work.

Implications of this are mainly related to organizations enabling and facilitating in a greater extent, the access to their professionals' specific experiences by means of human and technology-based systems. It was shown that the uses of other individuals' similar experiences can help the knowing work. These uses may probably enrich the quality of the knowledge created. Therefore, the present issue is a very significant one if the objective is to improve the venues for a high quality knowing work and its results.

5.3.4 Using the Knowledge within Organizations

Knowledge workers tried to use knowledge that has been already created inside their own organizations and departments. The knowledge in their organizations and teams (collective knowledge) were important inputs to their knowing practices, although they reported that sometimes it was difficult to access this knowledge. Therefore, equally important as the knowledge that is external to the organization (e.g. reports written by analysts), internal knowledge played an important role as an input to the construction of knowledge^{xxxiv}.

The empirical findings showed how knowledge workers needed and used internal created knowledge as inputs for their knowing work. The need to access and use the knowledge created in previous work was highlighted by informant 14 when answering the 'magic-wand' question:

To use the [internal] experience you really got to have good information fed forward from previous projects. A lot of it tends to be in people's minds, but you also use previous project plans and information thing. So, I suppose the improvement I'd use with my magic wand would be getting better information from the previous projects in a bit run. (Informant # 14)

Accessing the internal knowledge was emphasized and considered as key by informant 29. He used internal experts' knowledge to understand what was possible in terms of using a specific technology. This case clearly illustrated the reuse of internal knowledge to help create new one.

One of the key things you want to understand is what's been done before. You know, either within the wider world or within your own organization... We needed to understand who has done what before. Who within this organization knew something about this. (Informant # 29)

Informant 12 used his colleagues' knowledge in similar projects, with the purpose of understanding what kind of text documents could be easily captured by the technology he was studying. In this case, he tried to identify if any of his colleagues had done something similar or related to what he was doing, and that could also be used as a building block in his own project.

The use of knowledge within the knowledge workers' organizations has been a topic highly discussed in research and corporate fields, and it is a significant aspect of knowing work. The knowledge to be created can be benefited from the appropriate access and communication of the knowledge that had already been constructed in the organization. This may reduce the risk and the costs of reinventing the wheel and recreating knowledge instead of investing in generating new insights from a more mature starting-point.

5.3.5 The Need for Integrated Provision of Inputs

Knowledge workers would like to have inputs *spatially integrated*, in order to enable them to have *physical access* to inputs in one single place. Their demand for having inputs integrated was not only related to explicit-knowledge based inputs being integrated in relation to their physical availability (everything in one place). It was also in relation to the inputs content. Both needs for integration – physical and content-based – were situated. The integrations were expected to be done in relation to the meaning creation situations that knowledge workers were in, i.e. in relation to their specific input-encountering moments.

To exemplify the integration on the level of the physical access, quotes from informants 8 and 35 are shown below. When answering the magic-wand question, they preferred to have all sources of inputs in one single physical space.

The magic wand would be a comprehensive list of every production plant in the world, and all the detail about gas composition and production rates. But, that just wasn't all in one place. (Informant # 8)

If I had a magic wand I would ask that it [the technical reports] to be produced in the format that I needed an answer, than give me like tons of archives to swift through in order to find and aggregate the information that I needed. (Informant # 35)

The informants also manifested the need to integrate explicit-knowledge based inputs on the basis of their content. In this case, knowledge workers demanded content to be


integrated in relation to the meaning they were creating, i.e. to the situated questions and helps they needed in an input-encountering moment. Under these circumstances, informants expressed that they would like to have pieces or parts of explicit-knowledge-based inputs integrated.

It would be easier if all the information, or a summary, of the equipment performance was available on one sheet, because that would have saved a lot of time. (Informant # 1)

What would have been very helpful would have been someone to get all the information, put it into one place and give it to me. Rather than me having to get on, and finding and research it, analyze it, and synthesized it into all those messages that I had to give. (Informant # 23)

Overall, knowledge workers needed to get integrated inputs to ease their knowledge creation process. The physical and content-based integration were related to the specific creation of meaning they were focused on in a specific knowing situation. Thus, this need may be accounted for in the creation of approaches to facilitate the communication of knowledge. Integrating inputs presents a challenge to the knowing work, because the need for inputs is rooted in situated meaning creation acts, rather than content-based criteria only. Thus, integration strategies should also consider situated meaning creation acts to make knowledge available in consonance with how it is needed and used for the creation of meaning.

CHAPTER 6: THE KNOWING SITUATIONS IN KNOWING WORK: A QUANTITATIVE PICTURE



I beg you: do not take
your secret from me
by revealing it.

The riddle is not its answer.
The forest is not the sum of the trees. The
forest
is deep. The fields need
their water, but also
their darkness.

Gösta Ågren
(*Finnish poet*)

6.1 Introducing

The previous chapter provided a qualitative picture of the situational creation of meanings in the knowing work practice. The present chapter elaborates the above findings by specifying the characteristics of knowing situations and how meanings were created. A knowing situation incorporates the most frequent focus of knowledge creation (situation focus) that occur within the knowing situation, the critical questions that are needed to be answered by inputs, the helps that are needed to be got by using the inputs, the sense-making movements or verbings that are performed, and the inputs-communicators that are used. These components form what the present study refers to as the ‘knowing situations configurations’.

The configuration of a specific knowing situation is anchored in the situation descriptive focus (SDF). A specific knowing situation shows the possibilities of how meaning is created when a specific focus is guiding the knowledge creation practice. This is done by looking at the most frequent critical questions, inputs, verbings, and helps, and co-occurrences between questions and helps. The configurations of the five knowing situations revealed the important interlocking pieces or building blocks that were used by the present study to propose a different way of communicating knowing needs and knowledge (by human and technological systems).

The present chapter reports quantitative findings that evidence the characteristics and dynamics of knowing work as sense-making phenomena. The primary aim is to answer research questions 1, 2.1, 2.2, 2.3, and 2.4, by exploring how knowing is performed in practice, how its situatedness is brought to life, and how the knowing situations are configured. Thus, the findings reveal how the knowing situations were distinctly composed in terms of the critical questions asked (how knowledge workers articulated their gaps), the helps needed by knowledge workers, inputs, and the verbings used to create meaning.

In the beginning of this chapter, the occurrences and co-occurrences of the variables in the knowing situations are presented, and subsequently, each knowing situation was shown in its complete configuration as a diagram. This presentation of the complete configuration of a knowing situation is comprised of the questions that knowledge workers had, the help they needed, the actions they took to get answers to these questions (verbings), and the inputs communicators they most frequently used.

6.2 The Presentation of the Findings

The data analysis process and the findings reported in the following sections were focused on informants' narratives in relation to the Sense-Making Methodology metaphor (Figure 7, on page 134), and the data analysis was informed by SMM.

The findings are reported in relation to each of the main elements of the sense-making phenomena: the situations, the gaps (which were articulated as questions), the bridges (which components – the bricks - are the inputs), the verbings and the helps. For each of these elements of the sense-making phenomena, the research findings were reported on the following levels:

(a) The distributions of variables (SITUATION, CRITICAL QUESTION, INPUT COMMUNICATOR, VERBING and HELP) across all the units of analysis. Depending on the variable, the units of analysis were the informants-in-situation (n=36), or the input-encountering moments (n=100).

(b) The distributions of variables (SITUATION, CRITICAL QUESTIONS, INPUT COMMUNICATOR, HELP, and VERBING categories) in each of the 5 knowing situations found in the study.

(c) The distributions of the co-occurrences between CRITICAL QUESTION ENTITY and HELP, and CRITICAL QUESTION ATTRIBUTE and HELP categories in each of the 5 knowing situations.

(d) The configurations of the 5 knowing situations were graphically showed to illustrate how all the variables categories occurred in each knowing situation. These complete configurations were comprised of the findings presented in (b) and (c).

Discussions of the implications of the quantitative results are presented in Chapter 7.

Similar to Chapter 5, the findings are illustrated with some quotations taken from interviews. To facilitate reading, the findings, the variables, and their categories were all capitalized to distinguish them from the normal text, but in the discussion chapter this procedure was not applied. When referring to the variables and their categories in plurals only the letter 's' (e.g. CRITICAL QUESTION ENTITYs) was added instead of changing the

form of the word. Finally, numerical values were presented as numerals, and the symbols # and % were used instead of ‘number’ and ‘percentage’.

6.3 Situations

6.3.1 Findings

The analysis of the SITUATION DESCRIPTIVE FOCUS (SDF) in the 36 transcripts resulted on 5 main SDF categories as explained in Table 4 below. In terms of creating knowledge for business, the 5 knowing situations that were identified by the present study essentially included the main aspects of knowledge that are important for a business.

The Categories of the Variable

The informants’ descriptions of their knowledge creation situations were clearly stated and they did not include more than one focus in their descriptions. When they extended or narrowed down the description of their situations, this was made merely to clear or to make the background of the knowing situation more explicit, rather than to generate competing descriptions of situations. Additionally, there were no missing answers to the question that generated the descriptions of the knowledge creation situations.

Each informant-in-situation was coded to one category only. Table 4 below shows the definitions and some of the quotes that illustrate the respective SDF macro category.

Hereafter, the SDF categories are called as SITUATION (e.g. SITUATION 1 - Business Course of Action and Feasibility). SITUATION is what is referred to as a knowing situation.

SITUATION (SITUATION DESCRIPTIVE FOCUS) (EACH UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNITS OF ANALYSIS: INFORMANTS-IN-SITUATIONS, n= 36)			
CATEGORY NUMBER	SITUATION CATEGORY	GENERAL DEFINITION	EXAMPLES
Each category includes those knowledge creation situations in which knowledge workers were challenged or demanded to create knowledge that was primarily focused on			
SDF 1 (SITUATION 1)	BUSINESS COURSE OF ACTION AND FEASIBILITY	<p>The aspects related to the future directions or course of actions of a business, to the pathways and actions made or that should be made in order to get from one point to the other in terms of a business performance or its competitiveness; and also the creation of knowledge focused on aspects related to the feasibility⁴⁴ of businesses, products, services or business ideas.</p> <p>(This category is related to any level of granularity: business strategies or feasibility studies for groups of organizations, for a single organization, for products/services, projects, ideas, events, actions, decisions, processes, or for any specific businesses divisions (e.g. departments, business units) or organization processes (e.g. sales, logistics).</p>	<p>- ...so, I went away and spent about 4 months putting together a complete plan for what I wanted to do, how... (Informant # 5)</p> <p>- developing a business plan for our office in the Middle East, and so...the customer was in effect, our board, and the output was a plan which allowed them to make decisions about investing time, efforts and money, into the region. (Informant # 9)</p> <p>- ...this is preparing a proposal for a new launch, for a new journal based in New York". "8 page document that summarizes all the findings, goes in front of the board and the board then decides whether that's a valid enough justification for a lunch or not. (Informant # 25)</p> <p>- That was the natural gas vehicle. So, started as a feasibility study. We got the customer involved in the feasibility study and then, out of this score, we then, try to make recommendation; we tried to influence them to actually invest in a technology development program. (Informant # 25)</p>

⁴⁴ Feasibility studies are the analysis of the feasibility or potentiality of an idea, project, product or business.

SITUATION (SITUATION DESCRIPTIVE FOCUS) (EACH UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNITS OF ANALYSIS: INFORMANTS-IN-SITUATIONS, n= 36)			
CATEGORY NUMBER	SITUATION CATEGORY	GENERAL DEFINITION	EXAMPLES
<p>SDF 2 (SITUATION 2)</p>	<p>COMPETITION and INDUSTRY DYNAMICS</p>	<p>The structure, modes of operation, issues and forces that influence, shape, drive an industry⁴⁵/sector (e.g. automotive, air transport, energy) operation, functioning, performance, competitiveness, changes and events; and also on the aspects that drive the actions of organizations (e.g. innovations and investments) in an industry/sector.</p>	<p>- So, where we're going to be behind the competition, where we're going to be ahead of the competition, where we would be pairing with the competition, was the competition moving off in different directions that we felt we needed to follow at the same time, or not as a case maybe. So, that, sort of, became the analysis piece. (Informant # 6)</p> <p>- ...to do an environmental scan, to look at all our competitors, to look what they're, you know, their competitive advantage, what their competitive advantages are, looking at their strengths, doing a SWOT analysis on these companies. (Informant # 15)</p> <p>- So, it was a presentation on [company A]. Which is an interesting competitor for us because, we compete against them very often, they are the largest in the industry, in the services business. (Informant # 21)</p> <p>- ...what they actually asked me to do was to get together a proposal, to get together a presentation, comparing and contrasting different education systems around the world. (Informant # 23)</p>
<p>SDF 3 (SITUATION 3)</p>	<p>ORGANIZATIONS, MANAGEMENT and OPERATIONS</p>	<p>Organizations structure and functioning (internal), on how organizations operate and are managed, on how the business is conducted on different aspects and levels; and on the execution and flow of the work processes (formal and informal processes).</p>	<p>- ...what we really explored on there, is...really what, what's your way to work here. When we were trying to get into it, it's the sort of motivational feelings and so, emotional feelings, the reality of what it is like there. (Informant # 24)</p> <p>- ...the creation of a...a balance scorecard for a client to measure their... the performance of their IT. (Informant # 29)</p> <p>- ...we needed to understand very early on was what the main workflow was in the organization." " we wanted to find out where the crucial information pinpoints were, in that process, where were people really dependent on information. (Informant # 31)</p>

⁴⁵ Industry: the concept of industry adopted in this study is the following: "A group of productive or profit-making enterprises or organizations that have a similar technological structure of production and that produce or supply technically substitutable goods, services or sources of income" (Webster Third New International Dictionary, p. 1156). Munir & Philips (2002, p. 281) explained that industry is "a group of firms that produce close substitutes", which is a concept originated in industrial organization economics.

SITUATION (SITUATION DESCRIPTIVE FOCUS) (EACH UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNITS OF ANALYSIS: INFORMANTS-IN-SITUATIONS, n= 36)			
CATEGORY NUMBER	SITUATION CATEGORY	GENERAL DEFINITION	EXAMPLES
SDF 4 (SITUATION 4)	MARKETS and CUSTOMERS (internal or external customers)	A specific market ⁴⁶ , on the consumption behavior and supplying process that occur within it, and on internal or external customers (internal or external to the knowledge worker's organization) or stakeholders ⁴⁷ .	<p>- ... gather as much information as we can about the market, so, it was about a specific product, in an investment bank, which they trade. (Informant # 2)</p> <p>- So, we would start with undertaking a review of, basically, what our customers thought about products in each of our different product area, areas." " we would talk to heads of product development, business development, training, sales, marketing, and gather their views on the market, what they thought about us. (Informant #27)</p> <p>- ... we started to analyze what the clients told us, what they want for this particular application. (Informant #14)</p>
SDF 5 (SITUATION 5)	PRODUCTS, SERVICES and SOLUTIONS [short version: products and services]	Products, services, tools, systems, equipments, technologies, and solutions that are created, supplied or made available in a market (by any of the organizations in it) to fulfill the customers' needs and to help solve their problems.	<p>- ... get hold of the software, to try it out on their terminology, employing, uses cases of what they would use it for. And to assess the performance and then, to write reports and to give a presentation on my findings. (Informant # 11)</p> <p>- ... It was to look at a competitor's drug with the.....one of their drugs that is progressing through development, is a drug that is targeting 5 age D to C receptors in the brain" " we were getting a view of what the competitive landscape was. (Informant # 22)</p> <p>- I had to...do the survey of what's out there, what are the existing knowledge sharing tools, come up with... what are the theories of knowledge sharing and then, use the existing state-of-the-art andother research. (Informant # 12)</p>

Table 4 : The DESCRIPTIVE FOCUS OF SITUATION (SDF) coding categories and their definitions.

These SITUATION categories were the point of departure for the subsequent analysis of the other variables. The identification of what happened and how it happened in a knowing

⁴⁶ Market: the concept of market adopted in this study is the following: "A sphere within which price-making forces operate and which exchanges in title tend to be followed by actual movement of goods; a formal organized coming together of buyers and sellers of goods" (Webster Third New International Dictionary, p. 1383).

⁴⁷ Stakeholders: anyone in an organization that have a stake of it, which can capital or only labor. Stakeholders include shareholders, employees, directors, suppliers, government, and the community.

practice were identified and analyzed in situation. Thus, the CRITICAL QUESTIONSs, VERBINGs, INPUT COMMUNICATORs, and HELPs were understood in situation. Then, coherently with the research questions and the design of the data collection, the knowing practice was explored and analyzed in the context of the knowledge creation situations. This implies that the SITUATION categories are the fundamental structure to which the knowing practice and its variables were attached to.

The findings reported as follows show the distributions of the SITUATION categories across two units of analysis: informants-in-situation (n=36), and input-encountering moments (n=100). Both units of analyses were coded to one category only and they were presented with the purpose to give a complete picture regarding each knowing situation.

Distribution of the Variable Categories across the 36 Informants-In-Situation

The unit of analysis was informants-in-situation (n=36), and each unit was coded to one SITUATION category only. The distribution of the SITUATION variable categories across this unit of analysis is presented in Table 5.

SITUATION CATEGORIES # (SITUATION DESCRIPTIVE FOCUS)	SITUATION (EACH UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS = INFORMANTS-IN-SITUATION, n=36)	% INFORMANTS-IN-SITUATION (n=36)
SITUATION 1 (n=6)	BUSINESS COURSE OF ACTION AND FEASIBILITY	16.7%
SITUATION 2 (n=7)	COMPETITION & INDUSTRY DYNAMICS	19.4%
SITUATION 3 (n=6)	ORGANIZATIONS, MANAGEMENT & OPERATIONS	16.7%
SITUATION 4 (n=9)	MARKETS & CUSTOMERS (internal and external)	25.0%
SITUATION 5 (n=8)	PRODUCTS, SERVICES & SOLUTIONS	22.2%
TOTALS		100.0%

The highest value is highlighted with bright yellow
The second and third highest value are highlighted with pale yellow

Table 5 : Percentage distribution of SDF categories across informants-in-situation (n=36).

The most frequent knowing SITUATION was SITUATION 4 (Market and Customers), which had a focus on creating knowledge related to markets, the consumption and supplying processes and customers (25.0%). The second most frequent category was SITUATION 5 (Products, Services and Solutions) (22.2%) (Table 5). This SITUATION

category had a focus on situations that were challenging informants in creating knowledge related to products, services, solutions and technologies.

The third most frequent was SITUATION 2 (Competition and Industry Dynamics) (19.4%) (Table 5). This SITUATION category is related to understanding the dynamics and the issues of competition and the industry.

The Distribution of the Variable Categories across the 100 Input-Encountering Moments

The unit of analysis was the *input-encountering moments* (n=100) that occurred within the 36 informants-in-situation. Again, each unit was also coded to one SITUATION category only.

SITUATION CATEGORIES # (SITUATION DESCRIPTIVE FOCUS)	SITUATION (EACH UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS = INPUT-ENCOUNTERING MOMENTS, n= 100)	% INPUTS-ENCOUNTERING MOMENTS (n=100)
SITUATION 1 (n=16)	BUSINESS COURSE OF ACTION AND FEASIBILITY	16.0%
SITUATION 2 (n=18)	COMPETITION & INDUSTRY DYNAMICS	18.0%
SITUATION 3 (n=15)	ORGANIZATIONS, MANAGEMENT & OPERATIONS	15.0%
SITUATION 4 (n=22)	MARKETS & CUSTOMERS (internal and external)	22.0%
SITUATION 5 (n=29)	PRODUCTS, SERVICES & SOLUTIONS	29.0%
TOTALS		100.0%

The highest value is highlighted with bright yellow
The second and third highest value are highlighted with pale yellow

Table 6 : Percentage distribution of SDF categories across input-encountering moments (n=100).

The findings showed that across all the input-encountering moments (n=100) the dominant situation was SITUATION 5 (Products, Services and Solutions) (29%). This SITUATION category is related to knowing situations in which knowledge workers to create knowledge related to products, services, solutions and technologies (Table 6 above).

Secondly in prominence was SITUATION 4 (Markets and Internal or External Customers) (22.2%), which was a knowing situation in which knowledge workers create knowledge about markets and customers. The third most frequent SITUATION informants

created knowledge was related to the dynamics and issues of competition in an industry or sector (18%) (Table 6).

6.4 Gaps (Critical Questions)

6.4.1 Findings

The unit of analysis for the CRITICAL QUESTION ENTITY, CRITICAL QUESTION ATTRIBUTE, and CRITICAL QUESTION INTERROGATOR was the input-encountering moments (n=100). Each unit of analysis was coded to only one category.

Each input-encountering moment had a specific and unique critical question. A critical question is comprised of its respective CRITICAL QUESTION ENTITY (n=100), CRITICAL QUESTION ATTRIBUTE (n=100), and its CRITICAL QUESTION INTERROGATORS (n=100). Therefore, there are 100 combinations of CRITICAL QUESTION ENTITY with CRITICAL QUESTION ATTRIBUTE and with CRITICAL QUESTION INTERROGATORS. Considering the purposes of this research, the reported findings were made for each of the variables.

The iteratively coding of the critical questions informants had generated 7 categories for CRITICAL QUESTION ENTITY, 11 categories for CRITICAL QUESTION ATTRIBUTE, and 6 categories for CRITICAL QUESTION INTERROGATOR (Table 7, Table 10, and Table 13). These macro categories are presented and defined in the tables below.

6.4.1.1 Critical Question Entities

The CRITICAL QUESTION ENTITIES (CQENT) categories are explained in Table 11, as follows.

The Categories of the Variable

CRITICAL QUESTION ENTITIES (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	CRITICAL QUESTION ENTITY CATEGORIES <i>(human, non-human, objects, conditions, events, situations, actions, processes)</i>	GENERAL DEFINITION	EXAMPLES
Each category of critical-question-entity is defined as knowledge workers' questionings being primarily about and focused on			
CQENT 1	THEORETICAL AND ORGANIZATIONAL KNOWLEDGE	Focused on theories, models, concepts, and also on knowledge that has been created within the organization.	<ul style="list-style-type: none"> - <i>What are the theoretical fundamentals that explain [the topic]? What is grounding the design of this system? (Informant # 1)</i> - <i>What is the meaning of the researches findings? (Informant # 24)</i> - <i>How do the statistical methods work to analyze this? How do the appropriate methods work? (Informant # 10)</i> - <i>What had our team already done related to this? What knowledge did our team already construct in relation to this? (Informant # 4)</i> - <i>We had to figure out what we knew already. (Informant # 4)</i> - <i>Who I can turn to if I got problems. (Informant # 12)</i>
CQENT 2	MARKET AND CUSTOMERS <i>(internal or external to organizations)</i>	Focused on a specific market as a whole (e.g. lubricants, biotechnology), on the consumption, expenditure, supplying process that occur in it; and on internal or external customers.	<ul style="list-style-type: none"> - <i>What are the market demands? What does the market want to buy? (Informant # 9)</i> - <i>How is this market structured? (Informant # 28)</i> - <i>How much the market will spend or invest on consultancy? (Informant # 38)</i> - <i>Why the (internal) customers need this? (Informant # 11)</i>
CQENT 3	PRODUCTS, SERVICES AND SOLUTIONS <i>(existing or to be created)</i> [short version: products and services]	What is made available, offered, exchanged or traded in a market between organizations and their customers (internal and/or external to the organization), or between organizations and their suppliers; or what can be created and offered to customers in a specific market in order to fulfill their needs. This category includes technologies, tools, systems and tangible (e.g. project) or intangible solutions (e.g. consultancy)	<ul style="list-style-type: none"> - <i>On what or against what does this drug act? What does this product do? (Informant # 22)</i> - <i>What are the possible configurations or the composition that this product may have? (Informant # 25)</i> - <i>What are the technologies used for managing performance measurement? (Informant # 8)</i> - <i>What are the key problems and limitations with existing systems? (Informant # 6)</i>

CRITICAL QUESTION ENTITIES (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	CRITICAL QUESTION ENTITY CATEGORIES <i>(human, non-human, objects, conditions, events, situations, actions, processes)</i>	GENERAL DEFINITION	EXAMPLES
CQENT 4	ORGANIZATIONS AND MANAGEMENT	<p>Organizations as institutions, structures or systematic combinations of people, processes and resources; or on the processes of conducting or running a business.</p>	<ul style="list-style-type: none"> - <i>How are they structured to deal with possible issues? (Informant # 6)</i> - <i>What capabilities are needed to deliver the standards / benchmark? (Informant # 16)</i> - <i>How is the operation of this company? (operations, operational aspects) (Informant # 35)</i> - <i>What is the culture of this organization? (Informant # 37)</i> - <i>What is the organizational structure of this company? (Informant # 35)</i> - <i>What is the focus of this company? What areas, business or market is it focusing on? (Informant # 26)</i> - <i>What are the weaknesses of this company? (Informant # 3)</i>
CQENT 5	RESULTS (existing or potential)	<p>Existing or potential (that were not generated yet) qualitative and intangible results (e.g. better leadership), and also the quantitative ones (e.g. sales increase).</p> <p>This category includes but it is not limited to financial and tangible results.</p>	<ul style="list-style-type: none"> - <i>What made it profitable? What are the drivers of profitability? (Informant # 4)</i> - <i>What is its operating performance? (Informant # 1)</i> - <i>What made implemented services to be successful? (Informant # 4)</i> - <i>What will lead to and keep success? (Informant # 13)</i> - <i>How do the performance factors work together? (Informant # 37)</i> - <i>What are the potential blockers / hinders to success? (Informant # 13)</i>
CQENT 6	INDUSTRY AND COMPETITIVE ENVIRONMENT	<p>The external environment in which organizations operate and make business (industrial sector, such as pharmaceuticals), and the context in which organizations compete against other organizations and supply products or services to its market.</p>	<ul style="list-style-type: none"> - <i>How does this industry/sector work? (Informant # 13)</i> - <i>Which are the problematic challenges in the industry? (Informant # 2)</i> - <i>How differentiation has been achieved? How they (customer services) have differentiated themselves? (Informant # 6)</i> - <i>Which competitive threats are worrying this company? (Informant # 21)</i> - <i>What are the global suppliers / sources? (Informant # 8)</i> - <i>What will be the potential / future developments / investments on infrastructure? (Informant # 8)</i>

CRITICAL QUESTION ENTITIES (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	CRITICAL QUESTION ENTITY CATEGORIES <i>(human, non-human, objects, conditions, events, situations, actions, processes)</i>	GENERAL DEFINITION	EXAMPLES
CQENT 7	CHANGES AND TRENDS	The changes, movements or developments that can occur (e.g. growth, shrinking) and on their directions; or on the events which are inferred as being probable to happen.	<ul style="list-style-type: none"> - <i>What are the future trends / scenarios? (Informant # 37)</i> - <i>How is it growing or shrinking? (direction of movements) (Informant # 21)</i> - <i>How the changing business models are affecting this company? (Informant # 21)</i>

Table 7 : The CRITICAL QUESTION ENTITY (CQENT) coding categories and their definitions.

The Distribution of the Variable Categories by Situations

The unit of analysis of the CRITICAL QUESTION ENTITY was the input-encountering moments (n=100). Each unit was coded to only one category.

CRITICAL QUESTIONS ENTITIES (n=100) (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)								
CQENT1	CQENT2	CQENT3	CQENT4	CQENT5	CQENT6	CQENT7		
THEORETICAL & ORGANIZATIONAL KNOWLEDGE	MARKET & CUSTOMERS (internal or external to organizations)	PRODUCTS, SERVICES & SOLUTIONS (existing or to be created)	ORGANIZATIONS & MANAGEMENT	RESULTS (existing or potential)	INDUSTRY & COMPETITIVE ENVIRONMENT	CHANGES & TRENDS		
OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION	UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS) (N=100)	
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	0	8	4	0	3	1	0	16
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	0	0	8	3	0	6	1	18
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	1	2	2	6	4	0	0	15
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	0	7	10	2	0	1	2	22
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	10	3	13	0	2	0	1	29
% TOTAL	11	20	37	11	9	8	4	100
TOTAL	11%	20%	37%	11%	9%	8%	4%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 8 : Distribution of the CRITICAL QUESTIONS ENTITY (n=100) categories across all the input-encountering moments (n=100) of the knowing SITUATIONS.

Across all the input-encountering moments (n=100), knowledge workers' questionings were mostly focused on entities related to existing or to-be-created products, services, technologies, solutions, or tools (CQENT3, 37.0%). This was followed by questionings about entities related to markets and customers (CQENT2, 20.0%) (Table 8).

CRITICAL QUESTIONS ENTITIES (n=100) (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)									
	CQENT1	CQENT2	CQENT3	CQENT4	CQENT5	CQENT6	CQENT7		
	THEORETICAL & INTERNAL KNOWLEDGE	MARKET & CUSTOMERS (internal or external to organizations)	PRODUCTS, SERVICES & SOLUTIONS (existing or to be created)	ORGANIZATIONS & MANAGEMENT	RESULTS (existing or potential)	INDUSTRY & COMPETITIVE ENVIRONMENT	CHANGES & TRENDS		
UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS) (N=100)	% OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION / UNITS OF ANALYSIS IN EACH SITUATION	% OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION / UNITS OF ANALYSIS IN EACH SITUATION	% OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION / UNITS OF ANALYSIS IN EACH SITUATION	% OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION / UNITS OF ANALYSIS IN EACH SITUATION	% OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION / UNITS OF ANALYSIS IN EACH SITUATION	% OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION / UNITS OF ANALYSIS IN EACH SITUATION	% OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION / UNITS OF ANALYSIS IN EACH SITUATION	% OCCURRENCES OF THE QUESTION ENTITY IN THE KNOWING SITUATION / UNITS OF ANALYSIS IN EACH SITUATION	TOTAL
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	16	0.0%	50.0%	25.0%	0.0%	18.8%	6.3%	0.0%	100%
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	18	0.0%	0.0%	44.4%	16.7%	0.0%	33.3%	5.6%	100%
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	15	6.7%	13.3%	13.3%	40.0%	26.7%	0.0%	0.0%	100%
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	22	0.0%	31.8%	45.5%	9.1%	0.0%	4.5%	9.1%	100%
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	29	34.5%	10.3%	44.8%	0.0%	6.9%	0.0%	3.4%	100%
% TOTAL	100								
TOTAL									

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 9 : Percentage distribution of the CRITICAL QUESTIONS ENTITY categories (n=7) in each knowing SITUATION (n=5).

CQENT 3 (existing or to-be-created products, services, solutions, technologies, systems) predominantly occurred in 3 of the 5 SITUATIONS: 45.5% in SITUATION 4 (markets and internal or external customers), 44.8% IN SITUATION 5 (products, services and solutions), and 44.4% in SITUATION 2 (competition and industry dynamics) (Table 9 above).

On the analysis by each of the five SITUATIONS, the findings showed that in SITUATION 1 (business course of action and feasibility) knowledge workers asked more about products and services (CQNT 3, 50.0%). Coming next to this CRITICAL QUESTION ENTITY category were the questions about market and customers (CQENT 2, 25.0%) (Table 9).

Contrary to SITUATION 1, in SITUATION 2 (competition and industry dynamics), the CRITICAL QUESTION ENTITY that dominated was that related to products and services (CQENT 3, 44.4%). It was followed by questions about the industry and the competitive environment (CQENT 6, 33.3%) (Table 9).

In SITUATION 3 (organizations, management and operations), questions about organizations and management were the most frequent ones (CQENT 4, 40.0%), followed by questions about existing or potential results (CQENT 5, 26.7%) (Table 9).

In SITUATION 4 (markets and internal or external customers), questions about products and services were the most frequent ones (CQENT 3, 45.5%). They were followed by questions about market and customers (CQENT 2, 31.8%) (Table 9).

As in SITUATION 4, in SITUATION 5 (products, services and solutions) questions about products and services were also the most frequent (CQENT 3, 44.8%). This was followed by questions about theoretical and existing knowledge in organizations (CQENT 1, 34.5%) (Table 9).

An important observation that emerged from the findings in Table 8 and Table 9 was the concentration of CRITICAL QUESTION ENTITY 2 (market and internal or external customers) in SITUATION 1. This signaled that most of the knowledge workers' analyses of the courses of action and feasibility of ideas, projects or products are based on the understanding of the market and its customers. In terms of marketing and management principles, this may be possibly explained by the fact that these entities are actually the first look of analysts, and the main driver of conclusions in creating knowledge about a business course of action and feasibility, together with other factors including the technological,

social, political and regulatory environment. Thus, inherent to the nature of business and management, the internal or external market is the key driver and sustainer of a business, idea, or project. This may explain the high occurrence of CRITICAL QUESTION ENTITY 2 in SITUATION 1.

Another significant observation from the findings in Table 8 and Table 9 was the distribution of CRITICAL QUESTION ENTITY 3 (products, services and solutions), which had high occurrence in three of the five Knowing SITUATIONS (SITUATION 2, 4 and 5). It seems possible that these results are due to the focus of the knowing SITUATIONS. Knowledge workers in these SITUATIONS are trying to understand about competition, which naturally means to understand about competitors' products and services that are provided to a market, and on how they accomplish it. In general terms, with regards to understanding a competitor, this is an insightful source of knowledge that enables an understanding of what competitors are doing or planning to do, and if they have been successful or not. In addition, knowing SITUATION 4, which has a focus on creating knowledge related to markets, is equally demanding in the understanding about the products, services and solutions present in this market, because they can give the flavor of what may be happening in it, its configuration, changes and movements. In addition, it is natural that CRITICAL QUESTION ENTITY 3 occurs with high frequency in the knowing SITUATION 5, because in this situation knowledge workers are creating knowledge specifically related to the kind of entity that is reflected by CRITICAL QUESTION 3.

In all, it seems that CRITICAL QUESTION ENTITY 5 concentrated in two of the five situations: SITUATION 1 and 3. This may be due to the fact that it is natural that one needs to understand about existing or potential results, because these results may indicate if a business is feasible and how it may be operated and is managed.

6.4.1.2 Critical Question Attributes

The Categories of the Variable

The unit of analysis for CRITICAL QUESTION ATTRIBUTE was the input-encountering moments (n=100). Each unit was coded to only one CRITICAL QUESTION ATTRIBUTE category.

The data analysis identified 11 CRITICAL QUESTION ATTRIBUTE categories, which are explained in Table 10, as follows:

CRITICAL QUESTION ATTRIBUTES (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	CRITICAL QUESTIONS ATTRIBUTE CATEGORIES	GENERAL DEFINITION	EXAMPLES
Each category of critical-question-attribute is defined as knowledge workers' questionings being focused on aspects or characteristics of entities that are primarily related to			
CQATTRIB1	DIMENSIONS AND INDICATORS (quantitative and qualitative)	Qualitative and quantitative indicators and measures of size, shares, magnitude, proportion, scope, direction, of human and/or non-human entities.	<ul style="list-style-type: none"> - <i>What is the market size and shares? (Informant # 2)</i> - <i>What is the market-share of each of the available technologies? (Informant # 33)</i> - <i>What is the suppliers' market size? (Informant # 25)</i> - <i>What are the potential future sales of this product? (informant # 5)</i>
CQATTRIB2	DYNAMICS, INTERRELATIONSHIPS, MOVEMENTS [short version: dynamics and interrelationships]	The actions, events, movements, interconnections, and interrelationships between human and non-human entities (within and without organizations) and also on the forces, drivers and effects of them.	<ul style="list-style-type: none"> - <i>How do the researches findings connect with theories? How both are correlated? (Informant # 24)</i> - <i>How are companies competing in this market? (Informant # 28)</i> - <i>What is the dynamics of this market? (automobile lubricants) (Informant # 28)</i> - <i>What are the challenges in the industry? (Informant # 2)</i> - <i>How does this industry/sector work? (Informant # 34)</i>
CQATTRIB3	DESIGN, STRUCTURE AND CONFIGURATION [short version: design and configuration]	The structure, design, configuration, composition of non-human entities; or how entities should be configured or combined to form a whole of an entity (e.g. parts of an equipment, structure of an organization, composition of a drug).	<ul style="list-style-type: none"> - <i>What are the segments? Who are the players? (Informant # 3)</i> - <i>How is this market structured? (Informant # 28)</i> - <i>What are the services (scope) in this sector? (Informant # 16)</i> - <i>What are the characteristics of this product? (Informant # 38)</i> - <i>What is the organizational structure of this company? (Informant # 35)</i>
CQATTRIB4	NEEDS, DEMANDS	The needs, requirements, demands, expectations or wants of human (e.g. internal customers) and/or non-human entities (e.g. a project or a product).	<ul style="list-style-type: none"> - <i>What are the market demands? What does the market want to buy? (Informant # 9)</i> - <i>Why the (internal) customers need this? (Informant # 11)</i> - <i>What are customers' objectives and ideal solution? (Informant # 11)</i> - <i>What is our customers' perspective regarding performance measurements? (Informant # 29)</i>

CRITICAL QUESTION ATTRIBUTES (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	CRITICAL QUESTIONS ATTRIBUTE CATEGORIES	GENERAL DEFINITION	EXAMPLES
CQATTRIB5	STRATEGIES, OBJECTIVES, PRIORITIES [short version: strategies and objectives]	The high-level, broader and long-term aspects, stratagems, approaches, objectives, goals, foci and priorities of human and/or non-human entities.	<ul style="list-style-type: none"> - <i>How differentiation has been achieved? How they (customer services) have differentiated themselves? (Informant # 6)</i> - <i>What is the political system in this organization? (Informant # 37)</i> - <i>Which businesses and markets does this company target? (Informant # 21)</i> - <i>From researches findings, which is important or priority for this company? (Informant # 24)</i>
CQATTRIB6	AVAILABILITY, SUPPLYING, CONSUMPTION AND UTILIZATION [short version: availability and utilization]	The existence, availability, offering, supplying, uses, applications, consumption and utilization of human (e.g. knowledge) and/or non-human entities (e.g. products, services).	<ul style="list-style-type: none"> - <i>What are the companies' offerings in this sector? (Informant # 16)</i> - <i>How do the companies deliver or distribute their services and products to the market? (Informant # 15)</i> - <i>What are the existing knowledge and solutions in the market/industry? (Informant # 29)</i> - <i>What are the most representative / dominant types of products / equipments in use in UK? (Informant # 8)</i>
CQATTRIB7	CAPABILITIES AND EXPERIENCE	Internal and/or external capabilities, capacities, abilities, experience and competencies of human (e.g. experience in teaching) and/or non-human entities (e.g. capabilities of a system).	<ul style="list-style-type: none"> - <i>What did our team already done related to this? What knowledge did our team already constructed in relation to this? (Informant # 4)</i> - <i>How can it be produced in UK? (Informant # 8)</i> - <i>What skills are needed (does my customer have) to perform / deliver this service? (Informant # 23)</i> - <i>What are companies' capabilities in relation to the standards / benchmarks? (Informant # 16)</i>
CQATTRIB8	INFLUENCE AND IMPACTING POWER	The capacity and extension of human or non-human entities to influence, impact, affect or change events, processes and also to change other non-human and human entities.	<ul style="list-style-type: none"> - <i>What are the side effects or negative effects of this drug? (Informant # 22)</i> - <i>How the use of the product affect users? (Informant # 22)</i> - <i>How the changing business models are affecting this company? (Informant # 21)</i> - <i>What are the implications to the stock market? (Informant # 38)</i> - <i>What are the implications for supplier or producer organizations and consumers? (Informant # 38)</i>

CRITICAL QUESTION ATTRIBUTES (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	CRITICAL QUESTIONS ATTRIBUTE CATEGORIES	GENERAL DEFINITION	EXAMPLES
CQATTRIB9	REASONS, DRIVERS, GROUNDINGS RATIONALE [short version: reasons and drivers]	The logical basis, the background, the rationale, or the reasons behind and underpinning human (e.g. consumer behavior) or non-human entities (e.g. what explains a profitable product; what a theory means/explains), and also what non-human entities mean or explain.	<ul style="list-style-type: none"> - <i>What are the theoretical fundamentals that explain [the topic]? That is grounding the design of this system? (Informant # 1)</i> - <i>What is the academic research in this field or topic? (Informant # 11)</i> - <i>Why this market exists, why is it potential and why is the future? Why is it worth investing in this market? (Informant # 5)</i> - <i>Why people and companies use or invest on consultancy? (Informant # 30)</i>
CQATTRIB 10	LIMITATIONS, THREATS, PITFALLS, PROBLEMS [short version: limitations and problems]	Any aspects that limit, block, create barriers, or that represent weaknesses, pitfalls, conflicts, disputes, threats, and problems of human and non-human entities.	<ul style="list-style-type: none"> - <i>What are the key problems and limitations with existing systems? (Informant # 06)</i> - <i>What are the potential barriers for the solution? (Informant # 11)</i> - <i>What can stop the department being successful in the next year? (Informant # 13)</i> - <i>How are the changing business models (IT industry) affecting [company A]? (Informant # 21)</i> - <i>What are the physical constraints of their [customers'] gas terminal? (Informant # 17)</i>
CQATTRIB 11	FUNCTIONING, OPERATION	How human and non-human entities are done or accomplished, how they function or work; or related to operational aspects, processes, practices, and activities that are executed by human (e.g. people in organizations) and/or non-human entities (e.g. software).	<ul style="list-style-type: none"> - <i>How can I communicate the results clearly? (Informant # 10)</i> - <i>How do the statistical methods work to analyze this? How do the appropriate methods work? (Informant # 10)</i> - <i>What are the buying decision criteria [in this buying process]? (Informant # 9)</i> - <i>How does it operate, work? (Informant # 1)</i>

Table 10 : The CRITICAL QUESTION ATTRIBUTE (CQATT) coding categories and their definitions.

The Distribution of the Variable Categories by Situations

The unit of analysis was the input-encountering moments (n=100), and each unit was coded to only one category.

CRITICAL QUESTIONS ATTRIBUTES (N=100)												
(ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY)												
(UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)												
CQATTRIB 1	CQATTRIB 2	CQATTRIB 3	CQATTRIB 4	CQATTRIB 5	CQATTRIB 6	CQATTRIB 7	CQATTRIB 8	CQATTRIB 9	CQATTRIB 10	CQATTRIB 11		
DIMENSIONS & INDICATORS (quantitative and qualitative)	DYNAMICS, INTERRELATIONSHIPS, MOVEMENTS	DESIGN, STRUCTURE & CONFIGURATION	NEEDS, DEMANDS	STRATEGIES, OBJECTIVES, PRIORITIES	AVAILABILITY, SUPPLYING, CONSUMPTION & UTILIZATION	CAPABILITIES AND EXPERIENCE	INFLUENCE AND IMPACTING POWER	REASONS, DRIVERS, GROUNDINGS RATIONALE	LIMITATIONS, THREATS, PITFALLS, PROBLEMS	FUNCTIONING, OPERATION		
OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS) (N=100)	
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	3	0	3	1	0	5	1	0	2	1	0	16
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	0	2	1	0	2	6	3	1	0	3	0	18
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	1	1	2	1	2	3	0	0	2	1	2	15
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	0	5	3	2	3	5	0	2	0	1	1	22
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	2	1	2	2	2	7	2	2	4	2	3	29
TOTAL	6	9	11	6	9	26	6	5	8	8	6	100
TOTAL	6%	9%	11%	6%	9%	26%	6%	5%	8%	8%	6%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 11 : Distribution of the CRITICAL QUESTION ATTRIBUTE categories (n=11) across all the input-encountering moments (n=100) of the knowing SITUATIONS.

Across all the input-encountering moments (n=100), knowledge workers' questionings were predominantly focused on the availability and utilization of entities (CQATTRIB 6, 26%) (Table 11 above). This was followed by questions that were focused on the design AND configuration of entities (CQATTRIB 3, 11%). CRITICAL QUESTION ATTRIBUTE categories were heavily scattered. The category 6 was an exception.

CRITICAL QUESTIONS ATTRIBUTES (N=100) (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)													
	CQATTRIB1	CQATTRIB2	CQATTRIB3	CQATTRIB4	CQATTRIB5	CQATTRIB6	CQATTRIB7	CQATTRIB8	CQATTRIB9	CQATTRIB10	CQATTRIB11		
	DIMENSIONS & INDICATORS (quantitative and qualitative)	DYNAMICS, INTERRELATIONSHIPS, MOVEMENTS	DESIGN, STRUCTURE & CONFIGURATION	NEEDS, DEMANDS	STRATEGIES, OBJECTIVES, PRIORITIES	AVAILABILITY, SUPPLYING, CONSUMPTION & UTILIZATION	CAPABILITIES AND EXPERIENCE	INFLUENCE AND IMPACTING POWER	REASONS, DRIVERS, GRONDINGS RATIONALE	LIMITATIONS, THREATS, PITFALLS, PROBLEMS	FUNCTIONING, OPERATION		
UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS) (N=100)	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	% OCCURRENCES OF THE QUESTION ATTRIBUTE IN THE KNOWING SITUATION	TOTAL	
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	16	18.8%	0.0%	18.8%	6.3%	0.0%	31.3%	6.3%	0.0%	12.5%	6.3%	0.0%	100%
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	18	0.0%	11.1%	5.6%	0.0%	11.1%	33.3%	16.7%	5.6%	0.0%	16.7%	0.0%	100%
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	15	6.7%	6.7%	13.3%	6.7%	13.3%	20.0%	0.0%	0.0%	13.3%	6.7%	13.3%	100%
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	22	0.0%	22.7%	13.6%	9.1%	13.6%	22.7%	0.0%	9.1%	0.0%	4.5%	4.5%	100%
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	29	6.9%	3.4%	6.9%	6.9%	6.9%	24.1%	6.9%	6.9%	13.8%	6.9%	10.3%	100%
TOTAL	100												

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 12 : Percentage Distribution of the CRITICAL QUESTION ATTRIBUTE categories (n=11) across all the input-encountering moments (n=100) of the knowing SITUATIONS.

Of the five knowing SITUATIONS, the dominant CRITICAL QUESTION ATTRIBUTE category was the one related to the availability and utilization of entities (CQENT 6). This category was dominant in all situations (Table 12).

In SITUATION 1 (business course of action and feasibility) the most frequent CRITICAL QUESTION ATTRIBUTE category was the one related to the availability and utilization of entities (CQATTRIB 6, 31.3%). This category was equally followed by those related to the dimensions and indicators of entities (CQATTRIB 1, 18.8%), and by the category related to the design and configuration (CQATTRIB 3, 18.8%) (Table 12).

In SITUATION 2 (competition and industry dynamics), the CRITICAL QUESTION ATTRIBUTE category related to the availability and utilization of entities (CQATTRIB 6, 33.3%) was the dominant one. This category was equally followed by the one related to the capabilities and experience of entities (CQATTRIB 7, 16.7%), and by the category related to limitations and problems of entities (CQATTRIB 10, 16.7%) (Table 12).

Similar to SITUATIONS 1 and 2, in SITUATION 3 (organizations, management and operations), the most frequent CRITICAL QUESTION ATTRIBUTE category was related to the availability and utilization of entities (CQATTRIB 6, 20%). The second frequent categories were related to the design and configuration of entities (CQATTRIB 3, 13.3%), to the strategies and objectives of entities (CQATTRIB 5, 13.3%), to the reasons and drivers of entities (CQATTRIB 9, 13.3%), and to the functioning or operation of entities (CQATTRIB 11, 13.3%) (Table 12).

In SITUATION 4 (markets and internal or external customers) there were two equally dominant CRITICAL QUESTION ATTRIBUTE categories: the one related to the dynamics and interrelationships of entities (CQATTRIB 2, 22.7%), and the category related to the availability and utilization of entities (CQATTRIB 6, 22.7%). These categories were followed by those related to the design and configuration of entities (CQATTRIB 3, 13.6%), and by the category related to strategies and objectives of entities (CQATTRIB 5, 13.6%).

In SITUATION 5 (products, services and solutions), the most frequent CRITICAL QUESTION ATTRIBUTE category was the one related to the availability and utilization of entities (CQATTRIB 6, 24.1%). This category was followed by the one related to reasons and drivers of entities (CQATTRIB 9, 13.8%) (Table 12).

The major finding that emerged was that the distribution of the CRITICAL QUESTION ATTRIBUTE 6 was the most frequent in all the knowing SITUATIONS. The

possible explanation for this result is that the way entities are made available, are supplied to, or consumed and used by a market or by organizations may communicate much of trends, opportunities, strategies, culture, and movements or changes that are occurring. For example, knowing how customers consume and use a product is essential to understand a market and also to identify how a new product for this market would be feasible; knowing how company B is supplying a new service to the market is core to sense and identify its current and future strategies; knowing how specific products have been supplied to a different market in a different way (e.g. door-to-door) may signalize a change in a competitor's strategy; and understanding if which internal (organizational) knowledge is available can be important in the creation of knowledge regarding market, business feasibility, competitors, management and products. Therefore, the understanding of availability, supplying, consumption and utilization of entities can generate many clues to knowledge creation situations with different focus, because whatever entity these attributes are linked to, they are related to an essential process that make business alive.

6.4.1.3 Critical Question Interrogators

The Categories of the Variable

The unit of analysis for the CRITICAL QUESTION INTERROGATOR was the input-encountering moments (n=100). Each unit of analysis was coded to only one category.

The 6 CRITICAL QUESTION INTERROGATOR categories found in this study are explained in Table 13, as follows:

CRITICAL QUESTION INTERROGATORS (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	INTERROGATORS CATEGORIES	GENERAL DEFINITION	EXAMPLES
This category of critical-question-interrogator is used by knowledge workers when their critical questions were primarily asking about			
CQINT 1	WHAT	Non-human entities.	- <i>What are the implications of the crisis / problems with this product / service impact / to the whole market?</i>
CQINT 2	HOW	Processes, methods, steps to do something, to create/destroy something.	- <i>How do people formally and actually / informally work?</i>
CQINT 3	HOW MUCH	Quantitative aspects of processes, human and non-human entities.	- <i>How much the market will spend /invest on consultancy?</i>
CQINT 4	WHICH	Choices among human or non-human entities.	- <i>Which are the most appropriate way / method to use?</i>
CQINT 5	WHO	Human-entities or human-based processes.	- <i>Who are the potential clients / customers in this market?</i>
CQINT 6	WHY	Reasons, causes, motives, drivers, explanations of events, entities and/or processes.	- <i>Why this market exists, is potential and is the future? Why is it worth investing in this market?</i>

Table 13 : The CRITICAL QUESTION INTERROGATOR (CQINT) coding categories and their definitions.

The Distribution of the Variable Categories by Situations

The unit of analysis for the CRITICAL QUESTION INTERROGATOR was the input-encountering moments (n=100), and each unit of analysis was coded to one category only.

CRITICAL QUESTIONS INTERROGATORS (N=100) (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)							
CQINT 1	CQINT 2	CQINT 3	CQINT 4	CQINT 5	CQINT 6		
WHAT	HOW	WHICH	WHO	WHY	HOW MUCH		
TOTAL OF THE QUESTION INTERROGATOR IN THE KNOWING SITUATION	TOTAL OF THE QUESTION INTERROGATOR IN THE KNOWING SITUATION	TOTAL OF THE QUESTION INTERROGATOR IN THE KNOWING SITUATION	TOTAL OF THE QUESTION INTERROGATOR IN THE KNOWING SITUATION	TOTAL OF THE QUESTION INTERROGATOR IN THE KNOWING SITUATION	TOTAL OF THE QUESTION INTERROGATOR IN THE KNOWING SITUATION	UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS) (N=100)	
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	8	4	0	1	2	1	16
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	11	4	1	0	2	0	18
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	8	5	1	1	0	0	15
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	12	8	1	0	1	0	22
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	17	10	1	1	0	0	29
TOTAL	56	31	4	3	5	1	100
TOTAL	56%	31%	4%	3%	5%	1%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 14 : Overall occurrences of the CRITICAL QUESTION INTERROGATOR (n=100) that were coded in each category (n=6) across all the input-encountering moments (n=100), and in specific SITUATIONS (n=5).

Across all input-encountering moments (n=100), the CRITICAL QUESTION INTERROGATOR categories concentrated heavily on ‘what’ (CQINT 1, 56%), followed by the ‘how’ (CQINT 2, 31%) (Table 14).

		CRITICAL QUESTIONS INTERROGATORS (N=100) (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)						
		CQINT1	CQINT2	CQINT3	CQINT4	CQINT5	CQINT6	
		WHAT	HOW	WHICH	WHO	WHY	HOW MUCH	
	UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS) (N=100)	% TOTAL OF THE QUESTION ENTITY IN THE KNOWING SITUATION	% TOTAL OF THE QUESTION ENTITY IN THE KNOWING SITUATION	% TOTAL OF THE QUESTION ENTITY IN THE KNOWING SITUATION	% TOTAL OF THE QUESTION ENTITY IN THE KNOWING SITUATION	% TOTAL OF THE QUESTION ENTITY IN THE KNOWING SITUATION	% TOTAL OF THE QUESTION ENTITY IN THE KNOWING SITUATION	TOTAL
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	16	50.0%	25.0%	0.0%	6.3%	12.5%	6.3%	100%
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	18	61.1%	22.2%	5.6%	0.0%	11.1%	0.0%	100%
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	15	53.3%	33.3%	6.7%	6.7%	0.0%	0.0%	100%
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	22	54.5%	36.4%	4.5%	0.0%	4.5%	0.0%	100%
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	29	58.6%	34.5%	3.4%	3.4%	0.0%	0.0%	100%
TOTAL	100							
TOTAL								

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 15 : Percentage distribution of the CRITICAL QUESTION INTERROGATOR (n=100) categories (n=6) across all the input-encountering moments (n=100) that occurred within the knowing SITUATIONS.

Similarly to the results across all the input-encountering moments (n=100), when analyzing the occurrence of the CRITICAL QUESTION INTERROGATOR categories in each of the knowing SITUATIONS (n= 5) the interrogator ‘what’ (CQINT 1) was the most used in 5 of the five SITUATIONS. In addition, the interrogator ‘how’ (CQINT 2) was the second most used in all the five SITUATIONS, and the interrogator ‘why’ was the third most used across all five knowing SITUATIONS (CQINT 5) (Table 15 above).

6.5 Verbings

6.5.1 Findings

The Categories of the Variable

The analysis of VERBINGS includes all the movements performed by a knowledge worker to answer a critical question in his/her input-encountering moment, to construct interpretive bridges over gaps. The categories of the variable VERBING are naturally focused on the internal interpretations of the inputs that were accessed. Thus, the analysis of VERBINGS include the main movement in an input-encountering moment, which is related to the ‘best’ input, and also the complementary movements, which are related to other complementary inputs that were used in the same input-encountering moment.

The unit of analysis for the analysis of the variable VERBING was the input-encountering moments (n=100). Each of the units was coded to more than one category, because in each input-encountering moment a knowledge worker could have made different *movements or actions* in order to create meaning.

The VERBING categories that were identified are explained in Table 16 below.

VERBING (ONE UNIT OF ANALYSIS WAS CODED TO MORE THAN ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	VERBING CATEGORIES	GENERAL DEFINITION	EXAMPLES
Each verbing category is defined when the movements that knowledge workers performed to get answers, helps and create meaning in knowing situations were primarily focused on			
VING 1	INTERPRETING AND INCORPORATING THE TACIT DIMENSION OF OWN KNOWLEDGE	<p><i>Movements that knowledge workers performed to create meaning by gaining an understanding of the tacit dimension of own knowledge; or accessing what the knowledge worker her/himself had already known, perceived, sensed, experienced or lived, e.g. his own insights, ideas, practical experience, and intuition.</i></p>	<ul style="list-style-type: none"> - <i>We knew that. Because we know that the bank of international settlements measure the size of products (Informant # 2)</i> - <i>I knew it's going to be the future before I had all these paper (Informant # 5)</i> - <i>Because our experience said how it worked before (Informant # 14)</i> - <i>It's just a gut feeling in the end (Informant # 5)</i> - <i>And then, using our experience, our expertise, enhance, using our core consultancy, intuition, we create ideas. So, that's kind of pure creation, that is. (Informant # 2)</i> - <i>It's an intuition here, isn't it? When you are eliciting some of this stuff from employees, having conversations around it, you have to know when you've actually gone no more, and then move on to the next issue. Yes, it's a, it's an intuitive sense. (Informant # 6)</i>
VING 2	INTERPRETING AND INCORPORATING THE TACIT DIMENSION OF OTHERS' KNOWLEDGE	<p><i>Movements that knowledge workers performed to create meaning by gaining access to and understanding of the tacit dimension of other individuals' knowledge, of what they had already known, perceived, sensed, experienced or lived, e.g. their insights, personal experience and ideas.</i></p> <p>The tacit dimension of knowledge refers to the dimension "of which we have a knowledge that we may not be able to tell" (Polanyi, 1966, p. 10), that "consists of a set of particulars of which we are subsidiarily aware as we focus on something else" (Tsoukas, 2005a, p.158).</p> <p>Accessing and interpreting the tacit dimension of other individuals' knowledge means to access and interpret the "personal component" (Polanyi, 1958) of their knowledge that they are subsidiarily aware. That is, the dimension of their knowledge that is not clearly and readily observable and identifiable, which individuals only know that they have when they need or are demanded to speak about it, or they have to use it somehow. As such, and given the nature of tacit</p>	<ul style="list-style-type: none"> - <i>Their past experience, knowing that they've done before. Knowledge of my colleagues' expertise. (Informant # 12)</i> - <i>I find out about the 'soft things' by word-of-mouth. So, they weren't published. (Informant # 4)</i> - <i>Using the experiences of others in doing similar projects is pretty much vital to me. I like to use experiences of others in that area. (Informant # 26)</i> - <i>Past experience, because there's a group that had developed tools of a similar nature before and I have confidence in my colleagues, in their knowledge. (Informant # 12)</i> - <i>I looked at them [colleagues] as the voice of experience, and I thought they probably have a better understanding because they have been here longer and they'd done more and found more information on it. (Informant #38)</i>

VERBING (ONE UNIT OF ANALYSIS WAS CODED TO MORE THAN ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	VERBING CATEGORIES	GENERAL DEFINITION	EXAMPLES
		knowledge explained previously, 'accessing and interpreting the tacit dimension of knowledge' refers to accessing and interpreting that personal and not clearly identifiable part of knowledge, which, by nature, is often orally verbalized and communicated by people in face-to-face, social and personal interactions.	
VING 3	INTERPRETING AND INCORPORATING THE EXPLICIT DIMENSION OF KNOWLEDGE	<p>Gaining an understanding of the explicit dimension of knowledge that is formalized, articulated and objectified in any kind of written, digital or physical documentation and internal databases.</p> <p>Accessing and interpreting the explicit dimension of other individuals' knowledge means to access and interpret the part of individuals' knowledge that is readily and clearly observable and identifiable (Polanyi, 1966). As such, and given the characteristics of the explicit dimension of knowledge explained previously, accessing and interpreting this dimension of knowledge refers to accessing and interpreting knowledge that was articulated as statements, formulas, theories, maps, diagrams, articles, reports, etc.</p>	<p>- <i>Some of that was market material. (Informant # 6).</i></p> <p>- <i>Some reports. Quite detailed reports. Reports from the sector. Federal government reports. (Informant # 16)</i></p> <p>- <i>The news alerts, that would come through would be where people have actually discussed the outcomes of the trial (Informant # 22)</i></p> <p>- <i>The theories that come from books, and that come from official documents, from governments departments. (Informant # 23)</i></p>
VING 4	COMPARING, ADAPTING AND VALIDATING	Moving to make comparisons between inputs, balance, align, validate and adapt inputs in relation to objectives, needs, priorities, standards, requirements and priorities.	<p>- <i>And then, validate that with the equipment manufacturers and with the [company A]. (Informant # 08)</i></p> <p>- <i>I've collected a few textbooks and tried on few sample sets of data, and you expect that to work on correctly. So, it just seems to me that I could double check against something which was already in print somewhere. (Informant # 10)</i></p> <p>- <i>I think having a dialog really is just the best way to, to draw that out. It is that dialog stage where you're aligning your understanding with theirs. It makes it the most important. (Informant # 11)</i></p> <p>- <i>It helped us to identify where the insights that we've taken from the research were likely to be a barrier or a driver of business performance. (Informant # 24)</i></p>

Table 16 : The VERBING (VING) coding categories and their definitions.

As shown in Table 16, the verbing categories are focused on interpreting and incorporating inputs based on individuals' own or other individuals' knowledge, that is explicitly articulated and formalized, and on comparing or validating inputs.

The Distribution of the Variable Categories by Situations

The unit of analysis for the variable VERBING was the input-encountering moments (n=100). Each unit was coded to more than one category, because knowledge workers employed more than one movement to get answers and create meaning.

On average, there were 1.8 occurrences by each input-encountering moment (n=100). That means that in each input-encountering moment there were about 2 distinct actions or movements towards the creation of knowledge (Table 17 below).

The occurrences of the four VERBING categories by the knowing situations are shown in Table 17 below.

		VERBINGS (ONE INPUT-ENCOUNTERING MOMENT WAS CODED TO MORE THAN ONE CATEGORY) (INPUT-ENCOUNTERING MOMENTS, n=100)				
		VING1	VING2	VING3	VING4	TOTAL OCCURRENCES OF VERBINGS BY SITUATION
	UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS) (n=100)	INTERPRETING & INCORPORATING THE TACIT DIMENSION OF OWN KNOWLEDGE	INTERPRETING & INCORPORATING THE TACIT DIMENSION OF OTHERS' KNOWLEDGE	INTERPRETING & INCORPORATING THE EXPLICIT DIMENSION OF KNOWLEDGE	COMPARING, ADAPTING & VALIDATING	
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	16	3	8	12	1	24
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	18	12	8	17	4	41
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	15	4	9	13	1	27
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	22	11	13	12	4	40
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	29	10	18	17	4	49
TOTAL	100					
TOTAL OF OCCURRENCES ACROSS ALL FIVE SITUATIONS		40	56	71	14	181
MEANS ACROSS ALL FIVE SITUATIONS		0.40	0.56	0.71	0.14	1.81

The highest value is highlighted with yellow

The second highest value is highlighted with pale yellow

Table 17 : Frequencies and means of the four VERBING and the collapsed frequencies of the categories related to interpreting tacit knowledge.

Considering the occurrence of the *four categories of VERBING* across all the input-encountering moments (n=100) (Table 17 above), the dominant VERBING was related to knowledge workers interpreting and incorporating the explicit dimension of knowledge (VING 3). This VERBING category occurred 71 times across the 100 input-encountering moments (mean=0.71). The next frequent VERBING was related to interpreting and incorporating the tacit dimension of other individuals' knowledge (VING 2) (56 occurrences, mean=0.56), and interpreting the tacit dimension of one's own knowledge (VING 1) (mean=0.40). The high frequency of VING 2 evidences the importance of social networks in the knowing work.

Concerning the means of the four VERBING categories by knowing situations (Table 18 below) the category 'interpreting the explicit dimension of knowledge' (VING 3) was the most frequent one, having been performed in three of the five knowing situations. VING 3 dominated in the knowing SITUATIONS 1, 2 and 3, although the category interpreting and incorporating the tacit dimension of others' knowledge was most frequent in the knowing SITUATIONS 4 and 5.

		VERBINGS			
		(ONE INPUT-ENCOUNTERING MOMENT WAS CODED TO MORE THAN ONE CATEGORY)			
		(INPUT-ENCOUNTERING MOMENTS, n=100)			
		VING1	VING2	VING3	VING4
	UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS)	INTERPRETING & INCORPORATING THE TACIT DIMENSION OF OWN KNOWLEDGE	INTERPRETING & INCORPORATING THE TACIT DIMENSION OF OTHERS' KNOWLEDGE	INTERPRETING & INCORPORATING THE EXPLICIT DIMENSION OF KNOWLEDGE	COMPARING, ADAPTING & VALIDATING
SITUATION 1:					
BBUSINESS COURSE OF ACTION AND	16	0.19	0.50	0.75	0.06
SITUATION 2:					
COMPETITION & INDUSTRY DYNAMICS	18	0.67	0.44	0.94	0.22
SITUATION 3:					
ORGANIZATIONS, MANAGEMENT &	15	0.27	0.60	0.87	0.07
SITUATION 4: MARKETS & CUSTOMERS (internal and external)	22	0.50	0.59	0.55	0.18
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS	29	0.34	0.62	0.59	0.14
TOTAL	100				

The highest value is highlighted with yellow

The second highest value is highlighted with pale yellow

Table 18 : Means of the occurrences of the VERBING categories across the input-encountering moments of each of the five knowing SITUATIONS.

As shown by Table 18 above, if the categories of VERBINGS related to interpreting the tacit dimension of other individuals' knowledge (VING2), and to interpreting the explicit dimension of knowledge (VING 3) are compared, the latter dominated in 3 situations: 1, 2

and 3. In these situations knowledge workers needed to rely on additional inputs from the explicit dimension of knowledge that is articulated in documents besides interpreting the tacit dimension of other individuals' knowledge.

Comparing VING 1 and VING 3, the interpretation of the explicit dimension of knowledge was more frequent in four of the five situations: SITUATIONs 1, 2, 3 and 5. However, in SITUATION 4, VING 1 and VING 3 were very close. If VING 1, VING 2 and VING 3 are compared, the role of the tacit dimension of one's knowledge (VING 1) was smaller if compared to the role of the explicit dimension of knowledge (VING 3) in four situations (SITUATIONs 1, 2, 3 and 5), but it was almost close to the latter category in SITUATION 4.

Focusing on interpreting the tacit dimension of other individuals' knowledge (VING 2) and comparing it with VING 1, it is possible to see the role of VING 2 in knowing SITUATION categories 1, 3 and 5. This evidenced the importance of interpreting the tacit dimension of other individuals' knowledge (VING 2), and as such, the key role that social capital⁴⁸ can play in creating knowledge for business in the mentioned situations.

To gain an integrated and situational view of the interpretation of the tacit dimension of knowledge as a movement of sense-making, the occurrences of the categories VING 1 and VING 2 were collapsed in Table 19 and Table 20. Occurrences and means by situations are respectively presented in Table 19 and Table 20.

The attention now turns to the comparison between interpreting the tacit dimension of one's own and of other individuals' knowledge (VING 1 + VING 2), VING 3 and VING 4. The theoretical rationale to collapse VING 1 with VING 2 is the fact that both are related to interpreting the tacit dimension of knowledge. Together, it makes possible to have an integrated and richer picture of the interpretation of the tacit dimension of knowledge as a movement for meaning creation.

⁴⁸ Cf. Widén-Wulff (2007).

	VERBINGS (ONE INPUT-ENCOUNTERING MOMENT WAS CODED TO MORE THAN ONE CATEGORY) (INPUT-ENCOUNTERING MOMENTS, n=100)				TOTAL OCCURRENCES OF VERBINGS BY SITUATION
	UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT- ENCOUNTERING MOMENTS) (n=100)	VING 1 + VING 2	VING3	VING4	
		INTERPRETING & INCORPORATING THE TACIT DIMENSION KNOWLEDGE	INTERPRETING & INCORPORATING THE EXPLICIT DIMENSION OF KNOWLEDGE	COMPARING, ADAPTING & VALIDATING	
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	16	11	12	1	24
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	18	20	17	4	41
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	15	13	13	1	27
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	22	24	12	4	40
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	29	28	17	4	49
TOTAL	100	96	71	14	181
MEAN OF ONLY TO THE VERBINGS RELATED TO THE TACIT DIMENSION OF KNOWLEDGE (UNIT OF ANALYSIS: INPUTS-ENCOUNTERING MOMENTS, n=100)		0.96	0.71	0.14	1.81

The highest value is highlighted with yellow

The second highest value is highlighted with pale yellow

Table 19 : Occurrences of the VERBING category focused on interpreting the tacit dimension of knowledge (own and others') (VING 1 and VING 2 were summed).

As Table 19 indicates, the VERBING categories that are related to interpreting the tacit dimension of knowledge (VING 1 + VING 2) occurred more frequently (96 occurrences, mean=0.96) than the VERBING category related to interpreting the explicit dimension of knowledge (VING 3, 71 occurrences, mean=0,71) (Table 19).

	VERBINGS (ONE INPUT-ENCOUNTERING MOMENT WAS CODED TO MORE THAN ONE CATEGORY) (INPUT-ENCOUNTERING MOMENTS, n=100)			
	UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT- ENCOUNTERING MOMENTS) (n=100)	VING 1 + VING 2	VING3	VING4
		INTERPRETING & INCORPORATING THE TACIT DIMENSION KNOWLEDGE	INTERPRETING & INCORPORATING THE EXPLICIT DIMENSION OF KNOWLEDGE	COMPARING, ADAPTING & VALIDATING
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	16	0.69	0.75	0.06
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	18	1.11	0.94	0.22
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	15	0.87	0.87	0.07
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	22	1.09	0.55	0.18
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	29	0.97	0.59	0.14
TOTAL	100			

The highest value is highlighted with yellow

The second highest value is highlighted with pale yellow

Table 20 : Mean of occurrences of verbings in each knowing situation.

Focusing on the findings by situations shown in Table 19 and Table 20, and comparing ‘VING 1 + VING 2’ with VING 3 it can be seen that they were about equal in two situations: SITUATION 1 and 3. In knowing SITUATION 3, the categories related to interpreting and incorporating the tacit (VING 1 + VING 2) and the explicit dimensions of knowledge (VING 3) were even with 13 occurrences each.

Turning to the total of the category related to interpreting the tacit dimension of knowledge (VING 1 + VING 2) and comparing it to VING 3 and VING 4, it can be seen that ‘VING 1 + VING 2’ was more frequent in knowing situations 4 and 5: in SITUATION 4 (mean=1.09), and in SITUATION 5 (mean=0.97) (Table 20). In SITUATION 4, knowledge workers were creating knowledge focused on markets and customers, which demands an understanding of individuals’ experience, needs, satisfaction levels with products and services, and also to interact with experienced professionals in the market who know what happens in it. The frequency in SITUATION 5 can be explained by the fact that the focus of the knowing in this situation (products and services) demands an understanding of individuals’ experiences in using, making, constructing, using and creating the products and services. The nature of this knowledge being created in this knowing situation inherently requires understanding human experiences.

The occurrences of the category focused on interpreting and incorporating the explicit dimension of knowledge (VING 3) was slightly greater than interpreting and incorporating the tacit dimension of knowledge (VING 1 + VING 2) in SITUATION 1 (Table 19 and Table 20). This result can be explained by the nature of the knowledge creation situation. Knowledge workers were creating knowledge focused on a business course of action and feasibility, which also demands the use of facts and details about how organizations performed in relation to specific issues. As the focus of the knowing situation is on understanding how organizations make business, how they function in order to reach their objectives, it is reasonable to ground this knowledge by interpreting the explicit dimension of business-related knowledge that is communicated by documents, for example (e.g. investments in a market, financial performance). In addition, such knowing situations may also demand sensitive and strategic inputs, which are neither typically and easily articulable, nor often disclosed in documents. These inputs can be got by talking with knowledgeable individuals about how a specific business issue, such as how it a merger process was really conducted.

In order to obtain a more specific picture related to VERBINGs that were focused on interpreting the tacit dimension of knowledge (own and others'), the occurrence of the related VERBING categories (VING 1 + VING 2) were also analyzed based on another baseline. The distribution of the three VERBING categories ('VING 1 + VING 2', VING 3 and VING 4) was analyzed against the *occurrences of all the VERBING categories that occurred in the 100 input-encountering moments (n=181)*. Therefore, the baseline in the following analysis is different from the input-encountering moments, which was the unit of analysis employed previously in Tables 17 to 20.

In the context explained above, of all the 181 movements to create meaning in the five knowing situations (total of VERBINGs occurrences), the proportion of interpreting the tacit dimension of own (category VING 1, 22%) and others' knowledge (31%) was 53%, and of interpreting and incorporating the explicit dimension of knowledge (VING 3) was 39%.

The single and most outstanding observation that emerged from the data in Table 17 to Table 20 is that the interpretation and incorporation of the tacit dimension of knowledge is also a significant action for situational meaning creation within knowing work. Knowledge creation work also generally demands the inclusion of the interpretation of inputs that are based on the tacit dimension of knowledge as a natural way to enrich the understandings in the creation of new knowledge. Knowledge workers inherently need to access their own and other individuals' knowledge in order to build a richer picture about specific issues. Prior studies have also noted the importance and the use of tacit knowledge in the business context, such Hammond (2004), Information Builders (2007), Sternberg et al. (1995), Cianciolo et al. (2006), Strati (2003; 2007), Cook and Brown (1999), Tsoukas and Vladimirou (2001). Thus, knowledge workers also interpreted the tacit dimension of knowledge, even if they had interpreted the explicit-knowledge-based inputs.

It was also evidenced that interpreting the explicit dimension of knowledge has its role and significance in the situational meaning creation. Importantly, interpreting the tacit and the explicit dimensions of knowledge are situational and synergistic movements for meaning creation. They differed across knowing situations and they enabled and complemented each other. At a glance, this immediately implies the need of *balanced approaches* to support and facilitate the meaning creation in the knowing work, which includes the interpretation of *both dimensions of knowledge*.

The synergy between interpreting the tacit and explicit dimensions of knowledge was discussed in the qualitative analysis. The main implications of these findings are discussed in Chapter 7.

6.6 Inputs Communicators

6.6.1 Findings

The Categories of the Variable

The data analysis resulted on two main categories of INPUT COMMUNICATOR (ICOM) that are explained in the following Table 21.

INPUT COMMUNICATORS (EACH UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	INPUT COMMUNICATOR CATEGORIES	GENERAL DEFINITION	EXAMPLES
Each input-communicator category is defined when knowledge workers used inputs that were primarily communicated by			
ICOM_PEOP	BY PEOPLE	Inputs that were <i>communicated</i> by individuals in personal, social interactions.	<ul style="list-style-type: none"> - Employees of the analyzed/target companies - People from official or governmental organization - People (in gas transporters trade associations) - Partners in the same project - Professionals who were developing and implementing)
ICOM_DOCS	BY DOCUMENTS OR ARTIFACTS	Inputs that were <i>communicated</i> by any kind of written, digital or physical documents or knowledge-based product or object.	<ul style="list-style-type: none"> - Design drawings and specifications (organizational internal knowledge) - Financial reports - Scientific publications / papers - Publicly material about companies, market material - Reports in the organization corporate portal

Table 21 : The INPUT COMMUNICATOR (ICOM) coding categories and their definitions.

The Distribution of the Variable Categories by Situations

The unit of analysis for the variable INPUT COMMUNICATOR (ICOM) was the input-encountering moments (n=100). Each unit of analysis was coded to one category only.

The occurrences and percentage distribution of the categories are shown in Table 22 and Table 22 below.

	COMMUNICATORS OF THE 'BEST' INPUTS (ONE UNIT OF ANALYSIS WAS CODED TO ONLY ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)		UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT- ENCOUNTERING MOMENTS) (N=100)
	ICOM_DOCS	ICOM_PEOPLE	
	TOTAL OF OCCURRENCES	TOTAL OF OCCURRENCES	
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	10	6	16
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	14	4	18
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	8	7	15
SITUATION 4: MARKETS & CUSTOMERS (internal and external)	12	10	22
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	14	15	29
TOTAL	58	42	100
% TOTAL	58.0%	42.0%	100.0%

The highest value is highlighted with bright yellow

Table 22 : The occurrences of the INPUT COMMUNICATOR categories by knowing SITUATIONS.

Across all input-encountering moments, the inputs were communicated by documents (ICOM_DOCS) were somewhat more frequently (58%) than by people (42%) (Table 22).

In situations 1 and 2 inputs were communicated most frequently by documents (63%, 78%), whereas in other situations (3, 4 and 5) inputs were frequently communicated as frequently by documents and people.

Comparing the occurrence of inputs communicated by people across the five situations, it can be seen that it was most frequent in SITUATION 5 (analysis of products, services and solutions) (52%). This result can be explained by the nature of knowledge being created in this knowing situation, which demands more exchange of experiences regarding the products, services or technologies.

6.7 Helps

6.7.1 Findings

The Categories of the Variable

Informants did not give conflicting descriptions of the helps they needed in their input-encountering moments. Eight categories of helps were identified, which are presented and defined in Table 23 below.

HELPS (EACH UNIT OF ANALYSIS WAS CODED TO MORE THAN ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	HELPS CATEGORY (THE HELP KNOWLEDGE WORKERS NEED IS TO...)	GENERAL DEFINITION	EXAMPLES
Each help category is defined when knowledge workers need to be primarily helped to			
HELP 1	UNDERSTAND GOALS ACHIEVEMENT AND ACCOMPLISHMENT [short version: understand goals achievement]	Understand courses of actions and their implications; understand how the accomplishment of plans, strategies, visions, and missions are made; and to understand the actions, activities, movements, operations and behaviors that are employed to fulfill goals on any level of organizations (strategic, operational, inter and intra-organizational).	<p>- In order to advise these people of how to run the business, we need to understand their strategies. So, it was absolutely critical that we understand what they're doing now, that we understand the challenges. (Informant # 2)</p> <p>- I think it was because by looking from the outside into [company A], it's often difficult to see exactly what they see as the big priority threat. (Informant # 21)</p> <p>- The spreadsheets told me who to contact, what documents to look at and how, where the more up-to-date information might be. And how long it took us to get it as well. (Informant # 4)</p> <p>- After the first meeting when they told us, it was kind of obvious that they would tell you their buying criteria. So, after one meeting, we knew that that was the means by which we could work out what would it take to win a job (Informant # 9)</p>
HELP 2	SENSE, PRIORITIZE AND ADAPT TO [NEW] CONDITIONS AND SIGNALS (external and/or internal to the organization) [short version: sense and adapt to	Sense, scan, understand and adapt to signals, conditions, events, priorities, or demands that occur or might occur externally or internally to knowledge workers' organizations.	<p>- ... if you've done something before, you can often avoid a lot of problems and effort if you know how to, if you can apply what you've done before to where you are now (Informant # 11)</p> <p>- There are certain needs which we have to satisfy. So, we needed to know, these needs to keep our customers happy. (Informant # 13)</p> <p>-... it's all about understanding people's information needs. Everybody would use that, each client, each market will use that</p>

HELPS (EACH UNIT OF ANALYSIS WAS CODED TO MORE THAN ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGO RY NUMBER	HELPS CATEGORY (THE HELP KNOWLEDGE WORKERS NEED IS TO...)	GENERAL DEFINITION	EXAMPLES
	conditions]		<i>information differently. (Informant # 27)</i>
HELP 3	UNDERSTAND AND EVIDENCE FEASIBILITY, POTENTIALITY AND SUSTAINABILITY⁴⁹ [short version: evidence feasibility]	<p>Understand, justify, evidence, illustrate, prove the existence (or the nonexistence) of conditions and capacities to execute / be executed, to keep going, to achieve goals, to grow, to develop, to be/to keep being successful, to be profitable, viable, sustainable through time (to be continued and/or sustained through time); or to 'keep the fingers on the pulse' sensing, identifying and tracking the extension of feasibility, viability, potentiality and sustainability.</p> <p>This category includes but it is not limited to financial feasibility.</p>	<p><i>- If I could find the load of [company] articles on this field, it's another form of evidence.</i></p> <p><i>T hat was further evidence to suggest that we need a journal in this area. (Informant # 5)</i></p> <p><i>- On the first meeting you know whether or not they're potential client ; (Informant # 9)</i></p> <p><i>- ... that gives a view on what is technically possible or not. (Informant # 17)</i></p> <p><i>- Information about the different efficiency ratios and profitability ratios. (Informant # 35)</i></p> <p><i>- Just because it's not just a qualitative assessment, it's a quantitative assessment too. It's real knowledge about the quality of papers that potentially you could publish, but currently we were rejecting. And so, it gives you a very, very good indication of the type of papers that we can publish. (Informant # 25)</i></p>
HELP 4	ANTICIPATE AND AVOID PROBLEMS OR PITFALLS [short version: anticipate problems]	<p>Sense, perceive, identify, understand and realize in advance potential problems, issues, conflicts, and pitfalls, in order to avoid their occurrence/recurrence and their potential impacts.</p>	<p><i>- They told me what temperature the equipment failed or the temperature the equipment worked, so they defined the operating limits. (Informant # 1)</i></p> <p><i>- ...where they've applied technology, got some results. It tells you what's worked, what hasn't. (Informant # 11)</i></p> <p><i>- Just really told me if I do it the way I have suggested, this is where the bias would be. (Informant # 10)</i></p> <p><i>- That in previous work you've come across things that cheep you up, or that introduced problems, and so, those kinds of things could re-occur. (Informant # 11)</i></p> <p><i>- It doesn't give you a hundred percent of the answer, but it enables you to understand, it helps to understand the client's own problems, constraints. (Informant # 14)</i></p> <p><i>- Who know where they, where the unknowns or the controversial claims are. (Informant # 22)</i></p>

⁴⁹ The differences between these concepts are the following: (a) Feasible: a plan, idea or method that is feasible is possible and is likely to work; (b) Viable: a viable idea, plan or method that can work successfully, to continue to live or to develop into a living thing; (c) Potential: the possibility that something will develop in a particular way, or have a particular effect. (Source: Longman Dictionary of Contemporary English)

<p align="center">HELPS (EACH UNIT OF ANALYSIS WAS CODED TO MORE THAN ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)</p>			
CATEGORY NUMBER	HELPS CATEGORY (THE HELP KNOWLEDGE WORKERS NEED IS TO...)	GENERAL DEFINITION	EXAMPLES
HELP 5	SENSE FUTURE OPPORTUNITIES AND MOVE AHEAD	Perceive, estimate, or identify key aspects related to potential future events, trends, or scenarios, and to sense the opportunities that these might present in order to anticipate strategies, actions, movements, plans or decisions.	<p>-... help you understand the different trends as well. (Informant # 2)</p> <p>- It would have helped if they told us what products they will launch in the future. (Informant # 4)</p> <p>- Knowing where those energy sources are going to come from in the future ; where are these pipelines going to be, and where are they coming into the UK (Informant # 8)</p> <p>- And perhaps it gives you a few points as to where things may go in the vendors' space, what vendors might start to adopt in the future. (Informant # 11)</p> <p>- One key way, innovation. How to innovate. One of our technologies we came up with was a direct consequence of reviewing patents. (Informant # 33)</p> <p>- The understanding of knowing what the gas specification was, knowing what the trends might be for the future. (Informant # 8)</p>
HELP 6	USE OTHERS' EXPERIENCES TO PERFORM BETTER	To create, design, innovate, apply (to similar or different situations), adapt and improve products, service, management, decisions, processes, strategies and actions based on the experiences that other human-entities had already constructed within or without organizations.	<p>- More mature or more senior or someone who would be more experienced to lead or to say this is a direction, which you need to go. This would have made life a bit easier, because that would have prevented a lot of zigzagging to get to the final answer. So, guidance. It was missing. Probably an experienced person. (Informant # 1)</p> <p>- It told me, basically, what we do know already, it told me what we know, where it is, how to update it, and what might be difficult to find out. Because I remembered what we've done before. It might not be exactly the same, but I knew there was a good starting point. (Informant # 4)</p> <p>- It helped us to understand what they liked about our product, and what they didn't like about our product. Helped us to understand why they use our products, what concept they find useful. So, understanding their mind, how they use our products, and why they use them. (Informant # 27)</p>
HELP 7	UNDERSTAND AND COMPARE DIFFERENCES AND UNIQUENESSES [short version: understand differences and uniquenesses]	Perceive and understand what differentiate entities (e.g. processes, products, organizations, strategies) and how they differentiate, and to make or get comparative analysis to find out distinct or unique characteristics, dissimilarities, gaps and inconsistencies.	<p>- How the project was really rolled-out. Every roll-out is different. (Informant # 4)</p> <p>- It helped us to appreciate if there were anything that they were doing differently that helped them, compare to what we were attempting to do. (Informant # 6)</p> <p>- These reports were broader in their vision, so, it's something to draw all out and to show you where they're aligned and also where they differ. (Informant # 11)</p> <p>- I think it helped us to understand that the customer wanted to do something that was more complicated than necessary, because</p>

HELPS (EACH UNIT OF ANALYSIS WAS CODED TO MORE THAN ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)			
CATEGORY NUMBER	HELPS CATEGORY (THE HELP KNOWLEDGE WORKERS NEED IS TO...)	GENERAL DEFINITION	EXAMPLES
			<p><i>we knew another scenario that worked. So, because of knowing one scenario that worked we were able to then, recognize that the customer's scenario was more complicated. Then you can judge whether it deserves to be more complicated or not. (Informant # 17)</i></p> <p><i>- What the variations of the drug discovery process [were]. (Informant # 22)</i></p> <p><i>- That's what the technology is, it's the sound board. That's what makes it unique. (Informant # 34)</i></p>
HELP 8	<p>INCORPORATE DIFFERENT OR EXPERTS' PERSPECTIVES [short version: incorporate experts' perspectives]</p>	<p>Understand and incorporate varied perspectives to a subject, process or product; to incorporate the perspectives of all the entities involved on a subject, process or product; or to get and include the experts' (e.g. specialists on a field, decision-makers, top management) perspectives, opinions, analysis and thoughts.</p>	<p><i>- Dun and Bradstreet will create the credit rating, which means that you have an assessment of their financial analysis (Informant # 3)</i></p> <p><i>- The ideal situation would have been a lively conversation, and through a third-party, with the customer services director, who sat there and make observations from what he sees in front of him. (Informant # 6)</i></p> <p><i>- It gives you a slightly different view of the, the competitors, and what the vendors are doing. (Informant # 11)</i></p> <p><i>- if I could have got the author of the paper in the same room and just had a talk to them, and said ' this paper, you found this and I've got this problem, have you come across this?' (Informant # 12)</i></p> <p><i>- A different perspective to help us triangulate and to ensure that we don't end up in a situation where we think we know, and we don't have anything to challenge that assumption (Informant # 21)</i></p> <p><i>- To understand the different angles that I approach to them. (Informant # 27)</i></p>

Table 23 : The HELP coding categories and their definitions.

The Distribution of the Variable Categories by Situations

The unit of analysis for the variable HELP was the input-encountering moments (n=100) and each unit was coded to more than one category. Each of the units was coded to more than one category because knowledge workers inherently need to be helped in more than one way in input-encountering moments.

Table 24 indicates that across all input-encountering moments (n=100) the knowledge workers mostly needed to be helped to understand achievement and accomplishment of goals (HELP 1). It was needed about 2.7 times across all the 100 input-encountering moments. The next two most frequently needed HELP categories were sense and adapt to conditions (HELP 2), and evidence feasibility (HELP 3). Both were needed on average about twice across all the 100 input-encountering moments. The three most frequent HELP categories covered 70% of all the helps needed (n=961) by knowledge workers across all knowing situations.

The frequency of HELP 2 may be due to that in creating knowledge to support a business, the sensing of opportunities is one of the most valuable insight that knowledge workers can generate for their customers. The occurrence of HELP 3 may be due to the fact that the understanding of how things are feasible, viable and sustainable is an important one to ground customers' business strategies or actions. As a considerable part of knowledge created for business may be to ground this kind of actions, it would be natural to find out that the HELP 3 was also dominant. For example, most of the consultancy services (market, competitive analysis) are hired to make studies to evidence the potentiality of markets, products, or ideas and then, create the background knowledge to guide business decisions.

		HELPS (ONE UNIT OF ANALYSIS WAS CODED TO MORE THAN ONE CATEGORY) (UNIT OF ANALYSIS: INPUT-ENCOUNTERING MOMENTS, n=100)							
		HELP 1	HELP 2	HELP 3	HELP 4	HELP 5	HELP 6	HELP 7	HELP 8
		UNDERSTAND GOALS ACHIEVEMENT & ACCOMPLISHMENT	SENSE, PRIORITIZE AND ADAPT TO [NEW] CONDITIONS & SIGNALS (external and/or internal to the organization)	UNDERSTAND AND EVIDENCE FEASIBILITY, POTENTIALITY AND SUSTAINABILITY	ANTICIPATE AND AVOID PROBLEMS OR PITFALLS	SENSE FUTURE OPPORTUNITIES & MOVE AHEAD	USE OTHERS' EXPERIENCES TO PERFORM BETTER	UNDERSTAND AND COMPARE DIFFERENCES & UNIQUENESSES	INCORPORATE DIFFERENT OR EXPERTS' PERSPECTIVES
UNITS-OF ANALYSIS IN EACH KNOWING SITUATION (INPUT-ENCOUNTERING MOMENTS) (N=100)		AVERAGE OF OCCURRENCES (n=266)	AVERAGE OF OCCURRENCES (n=207)	AVERAGE OF OCCURRENCES (n=197)	AVERAGE OF OCCURRENCES (n=60)	AVERAGE OF OCCURRENCES (n=40)	AVERAGE OF OCCURRENCES (n=93)	AVERAGE OF OCCURRENCES (n=29)	AVERAGE OF OCCURRENCES (n=69)
SITUATION 1: BUSINESS COURSE OF ACTION AND FEASIBILITY (n=16)	16	2.06	2.44	4.44	0.19	0.50	0.69	0.19	0.63
SITUATION 2: COMPETITION & INDUSTRY DYNAMICS (n=18)	18	3.11	2.33	1.89	0.33	0.61	0.94	0.33	0.56
SITUATION 3: ORGANIZATIONS, MANAGEMENT & OPERATIONS (n=15)	15	2.80	0.80	1.33	0.40	0.00	0.93	0.13	0.53
SITUATION 4: MARKETS & CUSTOMERS (internal and external) (n=22)	22	2.45	3.91	1.59	0.77	0.59	0.41	0.23	0.86
SITUATION 5: PRODUCTS, SERVICES & SOLUTIONS (n=29)	29	2.79	0.97	1.28	0.97	0.28	1.45	0.45	0.76
ON AVERAGE	100	2.66	2.07	1.97	0.60	0.40	0.93	0.29	0.69

The highest value is highlighted with bright yellow
The second highest value is highlighted with pale yellow

Table 24 : The average occurrences of HELP categories across all the input-encountering moments (n=100) by knowing SITUATIONS.

Across all knowing situations, knowledge workers mostly needed helps in the first three categories (HELP 1, 2 and 3). HELP 1 was most frequently needed in SITUATION categories 2, 3 and 5. In SITUATION 2 it was mostly needed with HELP 2 and 3. In SITUATION 3, it was needed mostly needed with HELP 3 and 6.

In SITUATION 1 knowledge workers mostly needed to be helped in understanding and evidencing feasibility and sustainability (HELP 3). In each inputs encountering moment of this situation, HELP 3 was needed at least four times. This category was followed by the need to be helped to sense and adapt to conditions (HELP 2), and to understand goals achievement (HELP 1). Each of these categories was needed at least 2 times in each of the 16 input-encountering moments of SITUATION 1. The predominance of needing to be helped in understanding and evidencing feasibility and sustainability seems to be coherent with the focus of the knowledge creation in the respective knowing situation. This focus was business course of action and feasibility.

In SITUATIONS 2, 3 and 5, knowledge workers mostly needed to be helped to understand goals achievement (HELP 1). In SITUATION 2, this category was followed by HELP 2 and 3. In SITUATION 3, the second most frequent help needed was HELP 3. In SITUATION 5, the next most frequent help category was HELP 6.

The dominating HELP 1 in the three knowing situations mentioned above may be explained by the knowledge that was created in these situations. In SITUATION 2 knowledge creation was focused on competition and industry dynamics, and in this case the understandings of how organizations achieve and accomplish their goals indicate how they compete and operate business. In SITUATION 3, the focus of knowledge creation was on organizations, management & operations, if knowledge workers are helped in understanding how organizations accomplish their goals can give clear clues to how they manage the business. In SITUATION 5, the focus was on products, services and solutions. In this case, the understanding of how goals are achieved and accomplished can indicate which products or services that an organization is, for example, investing or having a good performance.

In the remaining SITUATION 4, the category HELP 2 was the most frequently needed, followed by HELP 1 and 3. The frequency of HELP 2 can be explained by the fact that in SITUATION 4 knowledge workers were creating knowledge focused on market and internal or external customers. In this case, knowledge workers may need to be helped in sensing aspects related to these customers (e.g. needs, priorities) and adapt their knowing process to these aspects.

6.8 Co-occurrences of Main Categories in Knowing Situations

The analysis of the co-occurrences between the CRITICAL QUESTION and HELP categories for each of the 5 knowing SITUATIONS was conducted to find out which category of a dependent variable (e.g. HELP) is most frequently associated with a specific category of an independent variable (e.g. CRITICAL QUESTION ENTITY).

The following results indicate how the CRITICAL QUESTION and HELP categories were associated within the five knowing SITUATIONS. These co-occurrences jointly with the results presented in the previous sections form the configuration of each knowing situation, that is, how they are structured. The complete configurations are presented following the present section.

Table 25 below shows the variables used in the present analysis.

INDEPENDENT VARIABLE	DEPENDENT VARIABLE	FOR KNOWING SITUATIONS 1,2,3,4 AND 5
CRITICAL QUESTION ENTITIES (CQENT)	HELPS (H)	
CRITICAL QUESTION ATTRIBUTES (CQATTRIB)	HELPS (H)	

Table 25 : The co-occurrences between categories that were analyzed in each knowing SITUATIONS.

The variables selected for the present analysis are those which mostly reflect the meaning creation in knowing situations. They are those which represent the mains aspects of the knowing phenomena under investigation.

In the following sections, the findings are purposefully reported with a focus on only the two highest of all the co-occurrences.

Chi-square tests (Pearson's) and the strength of associations (Cramer's V) were calculated for the associations between all categories of a dependent and all the categories of an independent variable within a specific situation. These analyses were focused on the pairs CRITICAL QUESTION ENTITY X HELP, and CRITICAL QUESTION ATTRIBUTE X HELP, given that these associations are the most important for the purposes of the present research. These results are presented at the end of the section discussing the co-occurrences in each knowing situation.

6.8.1 Knowing Situation 1

6.8.1.1 Critical Question Entities and Helps

The co-occurrences between the CRITICAL QUESTION ENTITY and the HELP categories were calculated based on the following:

$$\frac{\text{TOTAL OF OCCURRENCES OF A SPECIFIC HELP CATEGORY THAT CO-OCCURRED WITH A SPECIFIC CQ ENTITY CATEGORY}}{\text{TOTAL OF OCCURRENCES OF ALL THE HELP CATEGORIES THAT CO-OCCURRED WITH THE RESPECTIVE CQ ENTITY CATEGORY}}$$

The formula above was used for the respective analysis in all knowing situations.

KNOWING SITUATION 1 (n=16)							
CRITICAL QUESTIONS ENTITIES X HELPS							
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ENTITY OCCURRED <i>IT ANSWERS: Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X</i>							
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 4) that occurred when the independent variable occurred (e.g. critical question entity 1) / total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred							
	CQ ENTITY 1 (n=0)	CQ ENTITY 2 (n=88)	CQ ENTITY 3 (n=44)	CQ ENTITY 4 (n=0)	CQ ENTITY 5 (n=39)	CQ ENTITY 6 (n=7)	CQ ENTITY 7 (n=0)
HELP 1	0.0%	21.6%	13.6%	0.0%	12.8%	42.9%	0.0%
HELP 2	0.0%	27.3%	11.4%	0.0%	25.6%	0.0%	0.0%
HELP 3	0.0%	30.7%	52.3%	0.0%	46.2%	42.9%	0.0%
HELP 4	0.0%	1.1%	4.5%	0.0%	0.0%	0.0%	0.0%
HELP 5	0.0%	6.8%	0.0%	0.0%	5.1%	0.0%	0.0%
HELP 6	0.0%	9.1%	2.3%	0.0%	5.1%	0.0%	0.0%
HELP 7	0.0%	1.1%	2.3%	0.0%	2.6%	0.0%	0.0%
HELP 8	0.0%	2.3%	13.6%	0.0%	2.6%	14.3%	0.0%
TOTAL	0%	100%	100%	0%	100%	100%	0%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 26 : The co-occurrences between the CRITICAL QUESTION ENTITY and HELP categories in knowing SITUATION 1.

The predominant HELP categories used for the CRITICAL QUESTION ENTITY categories were HELP 3 (understand and evidence feasibility, potentiality and sustainability) and HELP 1 (understand goals achievement and accomplishment). CRITICAL QUESTION ENTITIES 1, 4 and 7 did not occur with the HELP categories in SITUATION 1.

As can be seen from Table 26, the HELP category that most frequently occurred with CRITICAL QUESTION ENTITY 2 was the one that reflected knowledge workers needing to

evidence feasibility (HELP 3, 30.7%). This was followed by knowledge workers needing to sense and adapt to conditions (HELP 2, 27.3%).

Of all the HELP categories needed with CRITICAL QUESTION ENTITY 3, 52.3% was related to knowledge workers need to be helped to evidence feasibility (HELP 3) of products and services. This category was equally followed by HELP 1 (understand goals achievement) and HELP 8 (incorporate experts' perspectives) (13.6% each).

46.2% of all the HELP categories that occurred with CRITICAL QUESTION ENTITY 5 were related to be helped to evidence feasibility and sustainability (HELP 3). This was followed by HELP 2 (25.6%), which is related to knowledge workers needing to be helped to sense and adapt to conditions.

HELP 1 (understand goals achievement) and HELP 3 (evidence feasibility) were equally the most frequently needed (42.9% respectively) when knowledge workers questioned about the industry and competitive environment (CQ ENTITY 6).

Explaining the Main Co-occurrences Between Critical Question Entities and Helps

In knowing SITUATION 1 (business course of action and feasibility), the three most frequent co-occurrences between CRITICAL QUESTION ENTITIES and HELPs were the following:

(a) *CRITICAL QUESTION ENTITY 3 (products, services and solutions) and HELP 3 (understand and evidence feasibility, potentiality and sustainability) (52.3%)*. This result is coherent with the fact that knowledge workers were trying to create knowledge about business feasibility, which demands to understand how products, services and solutions are or can be feasible and sustainable through time. By knowing this, a knowledge worker can prove that a business that involves such products and services is also feasible and sustainable.

(b) *CRITICAL QUESTION ENTITY 5 (existing or potential results) and HELP 3 (understand and evidence feasibility, potentiality and sustainability) (46.2%)*. These results can be explained by the focus of the knowledge creation in SITUATION 1, and also by the characteristics of the entity under questioning in this situation. To create knowledge about business course of action and feasibility, knowledge workers need to understand feasibility, potentiality and sustainability. When knowledge workers ask some aspects about existing or

potential results (e.g. sales, software reliability) is because they are trying to identify how these results signalize something related to a business course of action and feasibility, and consequently, help them prove feasibility of, for example, a product, an idea.

(c) *CRITICAL QUESTION ENTITY 6 (industry and competitive environment) with HELP 1 (understand goals achievement and accomplishment) (42.9%), and with HELP 3 (understand and evidence feasibility, potentiality and sustainability) (42.9%)*. This result can be due to the nature of knowledge being created in SITUATION 1. When knowledge workers ask about an industry or competitive context when they are creating knowledge about a business course of action and feasibility, they are needing to understand how the players in this industry achieve what they promised, how they do things, their performance and to evidence how feasible and sustainable things can be in the same industry. The understanding of how competitors achieve their goals and accomplish their processes or operation can indicate their course of action and how they work.

As can be seen, to be helped in understanding and evidencing feasibility, potentiality and sustainability was the most frequent help needed by knowledge workers when they created knowledge focused on business course of action and feasibility. Its proportion varied in four of the five SITUATIONS between 40% - 50%.

6.8.1.2 Critical Question Attributes and Helps

The co-occurrences between the CRITICAL QUESTION ATTRIBUTE and the HELP categories were calculated based on the following:

$$\frac{\text{TOTAL OF OCCURRENCES OF A SPECIFIC HELP CATEGORY THAT CO-OCCURRED WITH A SPECIFIC CQ ATTRIBUTE CATEGORY}}{\text{TOTAL OF OCCURRENCES OF ALL THE HELP CATEGORIES THAT CO-OCCURRED WITH THE RESPECTIVE CQ ATTRIBUTE CATEGORY}}$$

The formula above was used for the respective analysis in all knowing situations.

KNOWING SITUATION 1 (n=16)											
CRITICAL QUESTIONS ATTRIBUTES X HELPS											
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ATTRIBUTE OCCURRED											
IT ANSWERS: <i>Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X</i>											
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 4) that occurred when the independent variable occurred (e.g. critical question attribute 1) / total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred											
	CQ ATTRIBUTE 1 (n=33)	CQ ATTRIBUTE 2 (n=0)	CQ ATTRIBUTE 3 (n=33)	CQ ATTRIBUTE 4 (n=12)	CQ ATTRIBUTE 5 (n=0)	CQ ATTRIBUTE 6 (n=63)	CQ ATTRIBUTE 7 (n=12)	CQ ATTRIBUTE 8 (n=0)	CQ ATTRIBUTE 9 (n=15)	CQ ATTRIBUTE 10 (n=10)	CQ ATTRIBUTE 11 (n=0)
HELP 1	24.2%	0.0%	15.2%	41.7%	0.0%	20.6%	0.0%	0.0%	0.0%	20.0%	0.0%
HELP 2	9.1%	0.0%	3.0%	33.3%	0.0%	33.3%	16.7%	0.0%	20.0%	50.0%	0.0%
HELP 3	54.5%	0.0%	51.5%	0.0%	0.0%	28.6%	66.7%	0.0%	60.0%	10.0%	0.0%
HELP 4	0.0%	0.0%	6.1%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%
HELP 5	0.0%	0.0%	0.0%	0.0%	0.0%	9.5%	8.3%	0.0%	0.0%	10.0%	0.0%
HELP 6	6.1%	0.0%	3.0%	25.0%	0.0%	3.2%	8.3%	0.0%	13.3%	0.0%	0.0%
HELP 7	3.0%	0.0%	3.0%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%
HELP 8	3.0%	0.0%	18.2%	0.0%	0.0%	1.6%	0.0%	0.0%	6.7%	10.0%	0.0%
TOTAL	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 27 : The co-occurrences between the CRITICAL QUESTION ATTRIBUTE and HELP categories in knowing SITUATION 1.

The following CRITICAL QUESTION ATTRIBUTES did not occur in the 16 input-encountering moments of SITUATION 1: CRITICAL QUESTION ATTRIBUTES 2, 5, 8 and 11 (Table 27).

As can be seen from Table 27, HELP 3 was the most frequently needed help by knowledge workers (54.5%) when they asked about dimensions and indicators of entities (CQ ATTRIB 1) in SITUATION 1. Next frequently, knowledge workers needed to be helped to understand goals achievement (HELP 1, 24.2%).

51.5% of all HELP categories that occurred with CRITICAL QUESTION ATTRIBUTE 3 were related to be helped to evidence feasibility (HELP 3). 18.2% was related to be helped to incorporate experts' perspectives (HELP 8).

The most frequent help needed when knowledge workers asked about needs and demands of entities (CQATT 4) was related to the understanding of goals achievement (HELP 1, 41.7%). Following this category, they needed to be helped to sense and adapt to conditions (HELP 2, 33.3%).

HELP 2 (sense and adapt to conditions) was the most frequently needed (33.3%) by knowledge workers when they were asking about availability, supplying, consumption and utilization of entities (CQ ATTRIB 6). This was closely followed by HELP 3 (28.6%), which was related to knowledge workers needing to be helped to evidence feasibility.

When knowledge workers asked about the capabilities and experience of entities (CQATT 7), they most frequently needed to be helped to evidence feasibility (HELP 3, 66.7%).

60% of all the HELP categories that occurred with CRITICAL QUESTION ATTRIBUTE 9 were related to knowledge workers need to be helped to evidence feasibility (HELP 3). This was followed by HELP 2 category (20%), which was related to knowledge workers needing to be helped to sense and adapt to conditions.

The most frequently needed help when knowledge workers were asking about limitations and problems of entities (CQATT 10) was HELP 2 (50%). This HELP category was related to knowledge workers needing to be helped to sense and adapt to conditions. This was followed by HELP 1 (20%), which was related to be helped to understand goals achievement.

Explaining the Main Co-occurrences Between Critical Question Attributes and Helps

In knowing SITUATION 1 (business course of action and feasibility), the three most frequent co-occurrences between CRITICAL QUESTION ATTRIBUTES and HELPs were the following:

(a) *CRITICAL QUESTION ATTRIBUTE 7 (capabilities and experience) and HELP 3 (understand and evidence feasibility, potentiality and sustainability) (66.7%)*. When knowledge workers are creating knowledge about a business course of action and feasibility, asking about the capabilities and experience of entities (e.g. a customer service department, the capabilities of a country energy production) can generate hints and insights about how a similar, competitive or complementary business or project can be feasible and sustainable. Asking these aspects of entities indicate which specific business strategy may be in action. For example, if it is identified that company A is planning to improve and expand a specific market (e.g. company A is announcing hiring of personnel in China), this may indicate a specific market growth or new market penetration strategy.

(b) *CRITICAL QUESTION ATTRIBUTE 9 (reasons, drivers, groundings, and the rationale) and HELP 3 (understand and evidence feasibility, potentiality and sustainability) (60%)*. The understanding of what drives, bases, or explains entities (e.g. reasons for a product failure, how a department exhibits such high profit) can help on evidence how they are or can be feasible, potential or sustainable. Consequently, it is possible to know if a business involving these entities is also feasible and how this business has been working.

(c) *CRITICAL QUESTION ATTRIBUTE 1 (quantitative and qualitative dimensions and indicators) and HELP 3 (understand and evidence feasibility, potentiality and sustainability) (54.5%)*. These results can be explained by the nature of the knowledge being created in SITUATION 1 and by the kind of attribute of entities that knowledge workers used. If they are creating knowledge with a focus on a business course of action and its feasibility they need to have indicators or dimensions about entities such as markets, industry, products or organizations. These dimensions can indicate how these entities have performed, providing insights and an idea about their course of actions and extent of feasibility or sustainability.

To be helped in understanding and evidencing feasibility, potentiality and sustainability was most frequently needed when knowledge workers created knowledge focused on business course of action and feasibility. Its occurrence varied from 50% to 67%.

6.8.2 Knowing Situation 2

6.8.2.1 Critical Question Entities and Helps

The predominant HELP categories that co-occurred with the CRITICAL QUESTION ENTITY categories were categories HELP 1 and HELP 2 (Table 28). The following CRITICAL QUESTION ENTITY categories did not occur in the 18 input-encountering moments of SITUATION 2: CRITICAL QUESTION ENTITIES 1, 2 and 5.

KNOWING SITUATION 2 (n=18)							
CRITICAL QUESTIONS ENTITIES x HELPS							
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ENTITY OCCURRED IT ANSWERS: <i>Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X</i>							
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 4) that occurred when the independent variable occurred (e.g. critical entity 6) / total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred							
	CQ ENTITY 1 (n=0)	CQ ENTITY 2 (n=0)	CQ ENTITY 3 (n=90)	CQ ENTITY 4 (n=31)	CQ ENTITY 5 (n=0)	CQ ENTITY 6 (n=51)	CQ ENTITY 7 (n=10)
HELP 1	0.0%	0.0%	32.2%	12.9%	0.0%	37.3%	40.0%
HELP 2	0.0%	0.0%	12.2%	58.1%	0.0%	19.6%	30.0%
HELP 3	0.0%	0.0%	32.2%	3.2%	0.0%	7.8%	0.0%
HELP 4	0.0%	0.0%	3.3%	3.2%	0.0%	3.9%	0.0%
HELP 5	0.0%	0.0%	1.1%	0.0%	0.0%	17.6%	10.0%
HELP 6	0.0%	0.0%	10.0%	3.2%	0.0%	13.7%	0.0%
HELP 7	0.0%	0.0%	6.7%	0.0%	0.0%	0.0%	0.0%
HELP 8	0.0%	0.0%	2.2%	19.4%	0.0%	0.0%	20.0%
TOTAL	0%	0%	100%	100%	0%	100%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 28 : The co-occurrences between the CRITICAL QUESTION ENTITY and HELP categories in knowing SITUATION 2.

It can be seen in Table 28 the categories HELP 1 and HELP 3 were equally needed when (33.3% for both categories) knowledge workers asked about products, services and

solutions (CQENT 3). HELP 1 is related to knowledge workers needing to be helped to understand goals achievement, and HELP 3 is related to knowledge workers needing to be helped to evidence feasibility.

HELP 2 was predominantly needed (58.1%) when knowledge workers asked about organizations and their management (CQENT 4). HELP 2 was related to be helped to sense, and adapt to conditions. This category was followed by HELP 8 (19.4%), which was related to be helped to incorporate experts' perspectives.

When knowledge workers asked about an industry and competitive environment (CQENT 6), the most frequently needed help was HELP 1 (37.3%). This was related to be helped to understand goals achievement. This category was followed by HELP 2 (19.6%), which was related to be helped to sense and adapt to conditions.

HELP 1 was the most frequently needed (40%) when knowledge workers asked about changes and trends (CQENT 7). This category is related to be helped to understand goals achievement. This was followed by HELP 2 (30%), which is related to knowledge workers needing to be helped to sense and adapt to conditions.

Explaining the Main Co-occurrences Between Critical Question Entities and Helps

In knowing SITUATION 2 (competition and industry dynamics), the three most frequent co-occurrences between CRITICAL QUESTION ENTITYs and HELPs were the following:

(a) *CRITICAL QUESTION ENTITY 4 (organizations and management) and HELP 2 (sense, prioritize and adapt to [new] conditions and signals) (58.1%)*. When knowledge workers ask about aspects related to organizations and they are creating knowledge about competition and industry dynamics, they probably need to identify if there are any movements or strategies that these organizations have being making that can indicate any opportunities or highly influential changes for the sector and the competition. For example, if it is identified that organization A is buying large warehouses and hiring personnel in South Africa, together with other factors, this may indicate some kind of investment or market-growing strategy.

(b) *CRITICAL QUESTION ENTITY 7 (changes and trends) and HELP 1 (understand goals achievement and accomplishment) (40%)*. When knowledge workers create knowledge about competition and industry dynamics and they ask about changes and trends, they need to understand how goals are to be achieved, and how organizations can accomplish their goals in relation to what is or will change in the competition and industry. For example, if the population of older people will be much greater in 3 years, how does this affect house construction? How organizations will keep their profits if houses will cost more because they need to be constructed with different materials and include different functional aspects?

(c) *CRITICAL QUESTION ENTITY 6 (industry and competitive environment) and HELP 1 (understand goals achievement and accomplishment) (37.3%)*. When knowledge workers try to understand about competition and industry dynamics, it is natural that they ask about the sector, and about the competition context. By getting answers to this, they need to understand how organizations work, how they do (e.g. which sales channel they use, which market they aim to conquer, how they keep customers) to accomplish their goals.

Knowledge workers mostly needed to be helped in understanding goals achievement and accomplishment and to sense, prioritize and adapt to [new] conditions and signals when they created knowledge related to competition and industry dynamics. The occurrence of these HELP categories (HELP 1 and 2) varied between 30% and 60%.

6.8.2.2 Critical Question Attributes and Helps

The predominant HELP categories that co-occurred with CRITICAL QUESTION ATTRIBUTE categories were HELP 1 and HELP 2 (Table 29). The following CRITICAL QUESTION ATTRIBUTE categories did not occur in the 18 input-encountering moments of SITUATION 2: CRITICAL QUESTION ATTRIBUTE categories 1, 4, 9 and 11.

KNOWING SITUATION 2 (n=18)											
CRITICAL QUESTIONS ATTRIBUTES X HELPS											
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ATTRIBUTE OCCURRED											
IT ANSWERS: Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X											
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 4) that occurred when the independent variable occurred (e.g. critical question attribute 6) / total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred											
	CQ ATTRIBUTE 1 (n=0)	CQ ATTRIBUTE 2 (n=17)	CQ ATTRIBUTE 3 (n=9)	CQ ATTRIBUTE 4 (n=0)	CQ ATTRIBUTE 5 (n=19)	CQ ATTRIBUTE 6 (n=59)	CQ ATTRIBUTE 7 (n=49)	CQ ATTRIBUTE 8 (n=10)	CQ ATTRIBUTE 9 (n=0)	CQ ATTRIBUTE 10 (n=19)	CQ ATTRIBUTE 11 (n=0)
HELP 1	0.0%	23.5%	55.6%	0.0%	15.8%	35.6%	24.5%	40.0%	0.0%	36.8%	0.0%
HELP 2	0.0%	5.9%	0.0%	0.0%	63.2%	15.3%	18.4%	30.0%	0.0%	42.1%	0.0%
HELP 3	0.0%	11.8%	33.3%	0.0%	0.0%	27.1%	26.5%	0.0%	0.0%	0.0%	0.0%
HELP 4	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	6.1%	0.0%	0.0%	10.5%	0.0%
HELP 5	0.0%	35.3%	0.0%	0.0%	0.0%	1.7%	6.1%	10.0%	0.0%	0.0%	0.0%
HELP 6	0.0%	23.5%	11.1%	0.0%	5.3%	8.5%	8.2%	0.0%	0.0%	10.5%	0.0%
HELP 7	0.0%	0.0%	0.0%	0.0%	0.0%	6.8%	4.1%	0.0%	0.0%	0.0%	0.0%
HELP 8	0.0%	0.0%	0.0%	0.0%	15.8%	3.4%	6.1%	20.0%	0.0%	0.0%	0.0%
TOTAL	0%	100%	100%	0%	100%	100%	100%	100%	0%	100%	0%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 29 : The co-occurrences between the CRITICAL QUESTION ATTRIBUTE and HELP categories in knowing SITUATION 2.

Table 29 shows that HELP 5 was the most frequently needed help (35.3%) when knowledge workers asked about dynamics, interrelationships and movements of entities (CQ ATT 2). HELP 5 was related to knowledge workers needing to be helped to sense future opportunities and move ahead. This category was equally followed by HELP 1 and HELP 6 (23.5% each). HELP 1 was related to knowledge workers needing to be helped to understand goals achievement, and HELP 6 to use others' experiences to perform their knowing better.

When knowledge workers asked about the design and configuration of entities (CQATT 3) they mostly needed to be helped to understand goals achievement (HELP 1, 55.6%). This was followed by HELP 3 (33%), which was related to be helped to evidence feasibility.

Knowledge workers mostly needed to sense and adapt to conditions (HELP 2, 63.2%), when they asked about strategies and objectives of entities (CQATT 5). This was equally followed by knowledge workers needing to be helped to understand goals achievement (HELP 1, 15.8%), and to be helped to incorporate experts' perspectives (HELP 8, 15.8%).

The most frequent needed help when knowledge workers asked about availability and utilization of entities was HELP 1 (35.5%). This category is related to knowledge workers need to be helped to understand goals achievement. This is followed by HELP 3 (27.1%) which was related to be helped to evidence feasibility.

HELP 3 and HELP 1 were closely the most frequently helps needed when knowledge workers asked about the capabilities and experience of entities (26.5% and 24.5% respectively). HELP 3 was related to knowledge workers needing to be helped to evidence feasibility, and HELP 1 to understand goals achievement.

The most frequently help needed when knowledge workers asked about the influence and impacting power of entities was HELP 1 (40%). HELP 1 was related to be helped to understand goals achievement. This was followed by HELP 2 (30%), which was related to knowledge workers need to be helped to understand goals achievement.

When knowledge workers asked about limitations and problems of entities (CQATT 10), HELP 2 was the most frequently needed (42.1%). HELP 2 was related to knowledge workers need to be helped to sense and adapt to conditions. This was followed by HELP 1 (36.8%), which was related to be helped to understand goals achievement.

Explaining the Main Co-occurrences Between Critical Question Attributes and Helps

In knowing SITUATION 2 (competition and industry dynamics), the three most frequent co-occurrences between CRITICAL QUESTION ATTRIBUTES and HELPs were the following:

(a) *Critical Question Attribute 5 (strategies, objectives and priorities) and Help 2 (sense, prioritize and adapt to [new] conditions and signals) (63.2%)*. Answers to questions involving the strategies, objectives and priorities of entities can signalize the ways that they are competing in the industry, and the movements and changes that may be happening (e.g. mergers and acquisitions). In SITUATION 2, knowledge workers create knowledge about competition and industry dynamics, and thus, it is natural that they need to be helped in sensing potential changes, hidden movements by competitors, future actions that increase competitiveness. This should be accounted for in the creation of knowledge because these movements, changes, opportunities and conditions may have impacts to the business of the knowledge worker's customer.

(b) *Critical Question Attribute 3 (design, structure and configuration) and Help 1 (understand goals achievement and accomplishment) (55.6%)*. The understanding of how entities are or should be structured or designed (e.g. the financial or the sales department) can help knowledge workers to understand how the respective entity reach its goals and make things happen. Consequently, knowledge workers can know how these entities are competing and performing in the sector.

(c) *Critical Question Attribute 10 (limitations, threats, pitfalls and problems) and Help 2 (sense, prioritize and adapt to [new] conditions and signals) (42.1%)*. This result can be explained by the fact that by knowing the limitations, threats, pitfalls and problems of entities knowledge workers can sense how these entities are performing or even planning to change in order to handle these problems or limitations. This commonly signalizes how entities operate, move and compete in an industry.

In creating knowledge about competition and the industry dynamics, knowledge workers needed mainly to be helped in understand goals achievement and accomplishment

and to sense, prioritize and adapt to [new] conditions and signals. The frequency of these HELP categories (HELP 1 and 2) varied between 35% and 65%.

6.8.3 Knowing Situation 3

6.8.3.1 Critical Question Entities and Helps

The HELP category that predominantly co-occurred with the CRITICAL QUESTION ENTITY categories was HELP 1 (Table 30). The following ENTITY categories did not occur with any HELP in the 15 input-encountering moments of SITUATION 3: 6 and 7. The HELP category that did not co-occurred with any of the CRITICAL QUESTION ENTITY categories was HELP 5.

KNOWING SITUATION 3 (n=15)							
CRITICAL QUESTIONS ENTITIES X HELPS							
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURRED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ENTITY OCCURRED IT ANSWERS: <i>Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X</i>							
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 4) that occurred when the independent variable occurred (e.g. critical question entity 7)/ total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred							
	CQ ENTITY 1 (n=10)	CQ ENTITY 2 (n=12)	CQ ENTITY 3 (n=11)	CQ ENTITY 4 (n=47)	CQ ENTITY 5 (n=24)	CQ ENTITY 6 (n=0)	CQ ENTITY 7 (n=0)
HELP 1	20.0%	0.0%	36.4%	55.3%	41.7%	0.0%	0.0%
HELP 2	0.0%	16.7%	0.0%	14.9%	12.5%	0.0%	0.0%
HELP 3	20.0%	58.3%	9.1%	6.4%	29.2%	0.0%	0.0%
HELP 4	10.0%	0.0%	9.1%	8.5%	0.0%	0.0%	0.0%
HELP 5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HELP 6	40.0%	16.7%	45.5%	2.1%	8.3%	0.0%	0.0%
HELP 7	0.0%	0.0%	0.0%	2.1%	4.2%	0.0%	0.0%
HELP 8	10.0%	8.3%	0.0%	10.6%	4.2%	0.0%	0.0%
TOTAL	100%	100%	100%	100%	100%	0%	0%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 30 : The co-occurrences between the CRITICAL QUESTION ENTITY and the HELP categories in knowing SITUATION 3.

Table 30 shows that the most frequent help needed when knowledge workers asked about theoretical and internal knowledge (CQENT 1) was HELP 6 (40%). This category was related to knowledge workers need to be helped to use others' experiences in order to

perform their knowing better. This was equally followed by HELP 1 (understand goals achievement) and HELP 3 (evidence feasibility) (20% each).

When knowledge workers asked about market and customers (CQENT 2), they mostly needed to be helped to evidence feasibility (HELP 3, 58.3%).

Knowledge workers mostly needed to be helped to use others' experiences to perform their knowing better (HELP 6, 45.5%), when they asked about products and services (CQENT 3). This was followed by HELP 1 (36.4%), which is related to be helped to understand goals achievement.

HELP 1 was the most needed (55.3%) when knowledge workers asked about organizations and management (CQENT 4). HELP 1 was related to knowledge workers need to be helped to understand goals achievement.

When questioning was about the existing or potential results (CQENT 5), knowledge workers primarily needed to understand goals achievement (HELP 1, 41.7%). The following most frequent category was HELP 3 (29.2%) which was related to be helped to evidence feasibility.

Explaining the Main Co-occurrences Between Critical Question Entities and Helps

In knowing SITUATION 3 (organizations, management and operations), the three most frequent co-occurrences between CRITICAL QUESTION ENTITYs and HELPs were the following:

(a) CRITICAL QUESTION ENTITY 2 (market and internal or external customers) and HELP 3 (understand and evidence feasibility, potentiality and sustainability) (58.3%). Answers to questions about aspects of a market and customers can signalize the potentiality and sustainability of this market and of an idea, product or project related to it. The understanding of sustainability and feasibility supports creating knowledge related to how the organizations operations and management are employed to make these markets and products feasible and sustainable through time.

(b) CRITICAL QUESTION ENTITY 4 (organizations and management) and HELP 1 (understand goals achievement and accomplishment) (55.3%). The possible explanation for this result is that answers to questions about organizations and management can indicate how

these organizations reach their goals and accomplish their processes. Consequently, this enables the knowledge worker to understand the organizations management and operations.

(c) *CRITICAL QUESTION ENTITY 3 (products, services and solutions) and HELP 6 (use others' experiences in order to perform better) (45.5%)*. This result can be explained by the fact that answers to questions about products, services and solutions can help knowledge workers to understand individuals' experiences with these products (e.g. uses, problems, level of satisfaction). Knowledge workers can incorporate the understanding of these experiences to their knowledge creation related to the respective organizations and their operations, and thus, generate better products of their knowing.

In creating knowledge related to organizations, management & operations knowledge workers mostly needed to be helped to understand goals achievement, evidence feasibility, potentiality and sustainability, and use others' experiences to perform their knowing better. These HELP categories (HELP 1, 3 and 6) occurred in a range of 30% - 60%.

6.8.3.2 Critical Question Attributes and Helps

The HELP categories that predominantly co-occurred with the CRITICAL QUESTION ATTRIBUTE categories were HELP 1 and HELP 3. The following CRITICAL QUESTION ATTRIBUTE categories did not occur in the 15 input-encountering moments of SITUATION 3: 7 and 8 (Table 31). The HELPS category that did not co-occur with any of the CRITICAL QUESTION ATTRIBUTE categories was HELP 5.

KNOWING SITUATION 3 (n=15)											
CRITICAL QUESTIONS ATTRIBUTES X HELPS											
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ATTRIBUTE OCCURRED											
IT ANSWERS: <i>Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X</i>											
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 4) that occurred when the independent variable occurred (e.g. critical question attribute 5) / total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred											
	CQ ATTRIBUTE 1 (n=5)	CQ ATTRIBUTE 2 (n=7)	CQ ATTRIBUTE 3 (n=15)	CQ ATTRIBUTE 4 (n=9)	CQ ATTRIBUTE 5 (n=13)	CQ ATTRIBUTE 6 (n=21)	CQ ATTRIBUTE 7 (n=0)	CQ ATTRIBUTE 8 (n=0)	CQ ATTRIBUTE 9 (n=13)	CQ ATTRIBUTE 10 (n=5)	CQ ATTRIBUTE 11 (n=16)
HELP 1	0.0%	28.6%	66.7%	0.0%	53.8%	28.6%	0.0%	0.0%	46.2%	20.0%	62.5%
HELP 2	0.0%	42.9%	0.0%	22.2%	23.1%	0.0%	0.0%	0.0%	15.4%	0.0%	12.5%
HELP 3	80.0%	0.0%	13.3%	55.6%	15.4%	14.3%	0.0%	0.0%	15.4%	0.0%	12.5%
HELP 4	0.0%	28.6%	0.0%	0.0%	0.0%	9.5%	0.0%	0.0%	0.0%	40.0%	0.0%
HELP 5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
HELP 6	0.0%	0.0%	13.3%	11.1%	0.0%	42.9%	0.0%	0.0%	15.4%	0.0%	0.0%
HELP 7	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.3%
HELP 8	0.0%	0.0%	6.7%	11.1%	7.7%	4.8%	0.0%	0.0%	7.7%	40.0%	6.3%
TOTAL	100%	100%	100%	100%	100%	100%	0%	0%	100%	100%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 31 : The co-occurrences of the CRITICAL QUESTION ATTRIBUTE categories and the HELP categories in the knowing SITUATION 3.

When knowledge workers asked about dimensions and indicators of entities (CQ ATT 1), they mostly needed to be helped to evidence feasibility (HELP 3, 80%). Following this category was HELP 7 (20%), which was related to the need to be helped to understand differences and uniquenesses.

HELP 2 was the most frequent help needed (42.9%) when knowledge workers asked about the dynamics and interrelationships of entities (CQ ATT 2). HELP 2 was related to knowledge workers need to be helped to sense and adapt to conditions. This was equally followed by HELP 1 (understand goals achievement) and HELP 4 (anticipate problems) (28.6% each).

When the questions were about design and configuration of entities (CQATT 3), knowledge workers mostly needed to be helped to understand goals achievement (HELP 1, 66.7%). This category was equally followed by HELP 3 (evidence feasibility) and HELP 6 (use others' experiences to perform better) (13.3% each).

In asking questions about the needs and demands of entities (CQATT 4), the help mostly needed was HELP 3 (55.6%). HELP 3 was related to knowledge workers' need to be helped to evidence feasibility. This category was followed by HELP 2 (22.2%), which was related to be helped to sense and adapt to conditions.

The most frequent help needed by knowledge workers when they asked about strategies and objectives of entities (CQATT 5) was HELP 1 (53.8%). This category is related to the understanding of goals achievement. It was followed by HELP 2 (23.1%), which was related to be helped to sense and adapt to conditions.

When knowledge workers asked about the availability and utilization of entities (CQATT 6), HELP 6 was the most frequently needed (42.9%). HELP 6 is related to knowledge workers need to be helped to use others' experiences to perform their knowing better. This following category was HELP 1 (28.6%), which was related to be helped to understand goals achievement.

The most frequent help needed by knowledge workers when they asked about the reasons and drivers of entities (CQATT 9) was HELP 1 (46.2%). This was related to be helped to understand goals achievement. It was equally followed by HELP 2, HELP 3, and HELP 6 (15.4%).

HELP 4 and HELP 8 were equally the most frequent help needed (40% each) when knowledge workers asked about limitations and problems of entities (CQATT 10). HELP 4

was related to knowledge workers need to be helped to anticipate problems, and HELP 8 to incorporate experts' perspectives.

In asking about the functioning and operation of entities, knowledge workers most frequently needed to understand goals achievement (HELP 1, 62.5%). This category was equally followed by HELP 2 and HELP 3 (12.5% each).

Explaining the Main Co-occurrences Between Critical Question Attributes and Helps

In knowing SITUATION 3 (organizations, management and operations), the three most frequent co-occurrences between CRITICAL QUESTION ATTRIBUTES and HELPs were the following:

(a) CRITICAL QUESTION ATTRIBUTE 1 (quantitative and qualitative dimensions and indicators) and HELP 3 (understand and evidence feasibility, potentiality and sustainability) (80%). By getting the qualitative and quantitative dimensions of entities (e.g. market-share), knowledge workers can understand what is feasible and sustainable in relation to these entities (e.g. launch a new product). Consequently, this supports knowledge workers to create knowledge about organizations, management and operations related to the respective entities (e.g. how competitor A succeeds in providing specific services to most segments of the market).

(b) CRITICAL QUESTION ATTRIBUTE 3 (design, structure and configuration) and HELP 1 (understand goals achievement and accomplishment) (66.7%). Answers to questions about the design, structure and configuration of entities (e.g. product delivery to international markets) can help knowledge workers understand how these entities work to achieve their goals and to accomplish their processes (e.g. supplying or delivery process). Consequently, this supports the creation of knowledge related to organizations, management and operations.

(c) CRITICAL QUESTION ATTRIBUTE 11 (functioning, operation) and HELP 1 (understand goals achievement and accomplishment) (62.5%). A possible explanation for this result is that answers to questions related to how entities (e.g. the logistic department) function and operate, knowledge workers can understand how they are managed and how

they operate, how they accomplish their operational processes and reach their goals (e.g. how they ship products at a lower price).

When creating knowledge focused on organizations, management and operations, knowledge workers mostly needed to be helped to understand goals achievement and accomplishment, and to understand and evidence feasibility, potentiality and sustainability. These HELP categories (HELP 1 and 3) occurred between 45% and 80%.

6.8.4 Knowing Situation 4

6.8.4.1 Critical Question Entities and Helps

The HELP categories that predominantly co-occurred with the CRITICAL QUESTION ENTITY categories were HELP 2 and 1 (Table 32). The CRITICAL QUESTION ENTITY categories that did not occur in the 22 input-encountering moments of SITUATION 4 were the following: CRITICAL QUESTION ENTITYs 1 and 5 (Table 32).

CRITICAL QUESTIONS ENTITIES x HELPS							
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURRED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ENTITY OCCURRED IT ANSWERS: <i>Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X</i>							
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 4) that occurred when the independent variable occurred (e.g. critical question entity 6) / total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred							
	CQ ENTITY 1 (n=0)	CQ ENTITY 2 (n=84)	CQ ENTITY 3 (n=113)	CQ ENTITY 4 (n=26)	CQ ENTITY 5 (n=0)	CQ ENTITY 6 (n=5)	CQ ENTITY 7 (n=10)
HELP 1	0.0%	13.1%	31.9%	3.8%	0.0%	80.0%	20.0%
HELP 2	0.0%	42.9%	28.3%	50.0%	0.0%	0.0%	50.0%
HELP 3	0.0%	15.5%	16.8%	11.5%	0.0%	0.0%	0.0%
HELP 4	0.0%	9.5%	3.5%	15.4%	0.0%	0.0%	10.0%
HELP 5	0.0%	9.5%	4.4%	0.0%	0.0%	0.0%	0.0%
HELP 6	0.0%	1.2%	5.3%	3.8%	0.0%	0.0%	10.0%
HELP 7	0.0%	1.2%	2.7%	3.8%	0.0%	0.0%	0.0%
HELP 8	0.0%	7.1%	7.1%	11.5%	0.0%	20.0%	10.0%
TOTAL	0%	100%	100%	100%	0%	100%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 32 : The co-occurrences between the CRITICAL QUESTION ENTITY and HELP categories in knowing SITUATION 4.

As can be seen from Table 32, the most needed help when knowledge workers asked about market and customers (CQENT 2) was HELP 2 (42.9%). This category was related to be helped to sense and adapt to conditions. This was followed by HELP 3 (15.5%), which was related to be helped to evidence feasibility.

When knowledge workers asked about products and services (CQENT 3), they most frequently needed to be helped to understand goals achievement (HELP 1, 31.9%). This category was followed by HELP 2 (28.3%), which is related to be helped to sense and adapt to conditions.

HELP 2 was the most frequently needed (50%) when knowledge workers asked about organizations and management (CQ ENT 4). This category is related to be helped to sense and adapt to conditions. It was followed by HELP 4 (15.4%), which is related to be helped to anticipate problems.

Knowledge workers most frequently needed to be helped to understand goals achievement (HELP 1, 80%) when they asked about the industry and competitive environment (CQENT 6).

In asking about changes and trends (CQENT 7), HELP 2 was the most frequently needed (50%). This category was related to be helped to sense and adapt to conditions. This was followed by HELP 1 (20%), which is related to be helped to understand goals achievement.

Explaining the Main Co-occurrences Between Critical Question Entities and Helps

In knowing SITUATION 4 (markets and internal or external customers), the three most frequent co-occurrences between CRITICAL QUESTION ENTITYs and HELPs were the following:

(a) *CRITICAL QUESTION ENTITY 6 (industry and competitive environment) and HELP 1 (understand goals achievement and accomplishment) (80%)*. This result can be explained by the fact that answers to questions about an industry and competitive environment can help knowledge workers to know how organizations in this environment accomplish their processes and reach their goals. Consequently, this supports knowledge workers to create knowledge related to a market of this industry.

(b) CRITICAL QUESTION ENTITY 4 (organizations and management) and HELP 2 (sense, prioritize and adapt to [new] conditions and signals) (50%). A possible explanation of this result is that answers to questions about organizations and their management can help identify aspects, movements, actions, changes, or tactics that these organizations may be performing. Answers to questions about this entity can help knowledge workers to sense problems, opportunities or influential changes related to these organizations and management, and thus prioritize and adapt their analysis and the knowledge being created about markets.

(c) CRITICAL QUESTION ENTITY 7 (changes and trends) and HELP 2 (sense, prioritize and adapt to [new] conditions and signals) (50%). Getting answers to questions about trends and changes can help knowledge workers to perceive new conditions to which they should focus on or adapt in their knowledge creation about markets and internal or external customers. Trends and changes commonly signalize movements in a market and industry, which can help knowledge workers to focus, adapt and prioritize aspects and topics in their knowledge creation about these markets and customers.

Knowledge workers mostly needed to be helped to understand goals achievement and accomplishment, and to sense, prioritize and adapt to [new] conditions and signals, when they created knowledge related to markets and internal or external customers. These HELP categories (HELP 1 and 2) occurred in a range between 30% and 80%.

6.8.4.2 Critical Question Attributes and Helps

The HELP categories that predominantly co-occurred with the CRITICAL QUESTION ATTRIBUTE categories were HELP 2 and HELP 1 (Table 33 **Error! Reference source not found.**). The following CRITICAL QUESTION ATTRIBUTE categories did not occur in the 22 input-encountering moments of SITUATION 4: 1, 7 and 9 (Table 33).

KNOWING SITUATION 4 (n=22)											
CRITICAL QUESTIONS ATTRIBUTES X HELPS											
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ATTRIBUTE OCCURRED											
IT ANSWERS: Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X											
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 4) that occurred when the independent variable occurred (e.g. critical question attribute 9) / total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred											
	CQ ATTRIBUTE 1 (n=0)	CQ ATTRIBUTE 2 (n=43)	CQ ATTRIBUTE 3 (n=44)	CQ ATTRIBUTE 4 (n=26)	CQ ATTRIBUTE 5 (n=31)	CQ ATTRIBUTE 6 (n=64)	CQ ATTRIBUTE 7 (n=0)	CQ ATTRIBUTE 8 (n=10)	CQ ATTRIBUTE 9 (n=0)	CQ ATTRIBUTE 10 (n=14)	CQ ATTRIBUTE 11 (n=6)
HELP 1	0.0%	11.6%	25.0%	15.4%	22.6%	29.7%	0.0%	20.0%	0.0%	7.1%	83.3%
HELP 2	0.0%	46.5%	38.6%	15.4%	48.4%	32.8%	0.0%	50.0%	0.0%	28.6%	0.0%
HELP 3	0.0%	7.0%	13.6%	46.2%	12.9%	14.1%	0.0%	0.0%	0.0%	7.1%	0.0%
HELP 4	0.0%	11.6%	2.3%	23.1%	0.0%	0.0%	0.0%	10.0%	0.0%	28.6%	0.0%
HELP 5	0.0%	14.0%	6.8%	0.0%	9.7%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%
HELP 6	0.0%	0.0%	2.3%	0.0%	0.0%	9.4%	0.0%	10.0%	0.0%	7.1%	0.0%
HELP 7	0.0%	0.0%	4.5%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	7.1%	16.7%
HELP 8	0.0%	9.3%	6.8%	0.0%	6.5%	10.9%	0.0%	10.0%	0.0%	14.3%	0.0%
TOTAL	0%	100%	100%	100%	100%	100%	0%	100%	0%	100%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 33 : The co-occurrences between the CRITICAL QUESTION ATTRIBUTE and HELP categories in knowing SITUATION 4.

As can be seen from Table 33, HELP 2 was the most frequently needed help (46.5%) when knowledge workers asked about the dynamics and interrelationships of entities (CQATT 2). HELP 2 is related to be helped to sense and adapt to conditions. This was followed by HELP 5 (14%), which was related to be helped to sense future opportunities and move ahead.

The most frequent help needed when knowledge workers asked about the design, structure and configuration of entities (CQATT 3) was HELP 2 (38.6%). This was related to be helped to sense and adapt to conditions. This dominant category was followed by HELP 1 (25%), which was related to be helped to understand goals achievement.

When knowledge workers asked about needs and demands of entities (CQATT 4), HELP 3 (evidence feasibility) was the most frequently needed (46.2%). HELP 3 was followed by HELP 4 (23.1%), which was related to be helped to anticipate problems.

HELP 2 was the most frequently needed (48.4%) when knowledge workers asked about strategies and objectives of entities (CQATT 5). HELP 2 was related to be helped to sense and adapt to conditions. This was followed by HELP 1 (22.6%), which was related to be helped to understand goals achievement.

Knowledge workers mostly needed to be helped to sense and adapt to conditions (HELP 2, 32.8%) when they asked about the availability and utilization of entities (CQATT 6). The following category was HELP 4 (29.7%). This was related to knowledge workers need to be helped to anticipate problems.

When questioning turned to be about the influence and impacting power of entities (CQATT 8), HELP 2 (50%) was the most frequently needed. This category was related to knowledge workers need to be helped to sense and adapt to conditions. This predominant category was followed by HELP 1 (20%), which was related to be helped to understand goals achievement.

HELP 2 and HELP 4 were equally the most frequently needed categories (28.6% each) when knowledge workers asked about the limitations and problems of entities (CQATT 10).

When knowledge workers asked about the functioning and operation of entities, they predominantly needed to be helped to understand goals achievement (HELP 1, 83.3 %).

Explaining the Main Co-occurrences Between Critical Question Attributes and Helps

In knowing SITUATION 4 (markets and internal or external customers), the three most frequent co-occurrences between CRITICAL QUESTION ATTRIBUTES and HELPs were the following:

(a) *CRITICAL QUESTION ATTRIBUTE 11 (functioning, operation) and HELP 1 (understand goals achievement and accomplishment) (83.3%)*. Answers to questions about the functioning and operation of entities can help understand how these entities accomplish their processes and achieve goals. By understanding this, knowledge workers can create knowledge about a market related to these entities.

(b) *CRITICAL QUESTION ATTRIBUTE 8 (influence and impacting power) and HELP 2 (sense, prioritize and adapt to [new] conditions and signals) (50%)*. By getting answers to questions about the influence and impacts of entities (e.g. a new product) knowledge workers can identify which new conditions, foci and events related to these entities their knowledge creation should be accounting for, be adapted to, and prioritized. This supports creating knowledge about markets and customers related to the entities under questioning.

(c) *CRITICAL QUESTION ATTRIBUTE 5 (strategies, objectives and priorities) and HELP 2 (sense, prioritize and adapt to [new] conditions and signals) (48.4%)*. Answers to questions about the strategies, objectives and priorities of entities can help bring forth new conditions to the knowledge being created by knowledge workers should account for or focus on. Consequently, this enable to create knowledge about the market and customers related to these entities.

When knowledge workers created knowledge focused on markets and internal or external customers, they needed to understand goals achievement and accomplishment, and to sense, prioritize and adapt to [new] conditions and signals (external and/or internal to the organization) (HELP 1 and 2). These HELP categories were most frequent and occurred between 30% and 85%.

6.8.5 Knowing Situation 5

6.8.5.1 Critical Question Entities and Helps

The HELP category that predominantly co-occurred with the CRITICAL QUESTION ENTITY categories was HELP 1. The CRITICAL QUESTION ENTITY categories that did not occur in the 29 input-encountering moments of SITUATION 5 were the following: CRITICAL QUESTION ENTITYs 4 and 6.

KNOWING SITUATION 5 (n=29)							
CRITICAL QUESTIONS ENTITIES X HELPS							
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURRED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ENTITY OCCURRED IT ANSWERS: <i>Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X</i>							
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 6) that occurred when the independent variable occurred (e.g. critical question entity 5)/ total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred							
	CQ ENTITY 1 (n=87)	CQ ENTITY 2 (n=34)	CQ ENTITY 3 (n=107)	CQ ENTITY 4 (n=0)	CQ ENTITY 5 (n=16)	CQ ENTITY 6 (n=0)	CQ ENTITY 7 (n=15)
HELP 1	37.9%	14.7%	38.3%	0.0%	6.3%	0.0%	6.7%
HELP 2	10.3%	29.4%	4.7%	0.0%	0.0%	0.0%	26.7%
HELP 3	18.4%	11.8%	7.5%	0.0%	50.0%	0.0%	6.7%
HELP 4	8.0%	2.9%	14.0%	0.0%	18.8%	0.0%	13.3%
HELP 5	2.3%	0.0%	3.7%	0.0%	0.0%	0.0%	13.3%
HELP 6	10.3%	35.3%	15.9%	0.0%	18.8%	0.0%	6.7%
HELP 7	0.0%	2.9%	10.3%	0.0%	0.0%	0.0%	6.7%
HELP 8	12.6%	2.9%	5.6%	0.0%	6.3%	0.0%	20.0%
TOTAL	100%	100%	100%	0%	100%	0%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 34 : The co-occurrences between the CRITICAL QUESTION ENTITY and HELP categories in knowing SITUATION 5.

As evidenced by Table 34, the most frequent help needed when knowledge workers asked about theoretical and internal knowledge (CQENT 1) was HELP 1 (37.9%). HELP 1 is related to knowledge workers need to be helped to understand goals achievement. This dominant category was followed by HELP 3 (18.4%), which is related to be helped to evidence feasibility.

When knowledge workers asked about market and customers (CQENT 2), they most frequently needed to be helped to use others' experiences in order to perform their knowing better (HELP 6, 35.3%). This category was followed by HELP 2 (29.4%), which is related to be helped to sense and adapt to conditions.

HELP 1 (understand goals achievement) was the most frequently needed (38.3%) by knowledge workers asked about products and services (CQ ENT 3). The following most frequent category was HELP 6 (15.9%), which is related to be helped to use others' experiences to perform better. HELP 4 (anticipate problems) closely followed this category (14%).

When knowledge workers asked about existing or potential results (CQENT 5), they mostly needed to be helped to evidence feasibility (HELP 3, 50%). Equally following this category was HELP 4 (anticipate problems), and HELP 6 (use others' experiences to perform better) (18.8% each).

The most frequently needed help needed when knowledge workers asked about changes and trends (CQ ENT 7) was HELP 2 (26.7%). This category is related to be helped to sense and adapt to conditions. The next most frequent category was HELP 8 (20%), which is related to be helped to incorporate different or experts' perspectives.

Explaining the Main Co-occurrences Between Critical Question Entities and Helps

In knowing SITUATION 5 (products, services and solutions), the three most frequent co-occurrences between CRITICAL QUESTION ENTITYs and HELPs were the following:

(a) *CRITICAL QUESTION ENTITY 5 (existing or potential results) and HELP 3 (understand and evidence feasibility, potentiality and sustainability) (50%)*. This result can be explained by the fact that answers to questions about results of entities (e.g. of a new technology) can help knowledge workers in evidencing how these entities are feasible and sustainable. Consequently, this supports knowledge workers to create knowledge about products, services and solutions related to these entities (e.g. a natural gas vehicle).

(b) *CRITICAL QUESTION ENTITY 3 (products, services and solutions) and HELP 1 (understand goals achievement and accomplishment) (38.3%)*. A possible explanation for this result is that by getting answers about products, services and solutions, knowledge workers

can be helped in understanding how the goals related to these entities are accomplished. Consequently, this support knowledge works to create knowledge regarding the same products, services and solutions.

(c) CRITICAL QUESTION ENTITY 1 (theoretical and internal knowledge) and HELP 1 (understand goals achievement and accomplishment) (37.9%). This result can be explained by the fact that answers to questions about what has already been created in an organization can help knowledge workers understand how goals were achieved or how processes were accomplished. Consequently, knowledge workers can create knowledge related to products, services and solutions to which the existing knowledge in the organizations may be related to.

When the knowledge creation situation was focused on products, services & solutions, knowledge workers mainly needed to be helped to understand goals achievement and accomplishment, and to understand and evidence feasibility, potentiality and sustainability (HELP 1 and 3). They needed these help categories in a range of 35% to 50%.

6.8.5.2 Critical Question Attributes and Helps

The HELP category that predominantly co-occurred with the CRITICAL QUESTION ATTRIBUTE categories was HELP 1 (Table 35). All the categories of CRITICAL QUESTION ATTRIBUTE occurred in the 29 input-encountering moments that compound SITUATION 5 (Table 35).

KNOWING SITUATION 5 (n= 29)											
CRITICAL QUESTIONS ATTRIBUTES X HELPS											
BASELINE: THE TOTAL OF ALL THE OCCURRENCES OF ALL THE CATEGORIES OF THE HELP THAT OCCURED WHEN A SPECIFIC CATEGORY OF THE CRITICAL QUESTION ATTRIBUTE OCCURRED											
IT ANSWERS: Of the total of HELPS that occurred when CQ ATTRIBUTE Y occurred, x% occurred with HELP X											
IN EACH CELL: % total of occurrences of a specific category of the dependent variable (e.g. help 6) that occurred when the independent variable occurred (e.g. critical question attribute 8) / total of all the occurrences of all the categories of the dependent variable that occurred when the independent variable occurred											
	CQ ATTRIBUTE 1 (n=8)	CQ ATTRIBUTE 2 (n=15)	CQ ATTRIBUTE 3 (n=13)	CQ ATTRIBUTE 4 (n=22)	CQ ATTRIBUTE 5 (n=19)	CQ ATTRIBUTE 6 (n=52)	CQ ATTRIBUTE 7 (n=26)	CQ ATTRIBUTE 8 (n=19)	CQ ATTRIBUTE 9 (n=33)	CQ ATTRIBUTE 10 (n=18)	CQ ATTRIBUTE 11 (n=34)
HELP 1	75.0%	6.7%	69.2%	13.6%	31.6%	32.7%	19.2%	63.2%	24.2%	11.1%	35.3%
HELP 2	0.0%	26.7%	7.7%	40.9%	10.5%	13.5%	0.0%	5.3%	3.0%	5.6%	5.9%
HELP 3	12.5%	6.7%	7.7%	4.5%	15.8%	21.2%	0.0%	0.0%	33.3%	22.2%	11.8%
HELP 4	12.5%	13.3%	0.0%	4.5%	0.0%	9.6%	11.5%	10.5%	12.1%	33.3%	11.8%
HELP 5	0.0%	13.3%	0.0%	0.0%	0.0%	5.8%	7.7%	0.0%	0.0%	5.6%	0.0%
HELP 6	0.0%	6.7%	0.0%	36.4%	21.1%	1.9%	46.2%	0.0%	21.2%	22.2%	14.7%
HELP 7	0.0%	6.7%	15.4%	0.0%	15.8%	3.8%	7.7%	5.3%	0.0%	0.0%	5.9%
HELP 8	0.0%	20.0%	0.0%	0.0%	5.3%	11.5%	7.7%	15.8%	6.1%	0.0%	14.7%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

The highest value is highlighted with bright yellow

The second highest value is highlighted with pale yellow

Table 35 : The co-occurrences between the CRITICAL QUESTION ATTRIBUTE and HELP categories in knowing SITUATION 5.

Table 35 shows that HELP 1 (understand goals achievement) was the most frequently needed category (75%) when knowledge workers asked about the dimensions and indicators of entities (CQATT 1).

When knowledge workers asked about the dynamics and interrelationships of entities (CQATT 2) they most frequently needed to be helped to sense and adapt to conditions (HELP 2, 26.7%). The following most frequent category was HELP 8 (20%), which is related to be helped to incorporate experts' perspectives.

HELP 1 was the most frequently needed help (69.2%) when knowledge workers asked about the design and configuration of entities (CQATT 3). HELP 1 is related to be helped to understand goals achievement. Next to this was HELP 7 (15.4%), which is related to be helped to understand differences and uniquenesses.

In questioning about needs and demands of entities (CQATT 4) knowledge workers mostly needed to be helped to sense and adapt to conditions (HELP 2, 40.9%). The following most frequent category was HELP 6 (36.4%), which is related to be helped to use others' experiences to perform better.

To be helped to understand goals achievement was what knowledge workers mostly needed (HELP 1, 31.6%) when they asked about strategies and objectives of entities (CQATT 5). This was followed by HELP 6 (21.1%).

When asked about availability and utilization of entities (CQ ATT 6), HELP 1 (understand goals achievement) was the most frequently needed category (32.7%) by knowledge workers. This category was followed by HELP 3 (21.3%), which is related to be helped to evidence feasibility.

When critical questions were asked about the capabilities and experience of entities (CQ ATT 7), knowledge workers most frequently needed to be helped to sense future opportunities and move ahead (HELP 6, 46.2%). Following this category was HELP 1 (19.2%), which is related to be helped to understand goals achievement.

To be helped to understand goals achievement was how knowledge workers mostly needed to be helped (HELP 1, 63.2%) in their questionings about the influence and impacting power of entities (CQ ATT 8). The next most needed help was HELP 8 (15.8%), which is related to be helped to incorporate experts' perspectives.

When the questioning is about reasons and drivers of entities (CQ ATT 9), knowledge workers most frequently needed to be helped to evidence feasibility (HELP 3,33.3%).

Following this category was HELP 1 (24.2%), which is related to be helped to understand goals achievement.

Knowledge workers mostly needed to be helped to anticipate problems (HELP 4, 33.3%) when their questions were focused on the limitations and problems of entities (CQ ATT 10). Next to this category, they equally needed to be helped to evidence feasibility (HELP 3), and to use others' experiences to perform better (HELP 6) (22.2% each).

In the critical questions about functioning and operation of entities (CQATT 11), knowledge workers most frequently needed to be helped to understand goals achievement (HELP 1, 35.3%). Following, they equally needed to be helped to use others' experiences to perform their knowing better (HELP 6), and to incorporate experts' perspectives (HELP 8) (14.7% each).

Explaining the Main Co-occurrences Between Critical Question Attributes and Helps

In knowing SITUATION 5 (products, services and solutions), the three most frequent co-occurrences between CRITICAL QUESTION ATTRIBUTES and HELPs were the following:

(a) CRITICAL QUESTION ATTRIBUTE 1 (quantitative and qualitative dimensions and indicators) and HELP 1 (understand goals achievement and accomplishment) (75%). Answers to questions about indicators and dimensions of entities (e.g. growth of market share) can help knowledge workers to understand how these entities achieved the respective dimensions. Consequently, this supports the creation of knowledge related to products, services and solutions related to the indicators and dimensions of entities.

(b) CRITICAL QUESTION ATTRIBUTE 3 (design, structure and configuration) and HELP 1 (understand goals achievement and accomplishment) (69.2%). By getting answers to questions about the design, structure or configuration of entities (e.g. how a competitor structured its post-sales) knowledge workers can understand how these entities use this structure to accomplish processes and achieve their goals. Consequently, this supports knowledge workers to create knowledge about products, services and solutions related to the entities (e.g. the respective competitor).

(c) *CRITICAL QUESTION ATTRIBUTE 8* (reasons, drivers, groundings, and rationale) and *HELP 1* (understand goals achievement and accomplishment) (63.2%). This result can be explained by the fact that getting answers to questions related to the reasons, drivers, and rationale of entities enable knowledge workers to understand how these entities worked or operated. Consequently, knowledge workers can create knowledge related to the products, services and solutions related to these entities.

When the focus of the situational knowledge creation was on products, services & solutions, knowledge workers predominantly needed to be helped in understanding goals achievement and accomplishment (Help 1). This HELP category occurred between 30% and 75%.

6.9 The Configurations of Knowing Situations

By integrating the results presented previously in a unique view by each of the five knowing situations it is possible to see how a knowing situation is structured in terms of creating meaning in knowing work. This structure is comprised of the occurrences and co-occurrences of all the variable categories presented earlier and it is referred to in the present study as the ‘configuration of knowing situations’.

The configuration of a knowing situation is the set of different occurrences and co-occurrences between the categories of *CRITICAL QUESTION ENTITY*, *CRITICAL QUESTION ATTRIBUTE*, *CRITICAL QUESTION INTERROGATOR*, *HELP*, *VERBING*, and *INPUT COMMUNICATORS*. That is, the configuration is formed by the distribution of one variable and the co-occurrence of two or more variables across situations. A configuration reflects how each knowing situation is characterized, and they show the multiple and diverse ways that knowledge workers created meaning in it: how they defined and bridged their gaps (*CRITICAL QUESTION*, *VERBING* and *INPUT* categories), and how they needed inputs to contribute to their meaning creation (*HELP* categories).

The configurations of the five knowing situations synthesize the answers to research questions 1, and 2.1, 2.2, 2.3, and 2.4, which were described in Chapter 1.

The following diagram (Figure 14) integrates the configurations of the five knowing situations. The occurrences and the co-occurrences were presented in percentage, with

exception of HELP and VERBING categories, which were presented in their means. For practical reasons, the presented occurrences and co-occurrences were only those greater or equal to 18%. This threshold was used only to facilitate the inclusion all the variables in one single diagram. The unique exception to the threshold of 18% was the CRITICAL QUESTION ATTRIBUTE categories of SITUATION 3. In this case, categories with occurrence 13.3% were included because the distribution of the first most frequent category CQATT 6 was only 20%, and it was found useful to show categories that sum a total of at least 50%. All the values of occurrences and co-occurrences between the variable categories can be seen in previous sections.

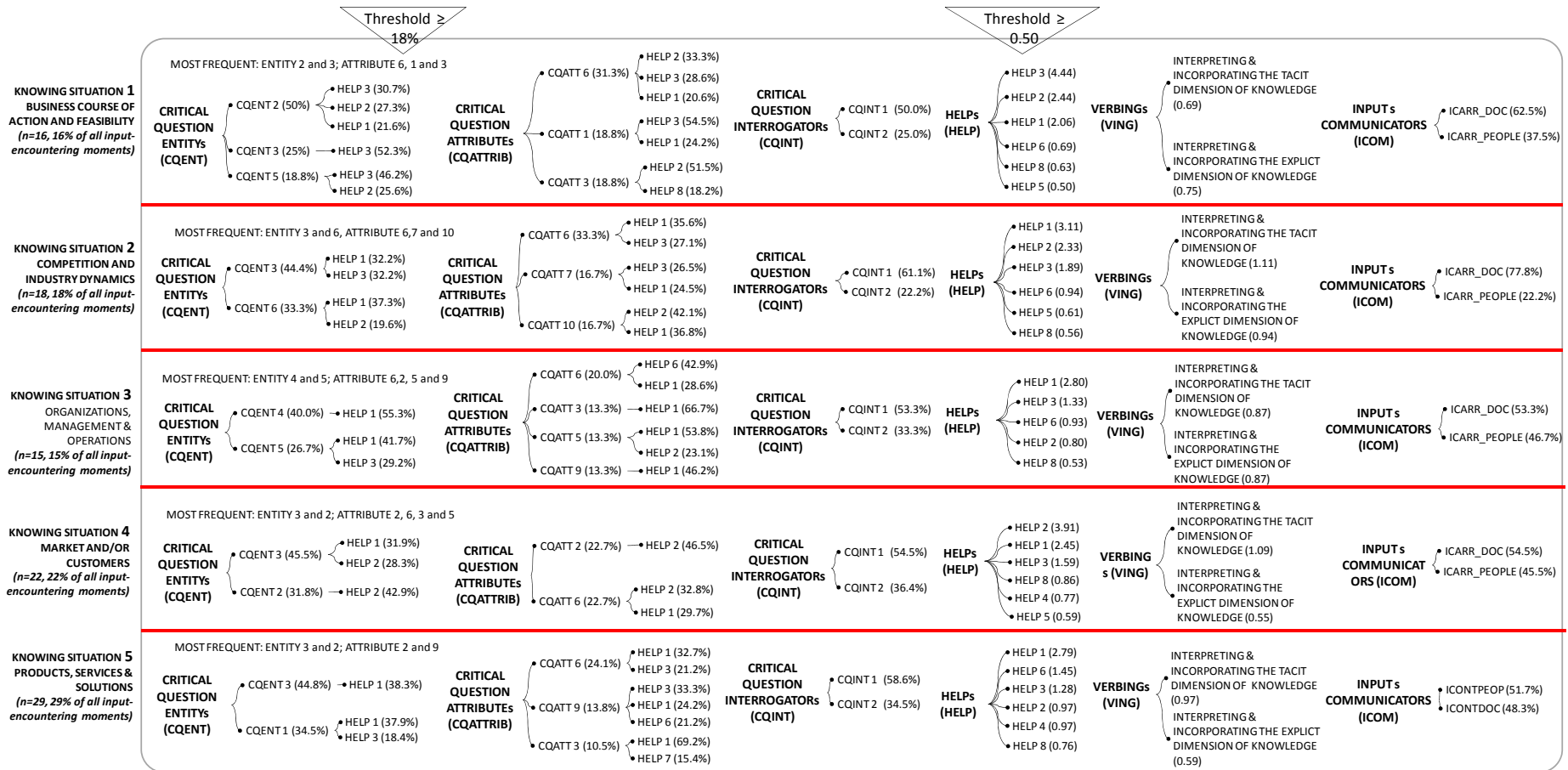


Figure 14 : The distributions and co-occurrences that form the configurations of the five knowing situations.

6.9.1 Situationality of Meaning Creation in Knowing Work

It is interesting to point out that comparisons between the occurrences and co-occurrences of the categories across the five knowing situations evidence the situational nature of sense-making or knowing practice, i.e. how the *situationality of meaning creation* manifested itself in knowing work.

As conceptualized previously the situationality of knowing means that the ways individuals create meaning, i.e. how they define and bridge their gaps, how they get answers and help, are considered to be contingent on characteristics of the moments in which the gap is faced, i.e. the situation focus variable. It is the aspects of this gap-facing moment in time and space that explain the differences of how meaning is created and knowledge is used for this meaning creation (Dervin & Reinhard, 2007b, p. 9, Dervin & Frenette, 2003/2001, p. 239). Therefore, considering that the QUESTIONS asked, HELPs needed, VERBINGs, and INPUTs COMMUNICATORs differed across the five SITUATION FOCUS (i.e. the label of the knowing situation), it is possible to see how actions and the uses of knowledge to create meaning creation differed, i.e. how situational they were.

In contrast, if the focus turns to the configuration of a single knowing situation, the patterns can be seen in how knowledge workers defined their gaps (CRITICAL QUESTION ENTITIES and ATTRIBUTES), bridged them (VERBINGs and INPUTs COMMUNICATORs), and needed to be helped in their meaning creation acts (HELP categories), when the focus of knowledge creation was a specific one (SITUATION FOCUS). Therefore, the configurations of the knowing situations also show the patterns of meaning creation actions or acts within each one.

The occurrence of both patterns and novel ways of meaning creation is a core premise of Sense-Making Methodology. This is because of its focus on the actions of meaning creation, on the moves between polarities. It is in these actions and moves that human beings can employ known or new ways of creating meaning. This is fundamentally theorized in the verbing and in the ‘in-between’ characteristic of sense-making (cf. Chapter 3).

The situationality of knowing is extensively demonstrated and discussed in Chapter 7. Importantly, its consideration in the communication of knowledge and needs is also explained in Chapter 7.

6.9.2 Articulating the Situational Meanings that are Needed to be Created

As the present research aims at understanding the *situational creation of meaning* in the knowing work practice, there is a need to clearly explain how it was articulated in the five knowing situations.

Based on the configurations of the knowing situations it can be seen how knowledge workers created meaning when they were focused on a specific knowledge creation process. On the basis of the configurations and with the purpose to explain how to articulate *the meaning creation actions that are situationally needed to be performed by a knowledge worker*, the focus turns to the variables CRITICAL QUESTION ENTITY, CRITICAL QUESTION ATTRIBUTE, and HELP. This focus is given because these are the variables that mostly express the *core of the meaning that knowledge workers need to create in a knowing situation*, i.e. what they need to answer, what gap they need to overcome by using knowledge or why they need to use specific knowledge-based inputs to create meaning (the CRITICAL QUESTION ENTITY and ATTRIBUTE categories), and how they need to be helped in create meaning by these inputs (the HELP categories). Specifically, how and why knowledge workers need knowledge to contribute to their meaning creation actions indicate the ‘situational meaning creation act’ that a knowledge worker needs to accomplish in a knowing situation. Consequently it also enables the articulation of the knowing needs that were conceptualized previously in Chapter 2.

Therefore, the articulation of the situational meaning creation acts in knowing situations is made by using the categories of the CRITICAL QUESTIONS they need to answer, and respective HELPs they needed in a specific SITUATION FOCUS (Figure 15). Each of the possible combinations between a CRITICAL QUESTION ENTITY and ATTRIBUTE with a HELP category is considered as a meaning creation action that needs to be performed in a specific knowing situation (Situation Focus) (Figure 15).

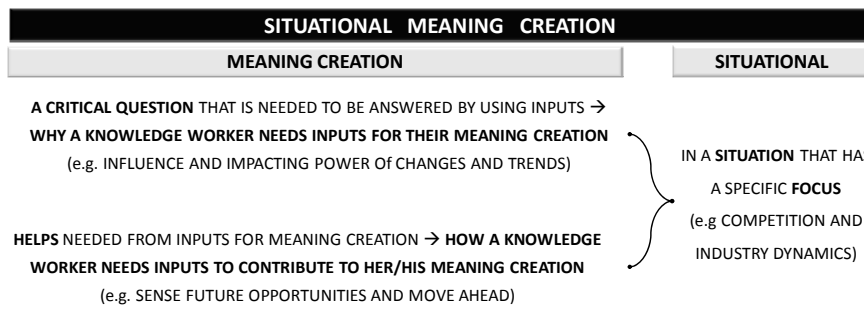


Figure 15 : How situational meaning creation was articulated and how it indicates knowing needs.

The detailing and discussion of the above, and the inclusion of the situational meaning creation into the communication of knowledge and needs are explained in Chapter 7.

6.10 Associations in Knowing Situations

A chi-square test of independence was performed to examine the relations between the variables of CRITICAL QUESTION ENTITYs and HELPs, and CRITICAL QUESTION ATTRIBUTEs and HELPs within all the five knowing situations. The results are shown in Table 36 and Table 37 below. The results were assessed against the $p < 0.5$ and $p < 0.01$. Cramer's V was calculated. Cramer's V was also a chi-square-based measure of nominal association, which assesses the strength of association, used for tables which have more than 2x2 rows and columns.

		CRITICAL QUESTION ENTITYs						
		Number of valid cases	PEARSON CHI-SQUARE	LEVEL OF SIGNIFICANCE (ASSYM. SIG.; 2-SIDED)	SIGNIFICANTLY RELATED IF p=		Cramer V (strenght of association)	strength of association
					p<.05	p<.01		
HELPS	SITUATION 1	178	31.229*	0.070			0.242	Strong
	SITUATION 2	182	89.769**	0.000			0.405	Very strong
	SITUATION 3	104	52.061***	0.001			0.354	Very strong
	SITUATION 4	238	45.185****	0.021			0.218	Strong
	SITUATION 5	259	91.298*****	0.000			0.297	Very strong


LEGEND:
 *22 cells (68.8%) have expected count less than 5. The minimum expected count is .12.
 **21 cells (65.6%) have expected count less than 5. The minimum expected count is .33.
 ***30 cells (85.7%) have expected count less than 5. The minimum expected count is .19.
 ****27 cells (67.5%) have expected count less than 5. The minimum expected count is .11.
 *****24 cells (60.0%) have expected count less than 5. The minimum expected count is .46.
 SIGNIFICANT

Table 36 : Results of statistical tests performed for the associations between CRITICAL QUESTION ENTITY and HELP categories within each knowing SITUATION.

		CRITICAL QUESTION ATTRIBUTES						
		Number of valid cases	PEARSON CHI-SQUARE	LEVEL OF SIGNIFICANCE (ASYM. SIG.; 2-SIDED)	SIGNIFICANTLY RELATED IF p=		Cramer V (strenght of association)	strength of association
					p<.05	p<.01		
HELPS	SITUATION 1	178	80.073*	0.000			0.274	Strong
	SITUATION 2	182	96.836**	0.000			0.299	Very strong
	SITUATION 3	104	1.060***	0.000			0.412	Very strong
	SITUATION 4	238	1.134****	0.000			0.261	Strong
	SITUATION 5	259	1.603*****	0.000			0.297	Strong


LEGEND:
 *46 cells (82.1%) have expected count less than 5. The minimum expected count is .17.
 **46 cells (82.1%) have expected count less than 5. The minimum expected count is .30.
 ***58 cells (92.1%) have expected count less than 5. The minimum expected count is .10.
 ****49 cells (76.6%) have expected count less than 5. The minimum expected count is .13.
 *****74 cells (84.1%) have expected count less than 5. The minimum expected count is .25.
 SIGNIFICANT

Table 37 : Results of statistical tests performed for the associations between CRITICAL QUESTION ATTRIBUTE and HELP categories within each knowing SITUATION.

Pearson chi-square measures showed that the connections between CRITICAL QUESTION ENTITY and HELP categories were significant in all the five knowing situations ($p < .05$), with exception of SITUATION 1. The Cramer’s V measures evidenced that the relations between CRITICAL QUESTION ENTITYs and HELPs in all five knowing situations were *strong*.

The chi-square measures also indicated that the associations between CRITICAL QUESTION ATTRIBUTE categories were significant in all the five knowing situations ($p < .05$ and $p < .01$). The Cramer’s V measures showed that the relations between CRITICAL QUESTION ATTRIBUTE s and HELPs in all five knowing situations were *strong* (Table 37).

CHAPTER 7: THE KNOWING WORK PRACTICE AND THE COMMUNICATION OF KNOWLEDGE

“Some people spend their entire lives reading but never get beyond reading the words on the page, they don't understand that the words are merely stepping stones placed across a fast-flowing river, and the reason they're there is so that we can reach the farther shore, it's the other side that matters.”

Jose Saramago

(Nobel-laureate Portuguese novelist)

7.1 Introducing

The present study was conducted to address a disconnection between how individuals need and use knowledge for knowing, and how this knowledge (inputs) has been communicated for such practice. It was argued that this disconnection is generated by limitations on the communication of knowledge and its needs.

One of the limitations of previous research is that the *acts of meaning creation* for which knowledge should be used have neither been considered in the communication of knowledge, nor in the communication of needs. Consequently, the *situationality of such meaning creation acts* has not been accounted for as well. Furthermore, in the practice of communicating knowledge there has been also a lack of adaptation to users' needs, priorities and situations, an absence of providing background and consequences of experts' analyses, and a focus on communicating on the basis of characteristics of knowledge by itself.

In relation to accessing knowledge it was argued that there has been a lack of clarity in communicating needs. In addition, needs have been understood with an excessive focus on what is needed and its content-based characteristics, and on the basis of users' characteristics. Therefore, in communicating needs the focus has been on aspects that are external and prior to the action of creating meaning to which the needs of knowledge should be fulfilled (e.g. socio demographic measures, topical interests).

In order to avoid the above limitations, the major objective of the present study was to identify ways to attune the communication of knowledge to how it is needed and used to create meanings, within a knowing work practice. This attuning was aimed to be done in the two constitutive and complementary communication processes when knowledge should be communicated: the communication of knowledge itself and the needs of such knowledge.

To these ends, the knowing work practice was studied with the objective to understand how knowledge workers perform such work at the level of meaning creation, and how they need and use knowledge (inputs) for such. The purpose was to study knowing work and the uses of knowledge situationally, communicatively, and from a practice-based perspective.

The approach to explore situational knowing was an interdisciplinary quest that demanded the involvement of knowledge developed in different but synergistic fields. To achieve the present study objectives, it was found helpful to mainly draw on Polanyi's tacit

knowing theory, and Sense-Making Methodology developed by Brenda Dervin. The study also drew on concepts related to the access, creation, communication and uses of knowledge, which were derived from the practice-based studies in the fields and research streams of Organizational Knowledge, Communication of Knowledge, Knowledge Management, and Information Science.

The above theoretical ideas influenced the perspective from which knowing was approached as the situational creation of meaning or sense, the conceptualizations used to describe the knowing work practice communicatively, and the design and implementation of the empirical study. Sense-Making Methodology was utilized conjointly with Polanyi's concepts. More specifically, Sense-Making Methodology informed the empirical study. It was used to design and execute the data collection, the conceptualization of variables, and the data analysis.

Sense-Making Methodology worked very well in the study of knowing at the level of situational meaning creation. One of the strengths of this methodology is that it enabled the study of deep aspects of knowing, based on the theoretical assumptions of movements, gaps, time-space, knowledge workers' interpretive world, knowledge being constructed and used in knowing, and of knowing situationality. At the same time, Sense-Making Methodology enabled the knowledge workers' situational knowing experiences to be identified and articulated in a systematic way. This made it possible to include their own perspective of meaning creation in an approach to the communication of knowledge that should work for them.

The study of the knowing work practice was developed to answer: *How are meanings situationally created in the knowing work within business environments?* The main findings include the situationality of meaning creation in knowing work, the knowing situations, the uses of knowledge that were driven by meaning, the frequency of interpreting the tacit dimension of knowledge, and the emergent and synergistic nature of knowing (Figure 16).

The major *implication of the findings at the theoretical level* is that the existence of the situationality and the anchoring of the communication of knowledge in situational meaning creation should be acknowledged in contemporary research regarding knowing, knowledge work, knowledge uses, and communication of knowledge. *At the practical level, the major implication* is that the necessary adaptivity of the communication of knowledge to a situational knowing practice gets instrumentality. The communication of knowledge can be pragmatically attuned to the knowing practice and to its situational nature. For such, the

present research provides ways to identify knowing needs from a situational perspective and to communicate knowledge in consonance with them.

The findings were applied to propose approaches for the communication of knowledge and needs. For such application, the configurations of the five knowing situations with a focus on the Situation Focus, Critical Question and Help categories were mainly used, and also the main qualitative findings, which underpin the applications. By doing this, a particular knowledge can be communicated by human- and technology-based systems according to their association to needs in situational meaning creation, and to how this knowledge can contribute to such needs. The communication of knowledge becomes then, the communication of knowledge *for knowing*.

In addition, instead of only communicating aspects related to what is needed, knowledge workers can also communicate aspects related to why and how they need a particular knowledge in a specific knowing situation (the situation focus). The ‘why’ of their needs is related to the critical questions which knowledge workers need to be answered by using knowledge. The ‘how’ of their needs is related to the helps that knowledge workers need that inputs provide to their meaning creation. Similarly, the communication of needs become then, the communication of *knowing* needs.

What is *unique* in the present study is the identification and elaboration of how meaning is situationally created, the situational uses of knowledge, and the evidences of how the situational meaning creation reveals itself in knowing work. The identification of knowing situations is a contribution as well, because they reflect the patterned and the different ways which meanings are created in knowing work. Significantly, the findings showed that knowledge is needed and used in relation to its contributions and appropriateness to meaning creation in a knowing work practice.

The main *theoretical contributions* of the present study include a deepening of the understanding of knowing work at the level of meaning creation situational actions. The findings also enriched the understanding of Polanyi’s (1958; 1966; 1968; 1969, and Polanyi & Prosch, 1975) tacit knowing by approaching it from the perspective of the sense-making practice and its intrinsic situationality. Notably, the application of the findings enriches Polanyi’s sense-giving process or communication of knowledge, and generates the beyond-content-indicators in business-related communication called for by Eppler (2004; 2005; 2007). Such enriched communication improves the accessibility of the tacit and explicit dimensions of knowledge in people and documents respectively. The study also contributed

to SMM. It empirically evidenced the situationality and in-betweenness of sense-making and how they manifest themselves in knowing. The categories of Situation, Gap, Help, and Verbing in the context of knowing work, and the configurations of the knowing situations provide a considerable contribution to SMM as well.

The most significant practical contribution that the present research generated for the knowing work is the ways to anchor the communication of knowledge into the situational meaning creation acts in which knowledge is needed and used. The findings provide the frameworks to help attune the communication of knowledge to situational meaning creation, enabling this communication to be closer to how knowing work is performed in practice. These frameworks are comprised by the situational meaning creation acts and their constitutive elements: Situation Focus, Critical Question and Help categories. Other contributions entail the elaboration of the picture of knowing situations, and the characteristics and complexity of knowing work, which empirically evidence the need for appropriate approaches to facilitate and support it.

The purpose of this chapter is to discuss the main findings focusing on the dynamics and nature of knowing work, and on its situationality. The core implications of the situational meaning creation in knowing work are discussed. Additionally, the applications of the findings to the communication of knowledge and needs are explained at a more concrete level. The present chapter was structured into four parts to answer the central and the third research questions⁵⁰ described in Chapter 1.

The first part discusses the most influential characteristics of the knowing practice as situational meaning creation, their relation to earlier studies, and the main implications of the findings. In reviewing the literature, no empirical studies were found with the same focus that is used by the present study, i.e. situational meaning creation and the uses of knowledge for such processes, within the knowing work practice. Thus, the references to literature were mostly made on the theoretical level.

The second part concentrates on the components of situational meaning creation acts within knowing situations. The third, fourth and fifth parts focus on the applications of the

⁵⁰ The research questions concerning the current part are the following: What are the main knowing situations that knowledge workers experience and how are these knowing situations configured in terms of meaning creation?; How can the situational creation of meaning in the knowing work practice be supported while accessing and communicating knowledge?

findings, explaining how they can be used to communicate knowledge and knowing needs. Finally, the contributions, limitations of the study, and further research are discussed.

7.2 Knowing as Situational Meaning Creation

The main findings are centered on the understanding of how meaning is situationally created in the knowing work practice and how knowledge is situationally used for such practice. Figure 16 discloses the main findings, which are briefly highlighted as follows. Discussion and implications are given in next sections.

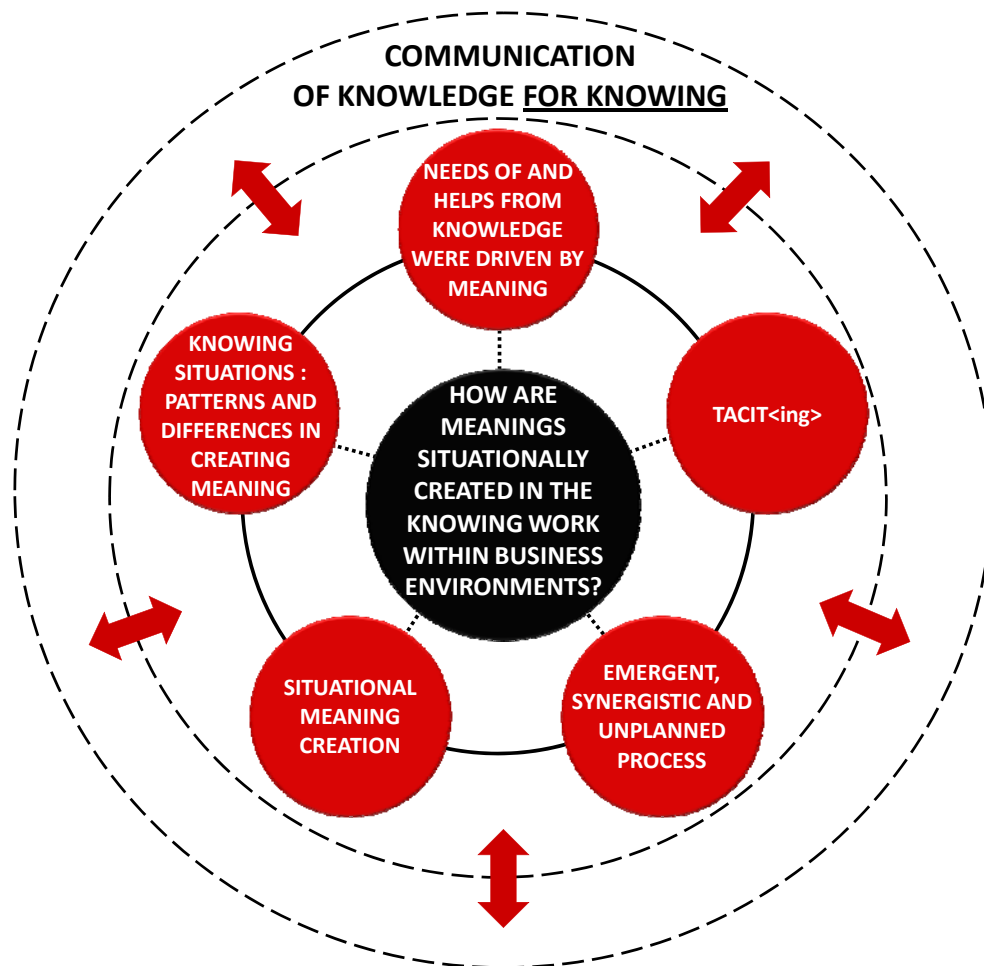


Figure 16 : The core understanding of situational meaning creation in knowing work practice.

(a) *Driven by meaning.* How knowledge workers needed knowledge (input) in their knowing was driven by the appropriateness of such knowledge in relation to the

meanings they needed to create. How knowledge workers were helped by knowledge was also related to its association to a particular meaning creation act.

(b) *Tacit <ing>*. Interpreting and incorporating the tacit dimension of individuals' knowledge was a predominant action for the situational creation of meaning across knowing situations. Situationally, it was the most frequent action in 3 of 5 knowing situations.

(c) *Emergent, synergistic and unplanned*. How new knowledge was created (knowing) and how knowledge was used for this process were marked by emergent, unplanned, and synergistic actions. These actions were also characterized as 'leapings'. Knowledge was mobilized and activated in the unfolding of knowing actions. Different actions and inputs were intertwined to support meaning creation.

(d) *Situational meaning creation and how it manifested itself*. How knowledge workers defined why they need knowledge, and how they need this knowledge for their meaning creation differed across the five knowing situations, evidencing the situationality of their meaning creation acts. How knowledge workers needed knowledge to contribute to their meaning creation (Helps), and why knowledge was needed to be used for meaning creation (Questions) were situational; they differed across the five knowing situations. Situational meanings that are needed to be created were articulated by the categories of Critical Question Entity, Attribute and Helps in a specific Situation Focus.

(e) *Knowing situations*. Five knowing situations in knowing work were identified. Their configurations reveal the patterns and differences in how meaning was created, and how knowledge was situationally needed and used for meaning creation within knowing work.

The main implication of the above findings to research is that, particularly studies on knowing, knowing work, knowledge work, knowledge communication, knowledge sharing, knowledge access, and knowledge management in business contexts, should acknowledge the situationality of knowing, and that knowledge is situationally needed and used. Research

should also consider the fact that knowledge is needed and used at the level of meaning creation processes.

7.2.1 Driven by Meaning Creation

When knowledge workers reported how they needed and were helped by knowledge (inputs) in the creation of meanings, these needs and helps were not necessarily confined to the appropriateness of the content, or of the knowledge characteristics (as a self-contained entity). In other words, the inputs needed and used in the creation of meaning were not confined to their substance (e.g. the content of a document or the expertise of individuals as such). It was not what the inputs were about or contained, but how the content enabled knowledge workers to create the meanings they needed to in a particular knowing situation.

Clear quantitative support for this assumption was given by the Help categories that were identified in the empirical study. These categories reflect how knowledge workers needed that inputs contribute to their situational meaning creation process. For example, the predominant help needed across all the five knowing situations (HELP 1) was related to understand goals achievement and accomplishment. In this case, inputs were used not only because they might reveal numbers, facts, knowledge about organizations processes, projects and performance. But mainly because knowledge workers needed these inputs to help them understand how an organization or a department achieves and accomplishes what they aim for. For example, to understand how they expanded their market share or improved the customers' services. Therefore, the interrelationship between a knowledge worker in a knowing practice, and the knowledge that is communicated to her/him, is rooted in the contribution of such knowledge to her/his creation of meaning. Another illustration is that knowledge workers' knowing needs were not associated only to the need to get content about a competitor 'X' in market 'B'. Rather, the content about a competitor 'X' was seen as helpful if it contributed to sense potential dangers, opportunities or unexpected movements in the competitive environment.

As knowledge workers were focused on how knowledge (inputs) could contribute to their meaning creation, the *intersection between knowledge and knowers occurred at the level of meaning creation*: the intersection between the meanings that are enabled to be created by knowledge (inputs), and the meanings that are needed to be created by knowledge workers.

Overall, knowledge workers' interaction with knowledge was driven by the meaning creation processes. They were concerned with the meanings that inputs would contribute to be created, and on the relation of this contributiveness to the meanings. This supports Polanyi's assumption (1958, p. 57) that individuals attend to things by "*what they mean and not by what they are as objects*" (Emphasis added). This is also supported by Rice et al. (2001, p. 305) highlighting that what makes a document interesting to an individual is subordinated to her/his interpretation, rather than the characteristics of the document itself.

Given that this knower-knowledge interaction is driven by meaning creation, the above finding is supported by Eppler's (2004; 2005; 2007) view on the necessary use of other kind of indicators than pure content in the communication of knowledge. Eppler (2004, p.6; 2005, p. 3; 2007, p. 292) emphasized the need for other indicators in the communication of knowledge, in order to help individuals who need the knowledge created by others (e.g. a knowledge worker needing the knowledge of an expert). These indicators would facilitate the understanding and reconstructing of the other individual's perspectives and insights, and to connect these to knowledge workers' own meaning creation process and prior knowledge. In this context, the communication of knowledge can be improved by indicators based on the association of a particular knowledge with particular meaning creation acts. This provides what Eppler (2004; 2005; 2007) claimed as the 'other indicators' needed in the communication of knowledge.

Implications

When knowledge workers access and use knowledge for their knowing work, these processes are driven by the connection between the meanings enabled to be created by the particular knowledge and the meanings that are needed to be created by the knowledge worker. This challenges the common perspective in current knowledge creation, knowledge communication, knowledge access, and knowledge management research, which holds on the needs and uses of knowledge as a self-contained object that can be accessed, shared and communicated detached from the actions in which it is needed and interpreted. The findings of the present research serve to undertake further research and discussions regarding more practice-based and meaning-creation-based approaches in relation to the access to knowledgeable people and documents within organizations.

A significant implication of the finding is that if knowledge workers need and use knowledge from the perspective of the meaning to be created, knowledge should also be communicated from this perspective, rather than only focusing on what this knowledge is, its content or topic. Communication of knowledge based only on its own characteristics and content is not sufficient to support knowledge workers in knowing practices, and in their navigation through inputs for such complex practice. For knowing work, it is necessary that the communication of knowledge transcends the content-based criteria and the knowledge-focused characteristics, and becomes more in consonance with how such knowledge is needed for meaning creation.

At the practical level, the communication of knowledge can be enhanced by indicating how knowledge is associated with meaning creation and needs in it, and by indicating how it can be helpful in relation to such knowing needs. The indication of the associations of a specific knowledge with the meanings it supports creating can be useful in the meaning creation journey. The indicators of these associations can facilitate a *smooth recognition of the applicability and helpfulness of a particular knowledge* in relation to a knowledge workers' meaning creation process even before they read or listen to the whole content. In addition, these indicators can also facilitate knowledge workers to navigate through the potential helpful inputs and combine those that can mostly contribute to the creation of meaning. Therefore, the provision of indicators based on situational meaning creation in the communication of knowledge is highly beneficial for the knowing work because it eases the intellectual access to knowledge.

Another implication would be related to communicating needs of knowledge. This communication has to consider how knowledge workers need to be supported by knowledge in the situated meaning creation actions. The current finding suggests that it is necessary to also communicate how and why a knowledge worker needs a specific knowledge for meaning creation in specific knowing situations. This means *to communicate more than 'what' is needed*, but also why and how it is needed.

For example, an analyst talking with an expert to understand his perspective concerning a future market can express her/his needs by also saying how and why s/he needs the expert's inputs about this particular issue. On the other side, the expert can adapt his communication of her/his knowledge according to the analyst's needs.

Furthermore, another key implication of the findings is that organizational practices and systems that are developed to facilitate the communication of knowledge have to also

consider this knower-knowledge connection driven by meaning creation. For example, organizations that intend to have intelligence or R&D units (e.g. market intelligence units), or those which are knowledge-based professional services (e.g. consultancies), should enable the access to and the communication of knowledge from the meaning creation practice perspective. Hence, the starting point for designing facilitative and supportive practices and systems should be ‘How to communicate knowledge in line with the ways our knowledge workers need to use knowledge and to be helped by it in their creation of meaning?’

The current finding can be used to *inspire a more meaning-creation-practice-based research and approaches to facilitate the communication of knowledge* for the knowing work in business context. The meaning creation based perspective to the communication of knowledge can help organizational systems and practices to become *more responsive* and closer to how knowing work is actually done.

7.2.2 Tacit<ing>

The focus of the following discussion is on the interpretation of the tacit dimension of individuals’ knowledge that was essentially communicated by people in face-to-face conversations. Hereafter, these actions of interpreting and incorporating the tacit dimension of individuals’ knowledge as a meaning creation action is referred to as *tacit <ing>*⁵¹.

Tacit<ing> appeared to be a very frequent action performed for the creation of meaning in knowing work, and the predominant one across the five knowing situations. Situationally analyzing, it was the most frequent action in three of the five situations (Situation 2, 4, and 5). Therefore, the interpretation of the tacit dimension of knowledge by means of conversations was an important action in knowing work, revealing its significant role and synergy with the explicit dimension.

Importantly, the findings of the present study indicated the importance of tacit<ing> in knowing work within a business scenario that has been predominantly concerned with the technology-based support when accessing the explicit dimension of knowledge that is communicated by documents. Most of the attention, research and investments in improving

⁵¹ Tacit <ing> or interpreting the tacit dimension of individuals’ knowledge is not dealing with the conversion of tacit to explicit knowledge. As explained earlier, this research did not adopt this dichotomized and convertible view of knowledge suggested by Nonaka (1991; 1994), for example.

the access to and communication of knowledge have been focused on its explicit dimension in documents⁵². As pointed out by Tsoukas (2005a, p. 142) “modernity has come to mistrust intuition, preferring explicitly articulated assertions, it is uncomfortable with ad-hoc practices, opting for systematic procedures”.

The findings of the present study also evidenced how the actions to interpret and incorporate the tacit dimension of knowledge varied according to knowing situations. The interpretation and incorporation of tacit knowledge was the predominant movement in the knowing situations related to the competition and industry dynamics (Situation 2), market and customers (Situation 4), and products and services (Situation 5).

These findings can be explained by the nature of knowledge that was under focus in the above knowledge creation situations. To create knowledge about the ways competitors work and the competitive environment operates, it is necessary to talk with people to get their personal experiences, assessments, and insights in a particular industry or sector. The richest inputs about the dynamics of a competitive environment can be accessed by talking with knowledgeable individuals with years of experience in a specific industry. The richest part of such knowledge is commonly very personal, strategic and sensitive, requiring dialogic interactions that help tapping an expert’s knowledge. The tacit dimension of such knowledge is not extensively and publicly available, since it is highly personal and dependent on the perceptions and experiences of those who have worked in a specific industry. Additionally, tacit face-to-face interactions are required because the experience from individuals who know the competitive and industry environment can be much richer than what is written in industry reports. Such personal knowledge naturally contains more and richer details that by nature are not articulable detached from their contexts, demanding conversations to help bring these details forth.

Similarly, the predominance of tacit in situations dealing with market and customers can be explained by the nature of the knowledge being created in such situations.

⁵² This can be seen by the growth of investments in enterprise content management technologies. A recent survey from Forrester predicted that these investments continue to grow despite the economic crisis: 72% of respondents plan to increase their investments in content management, and 19% plan to keep investments level from last year (source: <http://www.forrester.com/Research/Document/Excerpt/0,7211,47971,00.html>). In a survey conducted by Gartner in 2008 (U.S., the U.K., France, Germany, India and Australia), the revenue of enterprise content management technologies was \$2.9 billion market in 2007. Gartner predicted that total software revenue in this market will grow at a compound annual rate of 12.2% through 2012 (cf. <http://mediaproducts.gartner.com/reprints/hylandsoftware/160668.html>)

This focus of knowledge creation is associated with human behavior and it is highly strategic and sensitive for a business. As such, 'soft' details cannot always be clearly expressed in market research reports. Access to these details demands tapping individuals' personal experiences and needs, or interactions with those who have direct interaction with customers, such as sales people and researchers. Similar explanation can be given to the frequency of tacit<ing> in Situation 5 dealing with products and services.

Recalling the tacit dimension of individuals' knowledge as an input to knowing process is substantiated by Polanyi (1958, p. 91), when he emphasized the recollections and reflections of "particular contents of our knowledge which we cannot adequately specify". The interpretation of the tacit dimension of knowledge in business-related work is also consistent with studies such as Werr et al. (1997); Agor (1986); Isenberg (1986); Sternberg et al. (1995); Sternberg (1997); Tsoukas and Vladimirou (2001); Werr and Stjernberg (2003); Hammond (2004); Kikoski and Kikoski (2004); Tsoukas, (2005a); and Information Builders (2007).

Personal experience was the central input for knowing in the results found by Isenberg (1986), Werr and Stjernberg (2003) and Information Builders (2007). Isenberg (1986) showed that managers used their own personal experience in solving hypothetical business cases, despite having and knowing that there was additional information without extra cost to interpret the cases. The uses of 'gut feel', insights and intuition were also found by studies conducted by Agor (1986), Cook and Brown (1999), Hammond (2004), and Sundgren and Styhre (2004). Crossan et al. (1999) also considered intuiting as an individual knowledge creation process.

The finding that revealed the need of 'the author or the expert in the room' (on page 197) also evidenced how knowledge workers, even accessing the explicit dimension of knowledge communicated by documents, also needed to access the tacit dimension of knowledge by talking with the authors or experts. The tacit and explicit dimensions of knowledge were synergistically interpreted in knowing, as stressed by Polanyi (1958, 1966; 1969). This synergistic interpretation of the tacit dimension of knowledge with the explicit one is substantiated by results such as those found by Werr et al. (1997), Tsoukas and Vladimirou (2001), and Werr and Stjernberg (2003). These studies showed the complementary uses of the two dimensions of knowledge in knowledge work.

Implications

The findings regarding tacit<ing> suggest that knowledge workers were more inclined to interpret the tacit dimension of their own and other individuals' knowledge, as one of the actions of meaning creation in their knowing work. This implies the need for further investigations of the creation of business-strategy-related knowledge. Such studies should consider the tacit<ing> actions as well. Research on knowledge work, communication of knowledge, knowledge access, and knowledge management can advance the understanding of such actions and how they can be suitably facilitated in a business environment of increasing complexity and diversity of cultures, experiences and workers generations.

As a practical implication, the access to the tacit dimension knowledge as an input to knowing configures on one of the challenging issues in the context of the 21st century organizations which are highly dependent on knowledge to be in the vanguard of a market. Significantly, tacit<ing> presents a challenge to the communication of and access to knowledge in knowing work, requiring specific practices and competencies.

Tacit<ing> has a significant implication for enhancing the accessibility of knowledge of knowledgeable individuals and groups. Such knowledge should be made easily and timely accessible by appropriate communication approaches. It is not just a question of communicating what other individuals know, but to make the applicability and usefulness of such knowledge clearly and smoothly identifiable and understandable, i.e. to make knowledge intellectually accessible and assessable. This has support from an empirical study conducted by Borgatti and Cross (2003). They showed that the access to another individual's knowledge is a function of "(1) knowing what another person knows; (2) valuing what that person knows; and (3) being able to gain timely access to that person's thinking" (Borgatti & Cross, 2003, p. 440). To know what another individual knows is to "evaluate the knowledge and skills of the person sought out in relation to the problem the seeker is attempting to solve" (Borgatti & Cross, 2003, p. 434). Valuing what another individual knows is to positively evaluate another person's knowledge "in domains relevant to his or her work" (Borgatti & Cross, 2003, p. 435). According to Borgatti and Cross (2003, p. 435), *just knowing that other individuals have valuable knowledge is not sufficient*. Their knowledge should be 'accessible', which is "a question of timeliness: actor *i* must be able to bring actor *j*'s expertise to bear on his or her problem in a timely fashion to be of any real benefit". Accessibility means the extent that an individual can "access another person's thinking and

knowledge” (Borgatti & Cross, 2003, p. 437). They also emphasized that “*accessibility is also an issue of engagement: when an actor i does not know the exact question he or she needs to ask, access means getting actor j to mindfully focus on the totality of i’s problem to give i the information he or she needs*” (Borgatti & Cross, 2003, p. 435) (Emphasis added).

Therefore, tacit<ing> implies communicating the personal knowledge of knowledgeable individuals in ways that ease knowing what they know, valuing this knowledge in relation to knowers’ knowing needs, and mainly, access these individuals’ knowledge in a timely, smoothly and engaging manner.

The use of the findings of the present research helps develop what Borgatti and Cross (2003) explained as the conditions that facilitate the access to other individuals’ knowledge. If an individuals’ knowledge is communicated by indicating its association with and contributiveness to specific needs in a situational meaning creation, the accessibility (intellectual access) to this knowledge is improved. Knowledge workers can directly identify and recognize if and how other individuals’ knowledge can be helpful to their knowing process. The above situational-meaning-creation-based communication substantially improves the accessibility of the tacit dimension of knowledge in a timely and engaging manner. Additionally, by communicating knowing needs in conversations the necessary engagement and focus of knowledgeable individuals can be strengthened because they will have a clearer understanding of how and why knowledge workers need their contributions. As an effect, the communication of an individual’s knowledge becomes more focused and in line with its users’ knowing needs.

Tacit<ing> also indicates that organizations and knowing work teams need to include in their agenda some investments in developing appropriate practices and environment that can facilitate the communication of and the access to the tacit dimension of knowledge. The ongoing access to the tacit dimension of individuals’ knowledge for knowing work inevitably requires competencies such inquiring, listening and dialoguing. As highlighted by Kikoski and Kikoski (2004, xii): “the future belongs to those organizations that inquire in order to surface tacit knowledge on a continuous base”. Knowledge workers need to develop inquiring abilities such as the use of systemic questions (Kikoski & Kikoski, 2004) or Sense-Making questions. Especially to support knowing work, there is a need to invest in strategies that privilege social and conversational interactions and create a contributive environment for knowledge workers to have timely and engaging access to knowledgeable individuals.

Additionally, the findings also indicate that knowledge workers and other professionals in organizations need to develop competencies for creating, conducting and benefiting from worthy conversations such as ‘mutually generative conversation’. This kind of conversation is specific for accessing the tacit dimension of individuals’ knowledge (Kikoski & Kikoski, 2004, p. 147). In this conversational context for tacit<ing>, knowledge workers should be competent in what Kikoski and Kikoski (2004) explained as the reflexive communication, which is the foundation of mutually generative conversations. Reflexive communication helps the conversation to “get beyond the stereotypes of a person or a situation, surfacing the unique thoughts of another individual, generating new information, co-creating new realities, and discovering new solutions” (Kikoski and Kikoski, 2004, p. 148). Therefore, to facilitate tacit<ing> conversations for knowing work, knowledge workers need to improve their competencies in reflexive communication.

Another important implication of tacit<ing> by means of conversations is that knowledge workers structure somehow the communication process to avoid the pitfalls of excessively open conversations, as explained by Mengis and Eppler (2008), and Dervin (in press). Such conversations involve the time investment and personal engagement of timeless people. The process of communication of knowledge should be clear, focused and in harmony with knowledge workers’ needs, without losing the necessary flexibility in the dialogic interaction. The above implication has support in Topp (2000), Von Krogh et al. (2000), Gratton and Ghoshal (2002), Beer and Eisenstat (2004), Göranzon and Hammarén (2006), and Mengis and Eppler (2008).

Tacit<ing> also imply that knowledge workers make their needs clear in their conversational interactions. Mainly, they need to associate these needs to the meanings they have to create with the other individuals’ knowledge. They should not only communicate what they need (the content), but also uncover why and how they need a particular knowledge. This would help other individuals to understand the needs the communication of their knowledge should fulfill, to focus and adapt their contributions to those needs, and engage in the knower’s knowing process. This also has support from the studies conducted by Borgatti and Cross (2003) and Eppler (2004; 2005; 2007).

From a practical perspective, the findings of the present study makes the above possible by using the Situation Focus, Critical Question Entity and Attribute, and Help categories identified in the five knowing situations. These categories can be used to structure the communication of knowing needs, and to guide and focus the communication of

knowledge by means of conversations. The communication of knowing needs by using the above categories facilitates knowledgeable individuals to clearly understand such needs and communicate their knowledge attuned to how the knowledge worker needs it for their meaning creation. Likewise, the communication of needs anchored in situational meaning creation helps engage knowledgeable people to contribute, and eases the process of bringing forth their knowledge in harmony with the knowledge worker's knowing needs. Furthermore, the above facilitates the evaluation of the contributions of the tacit dimension of knowledge in relation to a knowledge worker's knowing needs. The proposed approach for such communication process in tacit<ing> conversations will be specified later on.

7.2.3 Emergent and Synergistic

Emergent

How knowledge was mobilized, activated and used for meaning creation was constituted in the unfolding of actions in an input-encountering moment. The findings showed that despite knowledge workers relied on similar past experiences in using knowledge (inputs), these experiences were used for resourcing the knowing process, rather than determining the sense-making course.

The empirical findings indicated that knowledge workers' actions in creating meaning were not stuck on fixed ways of creating meaning and using knowledge. This was evidenced by the different questions, helps and verbings within and between knowing situations. Despite knowledge workers maybe following formal work methods (e.g. a consultancy method) to guide their knowing work as a whole; knowledge workers immersed themselves in a creative action that was shaped in its course. This creative nature was evidenced by the fact that decisions to select and use inputs were made in action and according to the circumstances, like a bricolage.

This finding supports the ideas of Ciborra (2002) who characterized knowledge work as improvisation and bricolage. According to him, "bricolage is about leveraging the world as defined by situation. With bricolage, the practices and the situations disclose new uses and applications of the technology and the things" (Ciborra, 2002, p. 49).

This finding is also in line with Suchman's view (2007, pp. 72-73). Using an example of canoeing and the planning of how to go through the rocks and falls, Suchman (2007, p. 72) emphasized that "however detailed, the plan stops short of the actual business of getting your canoe through the falls. When it really comes down to the details of responding to currents and handling a canoe, you effectively abandon the plan and fall back on whatever embodied skills are available to you". She explained that the purpose of plans is not to determine the action, but rather to serve as resources for situated actions. Similarly, in a specific moment of meaning creation, knowledge workers actions did not completely follow a fixed journey. Otherwise, knowledge workers would always exhibit the same questions, verbings and need the same helps independently on the situation. This was also evidenced when the situationality of knowing is discussed.

The emergent nature of the meaning creation actions in knowing work is supported by Visscher (2006, p. 258). He pointed out that knowledge workers tailor their actions to the contingencies of the process of creating knowledge. These contingencies are essential for good knowing work and "cannot be covered by a fixed series of steps". The emergent nature of knowing identified by the present study is also substantiated by Markus et al. (2002, p. 182). They termed knowledge work as 'emergent processes', in which interpretations and actions unfold unpredictably.

The findings are also in agreement with Alvesson (2004, p. 23), who showed that rules, methodologies and planning of activities are less important or they are used in a more flexible way in the knowledge work. This finding is in agreement with Davenport's (2005) view on that knowledge workers have autonomy and independence in high levels.

In addition to the different ways of creating meaning, the present study identified the patterns within each knowing situation as well. This reflects the in-between assumption of SMM, which is related to the fact that while creating meaning, individuals can employ habitual actions and new ways of using knowledge and make sense.

Implications

How to communicate knowledge for an emergent process? The main implication of such emergent work practice is that the *communication of knowledge has to be adaptive to the different ways that individuals may need and use knowledge for their meaning creation.*

Communication of knowledge for knowing has to acknowledge the different needs in different points in time and space. ‘One communication fits all situations’ loses power because knowledge is needed and used differently, contingent on the knowing situation.

As evidenced by the findings, individuals differ in needing and using knowledge, and in creating new meanings with it according to the characteristics of the situation in which they face gaps (have questions) in their meaning creation. The findings showed how knowledge was differently needed to help meaning creation, i.e. the different help categories within and between situations. The findings also evidenced that knowledge was needed to support answering different questions, i.e. the different critical questions categories within and between situations. If knowledge was situationally needed and used for knowing, this knowledge has also to be communicated on the basis of its appropriateness to the specific needs in situational meaning creation. Therefore, this implies that these situational knowing needs are the guiding aspects for adapting the communication of knowledge for knowing work.

In spite of the above implication, a question remains related to how individuals and systems can accomplish such adaptive communication of knowledge in consonance with situational knowing needs. This indicates that it is necessary to assure ways to communicate knowing needs situationally because they can change, given that knowing is an emergent process. The communication of needs should include the situational meaning creation actions because it is these actions that reflect how individuals need knowledge for their meaning creation in a very specific moment in their knowing situation. This communication should be clearly performed to enable other individuals to appropriately adapt their communication of knowledge, and technology-based systems to adapt the selection of documents accordingly.

The required adaptivity in communicating knowledge is easily feasible in face-to-face conversations if the participants are capable of actually listening to each other, and have mature abilities in inquiring and dialoguing. The issue in this case is to make the knowing needs clear to the others in order to enable focused contributions to be communicated back. This adaptivity is more complex to be accomplished when knowledge is accessed and communicated by means of technology-based systems. In this case, the adaptive communication of knowledge can be facilitated by allowing the communication of the different ways that a particular knowledge can be needed for particular meaning creation actions, in specific points of the knowing process.

This means that the adaptivity that is associated to the situational meaning creation acts and the needs in it (knowing needs) demands to communicate knowledge on the basis of the needs and uses of knowledge for knowing that can mostly occur (the patterns of action), without killing or inhibiting the occurrence of new ways of needing and using it. Klaus Krippendorff characterized this matter as “design artifacts that increase their stakeholders’ ability to design on their own” (Krippendorff, 2006, p.74).

In practical terms, the components of the knowing situations are the instruments that enable the communication of knowledge to be adaptive to the emergent nature of knowing. Conjointly, the patterns of meaning creation acts identified within the knowing situations can help in recognizing the set of potential meaning creation actions that can be needed to be performed, and for which knowledge should be communicated.

Handling the communication of emergent knowing needs in specific points of the meaning creation process is feasible by using the findings of the present research. This can be done by flexibly using the categories of Situation Focus, Question-Entity, Question-Attribute and Help to articulate the meanings that are needed to be situationally created. This articulation of situational meaning creation was already explained in Section 6.9.2. Special attention should be given to the need to use all the four categories to express a situational meaning creation, and as such, to address the emergent nature of knowing. The knowing needs that can mostly occur in specific situations are only expressed by the questions and helps that can be mostly needed in a situation that has a specific focus. This is detailed in further sections.

The main implications of the emergent nature of knowing work are for the theories and research in knowledge work, knowledge-intensive organizations and knowledge management. The current finding brought forth an aspect of a work practice that challenges some assumptions regarding organizational systems, culture and practices that support and manage knowing work. As highlighted by Markus et al. (2002, p.185), the current information systems do not support the specific requirements of the emergent processes that characterize knowledge work. It is suggested that the emergent nature of knowing processes be accounted for in studies of knowledge uses, knowing work, knowledge work, and enterprise systems.

Synergistic

Essentially, creating meaning in knowing work was manifested as a synergistic combination of interpretive actions, emerging not only the complexity, but mainly, the fact that knowing actions are not self-contained. The findings showed that the meaning creation was composed by the main and complementary interpretive movements (verbings) that conjointly contributed to the whole meaning creation. Knowledge workers navigated through these actions in order to handle their critical questions.

The interpretation of inputs in both dimensions of knowledge aiming at fulfilling needs has been largely acknowledged in previous research. However, what is *emphasized in the present discussion is not the quantity and diversity of inputs, but the fact that the interpretation of one input helped the interpretation of another or led another input to be interpreted*. The uses of inputs in one dimension (e.g. tacit) were helped by the uses of inputs in the other (e.g. explicit). Thus, the *inputs in the tacit and explicit dimensions of knowledge activate each other in the knowing practice*. In addition, they contributed to the construction of meaning in knowing work in distinct but complementary ways, exhibiting synergistic roles in the meaning creation practice.

The synergistic interpretation of diverse inputs to create new knowledge is in line with the results obtained by Gherardi (2003, p. 357). According to her, knowledge is a “bricolage of material, mental, social and cultural resources”. Similarly, Davenport (2005, p. 155) emphasized that knowledge work demands using and juggling varied inputs at the same time. The combined interpretation of the tacit and explicit dimension of knowledge is also consistent with prior research that noted the synergistic role between these dimensions in a knowing process (Polanyi, 1958; 1966; 1969; Cook & Brown, 1999; Prieto & Revilla, 2004; Castro et al., 2007).

Implications

The finding indicates the need for consideration of the synergy between interpretive actions when researching about enterprise technology and practices that should support knowledge and knowing work. Any approach to support such kind of work should take into

account that knowledge workers do not perform standalone interpretive actions, but as in all creative and analytical processes, these actions are synergistic.

The synergistic uses of knowledge for knowing imply that organizational practices and systems should allow the access to and uses of both dimensions of knowledge as actions for knowing. The communication of and access to *both dimensions of knowledge, i.e. tacit and explicit, should be supported and facilitated*. This implies in privileging a *balanced approach in communicating knowledge to support and facilitate knowing work*. The need for such a balanced approach is substantiated by the empirical findings of Prieto and Revilla (2004). They demonstrated that the development of the organizations learning capacity requires a symbiosis between two knowledge practices: those dedicated to the access to structured knowledge by means of technology, and those focused on facilitating personal and social conditions to enable knowing. Choi and Lee (2003) also evidenced that both the tacit and explicit dimensions of knowledge are significant in capitalizing on corporate knowledge.

The synergy of knowing actions can be addressed if the communication of knowledge is accomplished by having as a starting-point how individuals need to be helped by knowledge in the meaning creation process. Then, whichever input that can be potentially associated with this knowing need can be communicated. This input can be a document, but it can also be the expertise of knowledgeable individuals, a workshop that will occur in the organization, or the outcomes of the last board meeting. Therefore, the communication of knowledge for a knowing work that is markedly demanding and comprised of synergistic meaning creation actions, should be sufficiently comprehensive and balanced, making accessible and usable what can potentially fulfill particular knowing needs.

Similar to the implications of the emergent nature of knowing, the flexibility and perspective claimed above can also be achieved if knowledge communication is focused on fulfilling needs for meaning creation acts. This perspective frees the process of communicating knowledge only by means of documents, for example. The focus turns to communicating knowledge for needs in a process of knowing extending the communication to what can possibly fulfill such knowing needs.

On the practical level, the findings of the present study provide ways to facilitate the communication of knowledge to be flexibly attuned to the emergent and synergistic nature of meaning creation actions in knowing work. This is explained in further sections.

7.2.4 Situational Meaning Creation

The following discussion is entirely focused on the situationality of knowing that the findings evidenced, because this is the central issue in communicating knowledge for knowing work.

Before moving to the discussion on situationality of knowing and consequently, to the application of the knowing situations, only the variables ‘Situation Descriptive Focus’ (hereafter Situation Focus), ‘Critical Question Entity’, ‘Critical Question Attribute’, and ‘Help’ were dealt with (for reasons previously explained). The categories of the variables above were those considered to reflect the main aspects of and mostly contribute to articulate the meanings needed to be created by knowledge workers in each knowing situations.

In this context, the meanings that are typically *needed to be created* in each knowing situation can be systematically articulated using the categories of the three main elements of sense-making identified by the present study: Situation Focus, Critical Question (Entities and Attributes), and Help categories (Figure 17, see also Figure 15 on page 295). This combination is referred to as situational meaning creation acts or actions. The *situational meaning creation* is only expressed if *all these elements are articulated*, i.e. if Critical Questions and Helps are articulated in relation to a Situation Focus (Figure 17).

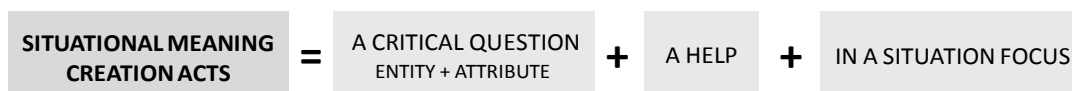


Figure 17 : How a situational meaning creation act was articulated.

The empirical study evidenced *how meaning creation actions differed across the knowing situations*. In other words, it was evidenced the ways that *the Critical Question and Help categories differently occurred and co-occurred across the Knowing Situations*. That is, meanings were situationally created, rather than following the same pattern of Critical Question and Help across the knowing Situations. A single Critical Question demanded different Helps. A single Help was associated to different Question Entities and Attributes.

This situationality is illustrated in Table 38. It shows the most frequent help needed with the Critical Question Entity 2 and the Attribute 1 across the five knowing situations.

These different associations reflect how meaning creation varied (the questions they had and the helps they needed from the uses of inputs) according to the Knowing Situations.

VARIABLE CATEGORY		KNOWING SITUATION 1	KNOWING SITUATION 2	KNOWING SITUATION 3	KNOWING SITUATION 4	KNOWING SITUATION 5
QUESTION ENTITY 2	MOST FREQUENTLY ASSOCIATED WITH:	HELP 3	NO OCCURR.	HELP 3	HELP 2	HELP 6
QUESTION ATTRIBUTE 1		HELP 2	HELP 1	HELP 6	HELP 2	HELP 1

Table 38 : An example of the different co-occurrences of the variables categories across situations.

Table 38 shows that Question Entity 2 had different Helps associated with it, according to the knowing situation: in situation 1, the most frequently associated Help was Help 3, whereas in situation 4 it was Help 2. Despite *asking about the same entity* (Question Entity 2) knowledge workers *needed to be helped in different ways*. Similarly, the Question Attribute 1 had different Help categories associated with it across the five knowing situations. This evidenced that even *asking about the same characteristics of entities* (Question Attribute 1), knowledge workers *needed different helps*, according to the situation.

Table 39 below provides another illustration of the situationality of knowing by zooming into the Help categories.

VARIABLE CATEGORY	KNOWING SITUATION 1	KNOWING SITUATION 2	KNOWING SITUATION 3	KNOWING SITUATION 4	KNOWING SITUATION 5
HELP 3	THE MOST FREQUENT ASSOCIATIONS (≥10%)				
	CQATT 7 (66.7%)	CQATT 6 (27.1%)	CQATT 1 (80%)	CQATT 4 (46.2%)	CQATT 9 (33.3%)
	CQATT 9 (60%)	CQATT 7 (26.5%)	CQATT 4 (55.6%)	CQATT 6 (14.1%)	CQATT 10 (22.2%)
	CQATT 1 (54.5%)	CQATT 2 (11.8%)	CQATT 5 (15.4%)	CQATT 3 (13.6%)	CQATT 6 (21.2%)
	CQATT 6 (25.6%)		CQATT 9 (15.4%)	CQATT 5 (12.9%)	CQATT 5 (15.8%)
	CQATT 10 (10%)		CQATT 6 (14.3%)		CQATT 1 (12.5%)
HELP 2	THE MOST FREQUENT CATEGORY ASSOCIATED WITH HELP 2 (HIGHEST FREQUENCY)				
	ENTITY 2	ENTITY 4	ENTITY 2	ENTITY 4 and	ENTITY 2
	ATTRIBUTE 3	ATTRIBUTE 5	ATTRIBUTE 2	ENTITY 7	ATTRIBUTE 4
			ATTRIBUTE 8		

Table 39 : An example of the co-occurrences of the Help categories across Situations.

The Critical Question Attribute categories that were most frequently associated with Help 3 differed across knowing Situations, despite showing patterns of co-occurrence within situations. For example, while in knowing situation 1, Help 3 was most frequently associated with Critical Question Attribute categories 7, 9, 1, 6 and 10 (the pattern within a situation), in knowing Situation 4, it was most frequently associated with Attribute categories 4, 6, 3 and 5 (Table 39). In addition, the Critical Question Attribute that most frequently occurred with Help 3 differed across all Situations: in Situation 1 it was Attribute 7; in Situation 2, Attribute 6; in Situation 3, Attribute 1; in Situation 4, Attribute 4; and in Situation 5, it was Attribute 9.

Another example in Table 39 involves the category Help 2 and the most frequent Question Entity and Attribute to which it occurred (the highest frequency). Although it occurred in all the five knowing Situations, the most frequent Question Entity and Question Attribute category associated with it varied across these knowing Situations. While in knowing Situations 1, 3 and 5, Help 2 mostly occurred with the same Question Entity 2, in the respective situations it was mostly associated with different Question Attributes: 3, 2 and 4 (Table 39).

The actions of meaning creation exhibited some *patterns* within situations. In other words, within specific knowing situations some questions were asked more frequently than others, and some questions were more frequently related with some helps than others. However, *differences* also occurred. Within knowing situations different helps were needed when the same question was asked, and a single help was needed when different questions were asked. The results of the present study support Sense-Making Methodology assumption of existing patterns of sense-making or knowing actions (the habitual actions), and as well as new actions (e.g. different helps needed for the same question). This is referred to as the ‘in-between’ assumption of SMM. The identification of both patterns and differences is a result of SMM focus on actions of sense-making (Verbings).

The main point is *the fact that knowledge workers having similar Critical Questions do not necessarily mean that they need the same Help*. Asking similar questions does not imply that they need to be helped by knowledge (inputs) in the same way. Even though, knowledge workers may need to know about an entity or aspects about the same entity, they do not necessarily need to be helped by knowledge (inputs) in the same manner. The ways they explain why they need knowledge (inputs), how they need to put this knowledge into use, and how they needed these uses of knowledge (inputs) to help their meaning creation differed across situations. The ways in which knowledge workers need knowledge for their

knowing, and the help they need from knowledge depends not only on the questions they need to answer with such knowledge, but also on how they need to be helped by it when they find themselves in a knowing situation with a particular focus on the gap-facing situation. This constitutes empirical evidence for the situationality assumption of sense-making in SMM.

Thus, if the creation of meaning would be an entirely pre-given action that occurs independently of the knowing situation, a pre-defined set of Questions and Helps would be consistently asked and needed across situations. The same question would be asked independently of which focus the knowledge creation situation would have. The Helps needed in a Critical Question would not vary according to the knowing situation focus.

Therefore, just in the moment of meaning creation, knowledge workers can ask the same questions or they can come up with different ones. They may need the same help, and they may need completely different help in answering a habitual question.

The present findings are in line with earlier studies showing that knowledge work is emergent and responsive to the characteristics of the situation (Alvesson, 1993; 2001; 2004; Carlsen et al., 2004). Specifically, practice-based approaches inherently consider knowing as a situated (Gherardi, 2003, p. 357; Nicolini et al., 2003, p. 23), and emergent process (Gherardi, 2003, p. 357), performed by ad hoc actions or improvisation to cope with situations that do not fit what was planned (Suchman, 2007; 1987, Ciborra, 2002; Brown & Duguid, 1991).

Implications

The findings uncovered the increasing and challenging complexity of knowing work as situational meaning creation. The situationality of knowing and of the uses of knowledge for such practice implies that research regarding these topics can consider this situationality in a more concrete way. This means that the discussion of situational knowing and uses of knowledge can open the 'black box' of how such situationality happens. Thus, the current finding allows the situationality of knowing to be referred to in research and literature in a less abstract way.

There are significant implications of the situationality of meaning creation for the research in knowing and knowledge work, knowledge access and communication, and

knowledge management fields. The situationality of knowing should be considered when making generalizations about the uses and needs of knowledge in knowing work on the basis of traditional measures (e.g. socio-demographics). The situationality of meaning creation actions also indicates a need to advance research related to understand knowing work, knowledge workers' and knowledge management practices.

The implication of the situationality of meaning creation for the communication of knowledge is equally significant. Facilitative practices and systems for communicating knowledge in knowing work have to recognize and become more adaptive to such situationality. The ways a knowing worker needs and uses this knowledge for her/his meaning creation differs situationally, and these ways impact how knowledge should be communicated.

Situationality significantly requests adaptivity in the sense-giving process in knowing work. The need of adaptation in communicating knowledge was emphasized by Eppler (2004; 2005; 2007), Borgatti and Cross (2003), and Kikoski and Kikoski (2004). Eppler (2004; 2005; 2007) stressed the need to use specific and didactic techniques to reduce the complexity in communicating knowledge and to adapt to users' needs, priorities and situations. Kikoski and Kikoski (2004) emphasized the need to use systemic questions to uncover individuals' needs, problems and situations in order to adapt the interaction in mutually generative conversations. The situationality of knowing needs significantly increase those requirements, because each knowing situation may demand different ways to communicate complex knowledge. The sense-giving process should not only endow words with meaning and describe experiences and knowledge in written and oral formats. There is also a need to endow meaning to words in a way that is as much suitable as possible to users' knowing needs. Situationality claims plasticity for the sense-giving process.

A considerable implication that stems from the situational nature of knowing is that the communication of knowledge for such practice starts occurring on the basis of a deeper level of communication (situational-practice-based) than those concerned only with the content on the matter that should be communicated. A new concern is incorporated in communicating knowledge: a concern with communicating to contribute to an underpinning knowing process that demands specific questions to be answered, and that demands communication to help this practice in particular ways and situations. This is markedly different to communicate knowledge for the sake of communicating knowledge, without attachment to human practices that are inherently involved in the process.

The above implies that in communicating knowledge, creators and knowledgeable individuals need to be able to uncover the needs and potential uses of the knowledge that has been communicated, in order to focus and adapt what is communicated back. This leads to another kind of cautious attention in relation to how knowledge is communicated. It is not just writing a report, or talking about what one knows. It is about to see what the other individual might need, and how s/he might need to use the knowledge been communicated. It is about seeing if the knowledge been communicated is sufficiently associated with specific knowing needs. Naturally, this requires the use of more sophisticated questioning of self and others than just discovering and connecting the knowledge that is to be communicated with the topic it is related to, or to the content needed by a knowing worker. Situationality calls for deeper discovering and understanding of differences in knowing needs. Situationality entails sensibility in the sense-giving process for adaptation to happen.

A core implication of the elaborated picture of situational knowing is that the creation of facilitative practices and systems now has a concrete framework to make the adaptivity to situationality happen. Therefore, in the knowing work context, it would be unfruitful to remain considering needs and uses of knowledge disregarding their situational nature, when the present study evidenced how this situationality manifests itself, and created ways to incorporate it into the communication of knowledge.

In practical terms, situationality can be taken into account by using the findings of the present research to communicate knowledge and needs. The categories of Question, Helps and Situation articulate situational meaning creation and they can be used to attune the communication of knowledge and needs to such situationality. Situationality is only articulated if the three categories above are conjointly articulated. Otherwise the articulation is not of a situational meaning creation, but merely of questions needed to be answered, and help needed to be got. Without locating these in a situation focus, the articulation is not of a situated meaning creation act. The situationality of meaning creation can be accounted for and articulated in communicating knowledge by means of face-to-face conversations and technology-based systems.

The consideration of the situationality of knowing in the communication of knowledge indicates the acknowledgement of differences, of how individuals differ in needing and using knowledge for their meaning creation processes. By communicating knowledge in consonance with such differences the knowledge accessibility is improved. Altogether, this adaptive communication of knowledge can help emerge more potentially

helpful inputs for knowing and enhance the final quality of knowledge created for a business strategy.

7.3 The Composition of Situational Meaning Creation

The focus of the present section is *entirely on the practical application of the situationality to the communication of knowledge for knowing work*.

This section answers the third research question of the study: *How can the situational creation of meaning in the knowing work practice be supported while accessing and communicating knowledge?* These applications attempt to help reducing the argued disconnection between how knowing work is accomplished in practice, and how knowledge is communicated for it.

To these ends, the configurations of knowing situations were looked and conceptualized at *different levels of granularity*. In the following sections the configurations of knowing situations are described at different levels of the occurrences, and combinations between the categories of Critical Question Entity, Critical Question Attribute and Help. These categories were called as the ‘*Knowing Situation Building Blocks*’.

The co-occurrences between the Critical Question Entity and Attribute with Help categories are the ‘*Knowing Situation Dynamics*’. A knowing situation is comprised of different ‘Dynamics’.

A very specific and single combination between two different categories is referred to as the ‘*Knowing Situation Positioning*’, e.g. Critical Question Attribute 2 with Help 5.

The above concepts are summarized in Figure 18. Their application to the communication of knowledge and needs are explained in the following sections.

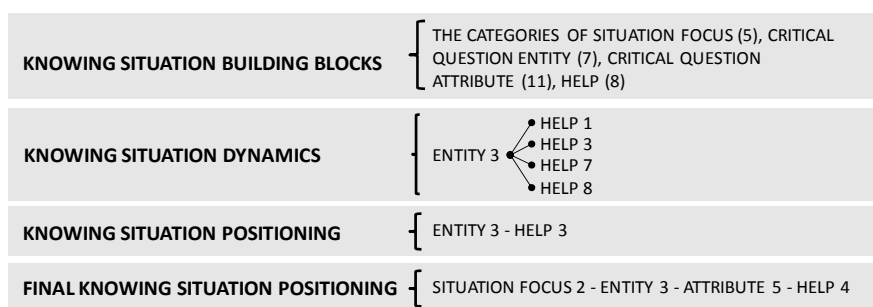


Figure 18: Illustration of the components of a situational meaning creation.

The purposes of explaining the knowing situations in different levels of granularity as above are the following:

(a) *Evidence the complexity of and the dynamics operating in a knowing situation.* By looking at the five knowing situations and identifying their structure in terms of Knowing Situation Building Blocks, Dynamics, Positionings, and Final Positionings one can see how complex the situational meaning creations can be within a particular knowing situation. This complexity is reflected by the varied ways in which, for example, a knowledge worker may need multiple and distinct help when s/he has a single critical question.

(b) *Create the frameworks to attune in the communication of knowledge to knowing practice and its situational meaning creation acts,* as it was proposed by the present study. The Knowing Situations Building Blocks, Dynamics, Positionings, and Final Positionings are used as the elements to help attuning the communication of knowledge and needs to situational meaning creation. The four concepts have different functions in communicating knowledge and knowing needs, but their aims are only one: to enable the articulation and communication of knowledge workers' situated meaning creation and their needs in such actions.

(c) *Help evidencing the situationality of the meaning creation in the knowing work practice.* The knowing situationality can be clearly understood and demonstrated by looking at the distinct Knowing Situation Positionings and Final Knowing Situation Positionings within and between the five knowing situations.

7.3.1 The Knowing Situations Building Blocks

The *Knowing Situations Building Blocks* are the categories of Situation Focus, Questions Entity, Question Attribute, and Help that were identified in the present study. There are the following four kinds of Building Blocks: (a) those related to the Situation Focus (5 Building Blocks), (b) those related to the Questions Entity (7 Building Blocks), (c) those related to the Question Attribute (11 Building Blocks), and (d) those related to Help (8 Building Blocks). The Building Blocks are shown in Figure 19.

KNOWING SITUATIONS BUILDING BLOCKS

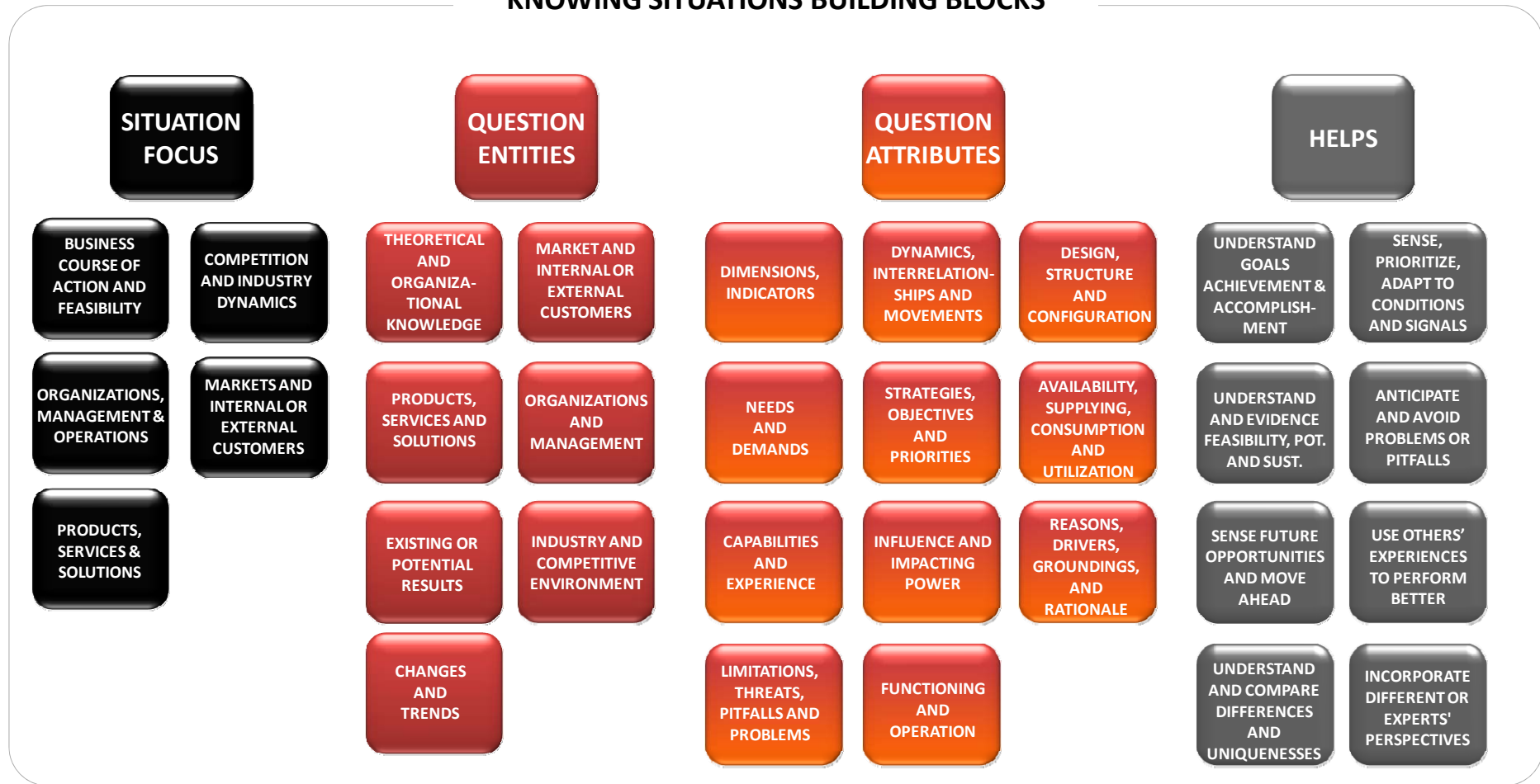


Figure 19 : The Knowing Situations Building Blocks that compound the knowing situations and that are used for the communicative of knowledge and needs.

The *Knowing Situations Building Blocks* are the smallest granule of the configuration of a knowing situation. They are the core components that enable the communication of situational meaning creation acts within a knowing situation.

The Knowing Situations Building Blocks have a critical role in the communication of knowledge for knowing work. They are essential to indicate the association that a particular knowledge has with specific needs in situational meaning creation, i.e. with knowing needs. Therefore, the Knowing Situations Building Blocks are core to the purpose of attuning communication of knowledge to situational meaning creation in knowing work.

The Building Blocks are also important for the communication of knowing needs. By using and combining the Building Blocks of Situation Focus, Question Entity, Question Attribute and Helps, knowledge workers can communicate the meaning needed to be created in a specific knowledge creation circumstance. When one Building Block (e.g. the situation focus ‘business course of action and feasibility’) is linked to another (e.g. the help ‘anticipate and avoid problems or pitfalls’), they communicate ‘pieces’ of a meaning creation act within a knowing situation. When all these pieces form a Critical Question with a Help with a specific Situation Focus, this linking of Building Blocks articulates a meaning creation act.

Importantly, it is the Building Blocks that enable the flexibility in communicating a situated knowing need to human and technology-based systems in an emergent process such as knowing. They also assure the necessary flexibility to indicate the association of a particular knowledge to a specific meaning creation act. In general, the Knowing Situations Building Blocks in Figure 19 enable 3.080 combinations can be made to express the meanings needed to be created and the meanings that a particular knowledge supports to be created.

7.3.2 The Knowing Situations Dynamics

Another important concept anchored in the Knowing Situation Building Blocks is the *Knowing Situation Dynamics*. The Dynamics is a set of Building Blocks of one variable that is combined with a different Building Block, e.g. all the Help categories that are associated with Critical Question Entity 3 (Figure 18).

The Knowing Situations Dynamics *reflect the patterns of meaning creation within the knowing situations* because it shows all the possible combinations related to one single

Building Block (e.g. all the Help categories associated to a Critical Question Attribute category).

The Knowing Situation Dynamics are applied only to communicating the knowledge workers' needs of inputs that are based on the explicit dimension of knowledge communicated by documents. Basically, the Dynamics are used as background knowledge for technology-based systems to understand the elicitation of a meaning creation act that may be made by a knowledge worker. They represent the patterns of meaning creation acts upon which the system maps the Building Blocks informed by knowing workers.

7.3.3 The Knowing Situations Positioning

The relation between two different categories of different variables, or the combination of two different Building Blocks is called a *Knowing Situation Positioning*. This is a unique co-occurrence between two Building Blocks, e.g. Entity 3 with Attribute 6 in a specific knowing situation (Figure 20). Three of all possible kinds of Knowing Situation Positionings are shown in Figure 20.

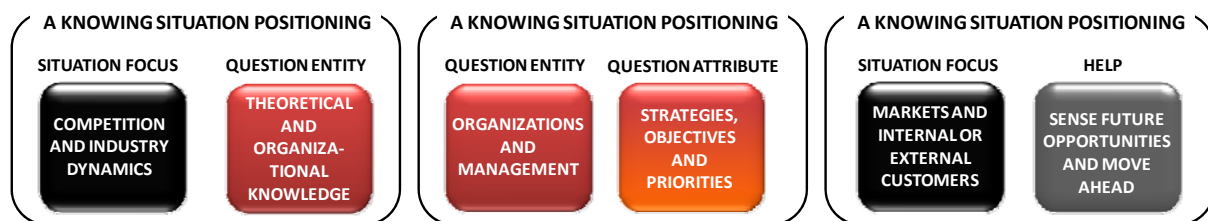


Figure 20 : Examples of three different Knowing Situation Positionings.

A *Knowing Situation Positioning* expresses just part of the situational meaning creation act in a knowing situation. For example, only the connection of Entity 3 with Attribute 6 does not articulate the entire meaning creation act that a knowing worker needs to accomplish. In order to know the entire meaning creation act it is necessary to know all the necessary Positionings: a Situation Focus with a Question Entity with a Question Attribute with a Help (Figure 21).

This integrated relationship between the four kinds of building blocks (one Situation Focus, one Question Entity, one Question Attribute, and one Help), form the *Final Knowing Situation Positioning* (Figure 21).



Figure 21 : An example of a Final Knowing Situation Positioning.

A Final Knowing Situation Positioning is the complete chain of one Situation Focus with one Question Entity with one Question Attribute with one Help Building Block at the same time, as shown by Figure 21. It is the Final Knowing Situation Positioning that articulates an entire situational meaning creation act that a knowledge worker needs to perform in a knowing situation.

In practice, when a Final Knowing Situation Positioning is formed, it communicates a situational meaning that is needed to be created: the situated Question a knowledge worker needs to answer, and the situated Help s/he needs to get from inputs in order to create meaning in a given knowing situation (situation focus). As such, the Final Knowing Situation Positioning also reflects how a knowledge worker needs to be supported by inputs (knowledge) in the creation of meaning within a specific knowing situation. The Final Knowing Situation Positioning evidences just one of the multiple, possible and diverse meaning creation acts that can occur in one single knowing situation. One knowing situation has multiple and different meaning creation acts.

The diverse Final Knowing Situation Positionings across knowing situations shows the situationality of meaning creation. They reflect how the meaning creations differ contingent on the Situation Focus. For example, the Final Positionings anchored in Critical Question Entity 2, and in Attribute 6 across knowing situations are shown in Table 40. It is possible to see how the same Entity has different Help and Attribute categories mostly associated with it across the situations. The same occurred with Attribute 6, which occurred with different Help and Entity categories. Each of the Final Positionings shown in Table 40 is different. Even though, asking about the same entity (Entity 2), and asking about the same aspects about entities (Attribute 6), knowledge workers needed different Helps in different knowing Situations (Table 40).

FINAL KNOWING SITUATION POSITIONINGS				
(MOST FREQUENT CO-OCCURRENCE IN RELATION TO THE FIRST CATEGORY)				
KNOWING SITUATION 1	KNOWING SITUATION 2	KNOWING SITUATION 3	KNOWING SITUATION 4	KNOWING SITUATION 5
ENTITY 2 – HELP 3 – ATTRIBUTE 7	ENTITY 2 DID NOT OCCUR	ENTITY 2 – HELP 3 – ATTRIBUTE 1	ENTITY 2 – HELP 2 – ATTRIBUTE 8	ENTITY 2 – HELP 6 – ATTRIBUTE 7
ATTRIBUTE 6 – HELP 2 – ENTITY 2	ATTRIBUTE 6 – HELP 1 – ENTITY 7	ATTRIBUTE 6 – HELP 6 – ENTITY 3	ATTRIBUTE 6 – HELP 2 – ENTITY 4 AND 7	ATTRIBUTE 6 – HELP 1 – ENTITY 3

Table 40 : The different Final Knowing Situation Positionings anchored to Entity 2 and Attribute 6 across the knowing Situations.

The objective of the present study is to facilitate the communication of knowledge in knowing practice to be performed in consonance with the situationality of this practice. For this purpose, a key requirement is to use the Final Knowing Situation Positioning, i.e. the four Building Blocks in an integrative way: one Situation Focus with one Critical Question Entity with one Critical Question Attribute with one Help). In other words, this is a premise if the aim is to attune communication of knowledge and needs to situational meaning creation. The separate identification of the Building Blocks *does not result in expressing situated meaning creation*.

The Knowing Situation Building Blocks and the Final Knowing Situation Positionings are merely resources for the communication of the situated creation of meaning that need to be accomplished and that a specific knowledge can contribute to. The purpose of the Knowing Situation Building Blocks and the Final Knowing Situation Positionings is to provide knowing workers with the possible ways that meaning creation may occur in specific knowing situations, allowing communicating their knowing needs and situational meaning creation. The Building Blocks provide the necessary flexibility to communicate knowledge and needs. The Final Knowing Situation Positionings provide the necessary structure in communicating a specific meaning that is needed to be created in knowing work. Final Positionings benefit from the flexibility of the Building Blocks because the former can be changed anytime by simply changing the latter. These concepts and frameworks simultaneously enable the necessary flexibility and some structure to communicate knowledge and needs to technology and human-based systems.

Both the concepts of Final Knowing Situation Positionings and the Knowing Situation Positionings have key roles in enabling the communication of knowing needs in consonance to situational creation of meaning to technology-based systems.

The Final Knowing Situation Positionings are also used to communicate knowledge. However, they are not necessarily required for communicating the tacit dimension of knowledge. This is detailed in the further sections.

7.4 Communicating for Situational Meaning Creation

The present research argued that often there is a disconnection between the ways which knowledge workers need and use knowledge to create new knowledge, and how this knowledge is communicated to them. It was claimed that this disconnection occurs because there are some limitations in how a particular knowledge and the needs for this knowledge are communicated to and by technology- and human-based systems. In the context of knowing work, knowledge can be communicated in consonance with how and why individuals need it for their meaning creation in specific situations. On a practical level, this is possible by using the Knowing Situations Building Blocks.

Figure 22 shows that Building Blocks are used to flexibly express the meanings a knowledge worker needs to create in a specific knowing situation, and the meanings that a particular knowledge (input) can help a knowledge worker to create, i.e. how it is associated to specific knowing needs. The Building Blocks enable the connection between knowers-in-knowing and knowledge to occur at the level of situational meaning creation. By using the Building Blocks to enable the meaning-creation-based connection between knowers-in-knowing and knowledge, the limitations in the communication of knowledge and needs that were argued by the present study can be reduced. As a result of such meaning-creation-based communication, the accessibility of knowledge is improved because knowing workers become able to access and communicate knowledge in consonance with the ways such knowledge is needed and used.

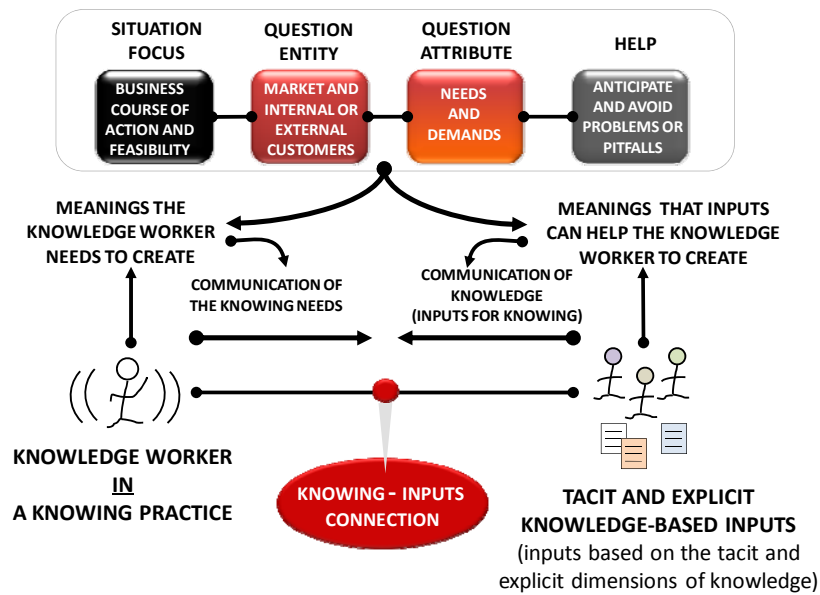


Figure 22 : Using the Building Blocks to communicate meanings needed to be created and meanings that are enabled to be created.

The Knowing Situations Building Blocks are used to attune the interdependent communication of knowledge and needs to the situational meaning creation in the following ways (Figure 22):

(a) *To communicate knowledge for knowing needs: how knowledge is associated to specific situational meaning creation.*

The Knowing Situations Building Blocks can be used to communicate how a specific knowledge is associated to particular knowing needs. This can be done to communicate the tacit dimension of knowledge by means of conversations, describe an individual's knowledge (e.g. an individual's experience with Asian markets), and communicate knowledge by documents (e.g. a business plan) (Figure 23). This is accomplished by indicating which Situation Focus the respective knowledge may be associated to, to which Critical Questions it can generate answers (the Questions Entity + Attribute categories), and how it can help in meaning creation (the Help categories).

COMMUNICATION OF KNOWLEDGE ATTUNED TO SITUATIONAL MEANING CREATION

USING THE KNOWING SITUATIONS BUILDING BLOCKS TO COMMUNICATE KNOWLEDGE :

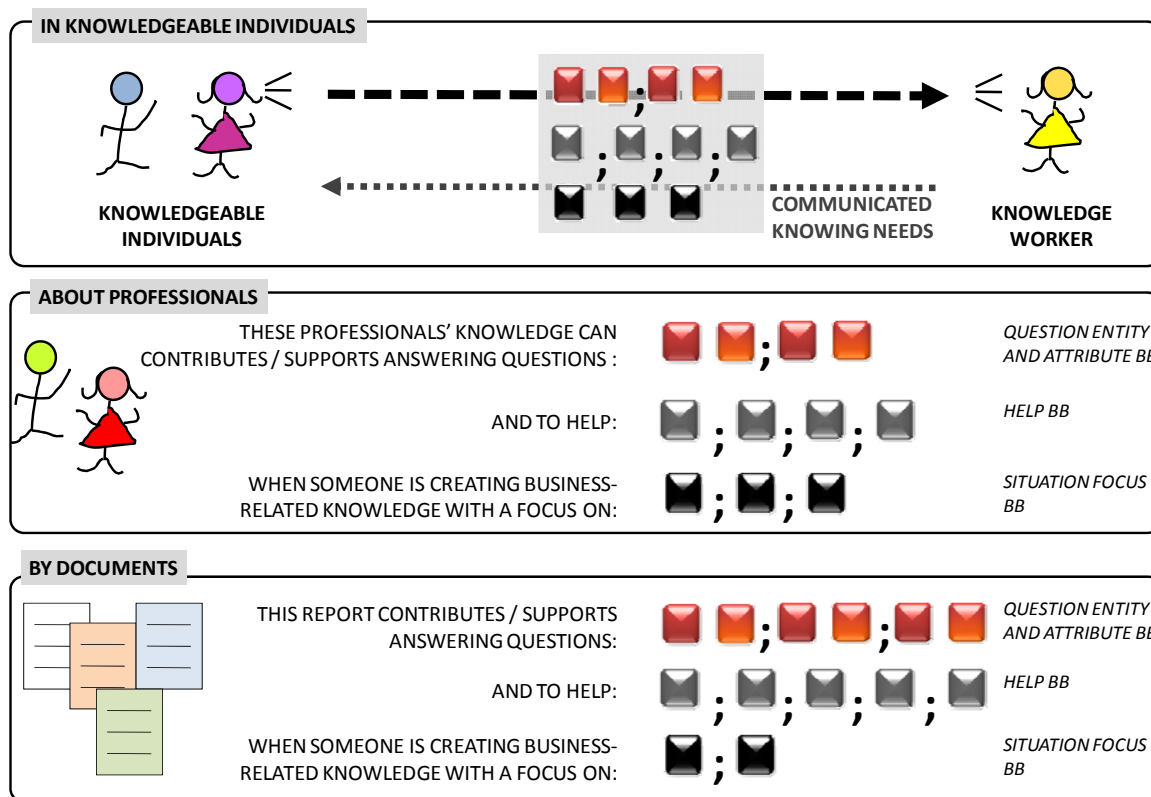


Figure 23 : Illustrating the application of Building Blocks to communicate knowledge for knowing.

By using the Building Blocks in a sense-giving process, it is indicated how a particular knowledge can contribute to specific meaning creation practices, facilitating for knowledge workers to identify its appropriateness in relation to the meanings they need to create. When an individual uses the Building Blocks to describe and communicate a particular knowledge, this enables the disclosure of a situational and a meaning-creation-based perspective to what Eppler (2007, p. 292; 2005) characterized as being demanded in the communication of knowledge, i.e. to disclose “context, background, and basic assumptions”, “personal insights and experiences”, and “one’s rationale and reasoning (i.e., one’s argumentation structure)”.

The communication of knowledge in consonance to the situational meaning creation to which such knowledge is associated generates significant benefits (Figure 24). Such benefits lead to the improvement of the accessibility of the tacit and explicit dimensions of

knowledge that are respectively communicated by people and documents. These benefits are outlined below and discussed in detail throughout the next sections.

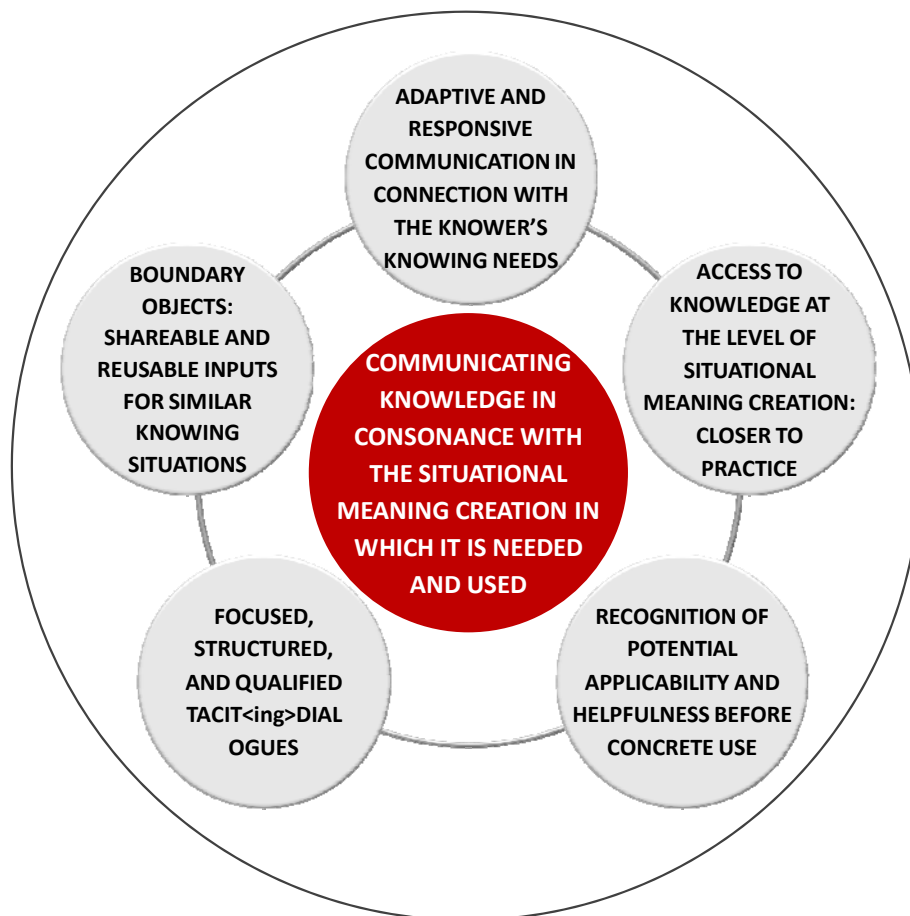


Figure 24 : The benefits of communicating knowledge in consonance with situational meaning creation.

In communicating knowledge in consonance with situational meaning creation, the main benefit is that the communication becomes more responsive and adaptive to knowledge users' knowing needs. This adaptivity can happen in two ways. First, by having the users' knowing needs communicated with the Knowing Situation Building Blocks. In response, knowledge can be communicated by documents and conversations in consonance with such knowing needs. Second, by indicating how a specific knowledge is connected with distinct knowing needs. This is enabled by using the Building Blocks to express the situations, questions and helps a specific knowledge can contribute to. In both ways, the communication of knowledge is performed in connection with its users' needs, contexts, priorities, i.e. according to their situational knowing needs.

Furthermore, the access to knowledge is enabled at the level of meaning creation, making this access to be closer to how individuals need and use knowledge in practice, and to how they differ in these needs and uses. As an effect of incorporating situational meaning creation, knowledge is communicated by aspects that go beyond their content or their characteristics as self-contained entities. The anchoring in situational meaning creation actions empower the communication of knowledge, enabling it to occur closer to how knowing work is performed in practice, i.e. as situational meaning creation.

The indication of the knowing-knowledge associations with the Building Blocks empower the recognition of potential usefulness of a specific knowledge right before it is completely and concretely read, listened to or disclosed. If it is communicated the situational meaning creation acts that a specific knowledge is associated with previously to its concrete use, knowledge workers can smoothly identify the applicability and helpfulness of the particular knowledge to the meanings they need to create. In the sense-giving process, the indication of how knowledge is associated to possible knowings it contributes to is a significant strategy to facilitate the acknowledgement of the potential usefulness of knowledge for knowing. The Building Blocks enable to improve the sense-giving process by indicating in advance the possible meanings that a specific knowledge can contribute to. As highlighted by Polanyi (1958) “if I come across a tool of which I do not know the use, it will merely strike me as a peculiarly shaped object” and “if we discredit the usefulness of a tool, its meaning as a tool is gone” (Polanyi, 1958, p. 56-57). Furthermore, indicating the associations of a particular knowledge with knowings can help with reducing the complexity of its communication (e.g. specialized knowledge).

Specifically to the communication of the tacit dimension of knowledge, when this communication attuned to situational meaning creation it also provides more focus and some necessary structure for tacit<ing> conversations. Knowledgeable individuals can articulate their knowledge in harmony with knowing needs previously specified with the Building Blocks by a knowledge worker.

The Building Blocks not only structure the communication of knowledge for the knowing work, but also knowledge resulted from such work. The Building blocks can structure the communication of knowledge among knowing workers, between them and their customers, and between them and other individuals in the organization. The Building Blocks create a common language based on actions of knowing that enable the communication of knowledge to other professionals. By using the Building Blocks to indicate the association of

a specific knowledge with the meaning creation actions that knowledge can be helpful, a boundary object⁵³ is generated (Star & Griesemer, 1989, p. 393; Carlile, 2002, p. 451). Because this indication is abstract enough to show the association of a particular knowledge with particular knowings in a way that is common to people who create knowledge for business or are related to the business, it can be accessed across functional and domain boundaries within knowing work, and by its customers. It contains sufficient indications that allow understanding the usefulness of a piece of knowledge in relation to the meanings an individual needs to create. The applicability of a particular knowledge that is communicated by a document can be easily identified by those involved in knowing work for business strategies. The concept of a boundary object was developed by Star and Griesemer (1989)⁵³. According to Carlile (2002, p. 451), they establish “a shared syntax or language for individuals to represent their knowledge”, and they describe “objects that are shared and shareable across different problem solving, contexts”. The creation of boundary objects by using the Building Blocks facilitates sharing and reusing knowledge among knowing workers and throughout the organization, because there is a layer describing how a specific knowledge can help create meaning in specific knowing situations (Help and Situation Building Blocks), and how it can contribute to specific critical questions (Question Building Blocks). For example, the notes taken from a tacit<ing> conversation or an intelligence report created for the board can be accessed by actors other than the creators and customers of knowledge (e.g. another manager), at the level of their own knowing needs.

(b) *To communicate needs of knowledge for situational meaning creation (knowing needs).*

The Knowing Situations Building Blocks can be flexibly used to express the meaning that a knowledge worker needs to create in a knowing situation (Figure 22). The Building Blocks enable the *communication of knowing needs* by incorporating not only what is needed, but also how and why it is needed in relation to a situational meaning creation. They are used to articulate the focus of the knowledge creation situation knowledge workers are in (the

⁵³ Star and Griesemer (1989, p.393) defined boundary objects as “objects which are both plastic enough to adapt to local needs and the constraints of several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common sense, and become strongly structured in individual-site use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation”.

Situation Focus), why they need knowledge (inputs) (to answer Questions Entities + Attributes), and how they need knowledge to contribute to the creation of meaning (to get Helps for their knowing by using inputs).

The Knowing Situations Building Blocks can be flexibly combined to communicate knowing needs in a dialogic face-to-face interaction that aims to access the tacit dimension of knowledge. Equally, they can be used for interactions with a technology-based system in the organization, to access the explicit dimension of knowledge that is communicated by documents. In communicating the knowing needs of the explicit dimension of knowledge by documents, the Knowing Situations Building Blocks enable to articulate to a corporate technology-based system⁵⁴ what, how and why knowledge workers need documents. This is possible by using the Building Blocks in the design of a user modeling component for a corporate system. In this case, the Knowing Situation Dynamics and Positionings of the five knowing situations are also used in addition to the Building Blocks. This is explained in later sections.

As a result of applying the findings of the present study to the communication of knowledge and needs, these communication processes consequently become *anchored in situational meaning creation acts*. The communication of knowledge gains attachment to the actions of situational meaning creation in which knowledge is needed and should contribute to. As a consequence, the ‘knowing’ part of the ‘knowing-inputs connection’ is activated and becomes influential in the processes of accessing and communicating knowledge.

In conclusion, the research findings contribute to the advancement of approaches that facilitate the communication of knowledge in knowing work. The advantages of having the communication of knowledge in consonance with situational meaning creation include the reduction of the time, efforts and complexity to get potential helpful knowledge for knowing work. Knowledge in people and documents become more intellectually accessible. The advantages also include the growing probability that the accessed inputs are potentially helpful in relation to the meanings needed to be created by knowledge workers. At the bottom

⁵⁴ In general, these corporate systems include knowledge management systems, information management systems, content management systems, and corporate portals. However, denominations and classifications are not important for the present study, which attempts to be independent of any technology or tools that are in fashion. The aim here is to improve any system that enables the access to information or knowledge within an organization, whichever name or technology it may be.

line, knowledge workers can have more time to dedicate to what actually adds value in their knowing work: to make sense and create new meanings.

7.5 Communicating the Tacit Dimension of Knowledge

The research findings substantiated the importance of accessing, interpreting and incorporating the tacit dimension of individuals' knowledge, namely tacit<ing>. By its nature, its communication is mostly enabled by interpersonal interactions between knowledgeable individuals, such as face-to-face conversations (namely tacit<ing> conversations). The present study concentrates its attention to such conversational process.

In face-to-face tacit<ing> conversations, the Knowing Situations Building Blocks are used in the two necessary processes to communicate knowledge: in communicating knowledge itself, and in communicating knowing needs. The results are mainly the generation of qualified conversations, and some structure and focus for the communication process and outcomes, facilitating contributions more in line with knowing needs.

In addition to facilitating the communication of the tacit dimension of knowledge in face-to-face conversations, the Building Blocks can also be used to describe individuals' knowledge in business organizations. This can be done by indicating the potential helpfulness of professionals' knowledge for specific knowing situations. Instead of indicating only what professionals know, or the projects they are working in, or their level of education, individuals' knowledge can be described in relation to the meaning creation that it can support, how it can help, which questions it is capable to provide answers to in specific knowing situations.

Addressing the purpose to facilitate the communication of knowledge in consonance with situational meaning creation, hereafter the focus is placed on face-to-face conversations that aim to surface and access the tacit dimension of other individuals' knowledge. The application of the findings is referred to as 'Situational Conversation for Tacit<ing>'. In this application the Building Blocks are used in communicating knowledge and needs conversations that aim tacit<ing>.

The Situational Conversation for Tacit<ing>

The application of the Knowing Situations Building Blocks to facilitate tacit<ing> face-to-face conversations generates the '*Situational Conversation for Tacit<ing>*'. This is a dialogic interaction that uses the Building Blocks conjointly with indirect and systemic questioning in order to emerge, surface and tap the tacit dimension of other individuals' knowledge.

The use of the Situational Conversation for Tacit<ing> in knowing work addresses the already discussed implications that are brought by tacit<ing>. In addition, it also addresses some of the evidenced issues in knowing work, such as the access to another individual's knowledge in individuals (Borgatti & Cross, 2003), the difficulties to find and get people engaged to help in their knowing, and the lack of knowledge workers' time to make sense.

Commonly, conversations focused on knowing processes present some challenges, which are commonly imposed by the use of excessively open conversations. If the aim of the conversation is to facilitate bringing forth the tacit dimension of individuals' knowledge, a very open conversation may lead to misuse of time and efforts of individuals involved in such conversation. As a result, the outcomes of such interactions may not be particularly useful for the needs of such meaning creation processes. The danger of counter productivity of an excessively open conversation increases if the time pressure in knowing work is considered.

The aim to generate some structure and focus to, and to manage tacit<ing> conversations by means of the Knowing Situations Building Blocks are in line with Topp (2000), Von Krogh et al. (2000), Gratton and Ghoshal (2002), Beer and Eisenstat (2004), Göranzon and Hammarén (2006), Mengis and Eppler (2008), and Dervin (in press).

In Situational Conversations for Tacit<ing>, the Building Blocks can be used to communicate individuals' knowing needs in relation to the other individual's knowledge. In *communicating knowing needs* to other individuals, knowledge workers can flexibly use and combine the Knowing Situation Building Blocks – Situation Focus, Question-Entity with Question-Attribute and Help. These Building Blocks can be used as a starting-point to articulate and communicate a knowledge worker's needs for a situational meaning creation. The Building Blocks communicate to knowledgeable individuals the focus of knowledge workers' knowing situation, the specific critical questions they need to answer, and how they need to be helped for their meaning creation. In this case, knowledge workers would be

creating and communicating Final Knowing Situation Positionings to begin and guide a tacit<ing> conversation.

The Building Blocks can also guide and facilitate the initial questionings by knowledge workers, helping to shape the use of the systemic questions, for example. In articulating situated knowing needs, the Building Blocks are used as a starting-point and a structure for indirect questioning⁵⁵ and their use can be followed by the systemic questions (based on the General Systems Theory). This way of questioning is acknowledged to be very appropriate to help accessing and communicating individuals' tacit knowledge (Kikoski & Kikoski, 2004). Systemic questions are focused on the dynamic context, rather than on linear causality, evidencing its high suitability for the nature and objectives of tacit<ing> conversations. These questions were explained by Kikoski and Kikoski (2004) as being comprised of circular questions, hypothetical questions and especially reflexive questions. The use of the Knowing Situation Building Blocks and systemic questions to guide tacit<ing> conversations can help to bring individuals' tacit knowledge forth, by engaging them in a focused interaction. It would also create openness and opportunities for emerging new insights and ideas.

In the Situational Conversation for Tacit<ing>, the Building Blocks are used to guide the communication of knowledge by the knowledgeable individuals in response to the knowing needs that were previously explained by knowledge workers with the Blocks. The use of the Knowing Situations Building Blocks can help these knowledgeable individuals in drawing attention to, and recollecting what they know on the basis of what is needed from them. The individuals' articulation of their knowledge can be guided by the same Building Blocks used by knowledge workers to disclose their knowing needs. This would enable the knowledgeable individuals to communicate the tacit dimension of their knowledge in consonance with the specific knowledge workers' knowing needs.

For communicating the tacit dimension of knowledge in consonance with knowing needs, the Knowing Situation Building Blocks allow the introduction of some structure to the tacit<ing> conversations, generating more focus without eliminating or inhibiting the necessary adaptability in this kind of interactions.

⁵⁵ In indirect questioning the knowledge workers' questions and the communication of experience, insights and knowledge emerge gradually in the action of conversing (Göranzon and Hammarén, 2006).

Importantly, knowledge workers can also use the Knowing Situation Building Blocks as a framework to structure the notes-taking during the conversation, enabling their future reflection, comparison, sharing and reuse. As a result, knowledge workers generate comparable and reusable outcomes of tacit<ing> conversations.

Figure 25 illustrates the use of the Knowing Situation Building Blocks to articulate the meanings a knowledge worker needs to construct in a specific knowing situation.

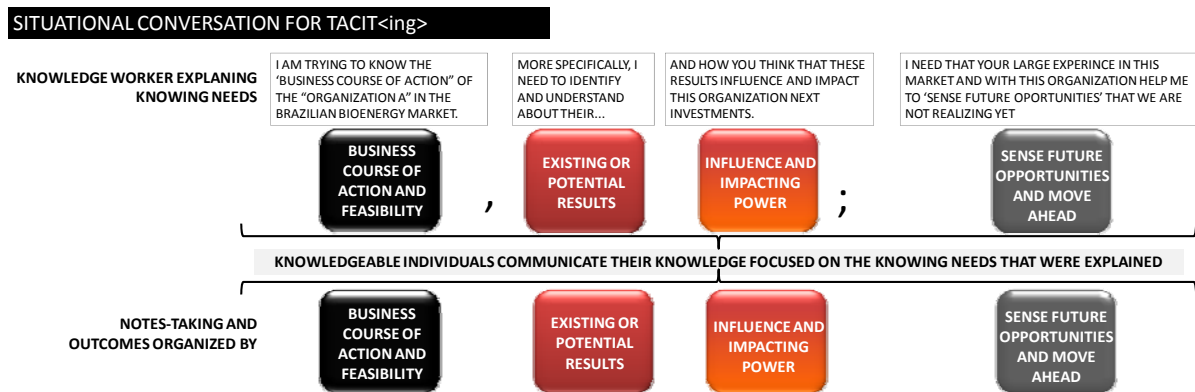


Figure 25 : Illustrating the use of the Situational Conversation for Tacit<ing> framework.

When using the Building Blocks, the communication of knowledge in tacit<ing> conversations can gain more pertinence to the knowledge workers' situated knowing needs. Knowledge can be communicated in a way that is more closely associated with the needs of knowledge workers' meaning creation. Most of all, with the Situational Conversation for Tacit<ing>, the interactions gain a common language that facilitate the communicating of tacit knowledge with less imprecision and vagueness. Ultimately, the tacit<ing> dialogic conversations between individuals may become richer, more nourishing and insightful, and probably more elucidative in relation to the knowledge workers' situated knowing needs.

The simultaneous flexibility and loose structuredness enabled by the Situational Conversation for Tacit<ing> address important issues that have increasingly challenged the facilitation of the knowing work practice in organizations. The benefits of the Situational Conversation for Tacit<ing> include the following:

(a) It can reduce the chaos of excessively free conversation, which is a problematic issue especially if the conversation has a clear aim to access individuals' tacit knowledge.

(b) It allows more effective use of the knowledgeable individuals' working time, and of their engagement to help knowledge workers in their knowledge creation. It also enables better use of the knowledge workers' time and efforts to tap other individuals' tacit knowledge.

(c) It facilitates knowledgeable individuals to articulate their tacit knowledge in a more structured and focused way, *in consonance with needs* that were previously expressed using the Building Blocks. The Building Blocks work as anchors to the communication of knowledge in consonance with knowledge workers' situated needs in meaning creation, reducing excessively aimless and useless interpersonal interactions and their results.

(d) It reduces efforts in recollecting and surfacing the tacit dimension of one's knowledge because the Building Blocks help focusing to specific points that knowledgeable people should focus their attention to in the recollecting process.

(e) It reduces the ephemeral nature of conversation outcomes.

(f) It helps to structure the narratives of knowledgeable individuals. As such, it enables the creation of conversations outcomes in a structured, comparable, shareable and reusable way.

(g) It enables the conversations outcomes to be registered, described or written down in a structured way that can be reused by other knowledge workers, helping them in similar knowing situations.

(h) It allows the accumulation of knowledge related to situated needs in meaning creation over time.

(i) It enables comparisons to be made between multiple individuals' knowledge at the level of their association with situational meaning creation, because the outcomes of the conversations can be written down in a structured format by using the Building Blocks. The structure that the outcomes get enables the comparison of how different individuals' tacit knowledge can be applied or be helpful in specific meaning creation acts within knowing situations.

(j) It enables knowing needs to be clearly expressed and the complexity in articulating the tacit dimension of knowledge to be reduced.

(k) It enables posterior reflection to be made about the outcomes of the tacit<ing> conversations and richer posterior interactions with the knowledgeable individuals who helped.

(l) It facilitates the assessment of the contributions given by knowledgeable individuals, and the assessment of what a knowledge worker has learned from the tacit<ing> conversations.

On top of all, the Situational Conversation for Tacit<ing> improves the access to other individuals' knowledge and reduces the chances of the contributions to be distant from what and how knowing workers need such knowledge for their knowing.

A single Situational Conversation for Tacit<ing> can deal with one or more knowing situations. In addition, it can be a one-off conversation or a series of encounters for dialoguing and accessing the tacit dimension of individuals' knowledge.

The application of the research findings to an approach such as the Situational Conversation for Tacit<ing> is supported by the ideas of the Dialogue Seminar Method developed by Göranson and Hammarén (2006). The Dialogue Seminars are guided by a framework that is created by the participants themselves. The framework provides some structure to the dialogues that aim at surfacing tacit knowledge.

Additionally, the application of the present research findings to tacit<ing> conversations is also consistent with the results obtained by Mengis and Eppler (2008). They proposed a prescriptive framework for managing conversations with six dimensions which delineate the conversational context for making sense and co-constructing knowledge. Furthermore, the application of the findings to facilitate tacit<ing> conversations is consistent with the need to communicate needs in clearer ways (Eppler, 2005; 2007). It also addresses the limitations in the communication of knowledge between experts and non-experts, and the lack of adaptation of the experts' contributions to users' situations (Eppler, 2004; 2005; 2007).

Unfortunately, so far, the access to the tacit dimension of knowledge in the creation of new knowledge by means of conversations has been often neglected in organizations. Kikoski and Kikoski (2004, p. 145) pointed out that "conversation has been the most underutilized asset of Information Era organizations". Equally disregarded has been the issue of abilities in inquiring and listening that enable this access in face-to-face conversations.

Facilitating conversations within a flexible structure that can clearly communicate how individuals need others' knowledge for their knowing practice is not only a matter of improving the communication process and the generation of insightful outcomes. Mainly, structured conversations favor the accessibility and the engagement that is necessary when one needs access to another individual's knowledge, as explained by Borgatti and Cross (2003).

More than the framework of the Situational Conversation for Tacit<ing> itself, the present study aimed at bringing a more meaning-creation-practice-based perspective to how the communication of the tacit dimension of knowledge can be facilitated. In this sense, the insightfulness and contributiveness of a tacit<ing> conversation can, to a great extent, be amplified in a way that is adapted to what matters for knowledge workers: their knowing needs.

7.6 Communicating the Explicit Dimension of Knowledge

In communicating the explicit dimension of knowledge by means of documents, knowledge creators can use the Knowing Situation Building Blocks to indicate how particular documents are associated with specific situational meaning creation acts. In this context, knowledge creators can indicate the foci of knowledge creation situations that a particular document can be helpful, which critical questions the document mostly supports answering, and the helps which it can provide in the respective situation focus.

By doing this, a particular knowledge is associated with situational meaning creation by means of providing the possible Final Knowing Situation Positionings for a specific document. The Final Knowing Situation Positioning literally locates a document in a 'map' of the distinct meaning creation actions (patterns of questions and helps in a situation focus) that can be accomplished in a knowing situation.

Noteworthy, in accessing explicit knowledge by means of documents, *Knowing Situation Building Blocks can be used as tags or filters*, if they are expressed as a combination (vector) of Final Knowing Situation Positionings. If they are used separately, they do not express situational meaning creation. Only the Final Knowing Situation Positioning expresses a *situational meaning creation* and the *needs* a knowledge worker has for this action.

The communication of knowledge based on the Knowing Situation Building Blocks can improve the intellectual access to knowledge communicated by documents. This is because knowledge is communicated on the basis of its association with the situational meanings it contributes to be created. This eases the identification and recognition of its helpfulness for specific knowing needs before an individual has to read the entire document. As an effect, time spent in reviewing irrelevant documents (20% to 60% of their search time, according to Manafy and McKellar, 2007, p. 42-44) can be reduced.

The indication of the association of a particular knowledge in a document with a situational meaning creation act and knowing need provides what Eppler (2004; 2005; 2007) referred to as the alternative indicators for those based on content, which are needed in the communication of knowledge.

In communicating knowledge for and of knowing work, the indication of the association of a particular knowledge to situational meaning creation acts is supported by Carlsen et al. (2004). Carlsen et al. (2004, p. 7) highlighted that “forming good boundary objects for work requires that experiences are described attentively, addressed to persons performing existing activities, or for the imaginative generation of activities”. The communication of knowledge based on the Building Blocks enables to address individuals performing possible knowing practices with such knowledge. Additionally, such approach also creates a common language that can be understood across functional boundaries and domains of knowledge *within the knowing work practice*. Knowing workers dedicated to different domains (e.g. consultants for different industries in the same organization) can make use of the Building Blocks to communicate knowledge for their colleagues. This communication based on the Blocks can also be made to internal and external customers. This is possible because all these professionals share a common goal that is to create and use business-relevant knowledge to ground strategies and actions. Despite the communication between knowledge workers and their customers bang between different ‘worlds’, at a certain level of abstraction they share a common business-related language and a common goal related to the knowledge created. The Building Blocks indicate the association of a particular knowledge with knowing needs at a level that is abstract enough to be understood by creators and users of the knowledge, and flexible enough to be mapped and compared against individuals’ knowing needs. In the end, these inputs become what Star and Griesemer (1989), and Carlile (2002) referred to as boundary objects. A positive side effect of such approach is that the communication of knowledge based on situational meaning creation can also improve

the reuse of the knowledge created within a knowledge-intensive organization. As showed by the findings of the present study, knowing workers reported the need to reuse internal knowledge.

A similar approach to the communication of knowledge exists in the medical community, which uses a knowledge exchange protocol to structure communication between physicians and patients. This protocol is called SOAP and it is “used to structure and document situation-oriented, physician/patient clinical encounters” (Herschel et al., 2001, p. 107). According to Herschel et al. (2001, pp. 107-108), SOAP is a framework with functions such as: structuring clinician-patient narratives; understanding the clinician’s thinking about perceived problems and issues; documenting what the physician understands about the patient’s situation; and documenting actions taken.

Explicit-knowledge based inputs that are communicated by documents can be also *described by their users*^{xxxv} using the Building Blocks. A corporate system may ask users to inform how the documents they used were helpful in their situational meaning creation. Knowledge users can indicate how the document helped them in specific meaning creation (Help Building Blocks), in which knowledge creation circumstances it helped (Building Blocks of Situation Focus), and which questions it helped answering (Question Building Blocks). Users’ indications of the helpfulness of a particular knowledge allow individuals to reuse it in similar meaning creation actions within knowing situations. In knowing work, knowledge workers can benefit from the experience of those who used similar knowledge in similar meaning creation actions. The present study findings showed that previous experience with similar inputs in similar situations lead to their reuse.

In knowing work, it is suggested that the description of the explicit dimension of knowledge that is communicated by documents using the Building Blocks would be compulsory for the authors or creators of knowledge^{xxxvi} (e.g. competitive intelligence analysts). The helpfulness description by the knowledge users can be optional (e.g. other employees, other analysts, managers).

Importantly, the approach proposed by the present study does not work alone. Rather, it should be sustained by organizational culture, practices, leadership, internal policies, and procedures that facilitate and support knowledge workers in their knowing work and in communicating knowledge. An environment that privileges the integration of the aspects above is important for the communication of knowledge, the access, and the reuse of knowledge created in knowing work.

The communication of knowledge considering the situational meaning creation is complementary to the typical description of documents that is focused on their characteristics (e.g. author, year of publication), and their content (domain of knowledge). The explicit dimension of knowledge that is communicated by documents can be described at three levels: (a) the traditional description that is based on content or on the domain of knowledge⁵⁶ of a document, (b) indicators of the situated meanings creations for which a specific knowledge can be potentially helpful (using the Building Blocks), and (c) the indicators of helpfulness for specific situated meaning creation actions that are given by users. All three kinds of descriptions can synergistically work together.

Nearly similar to the approach to communicate knowledge, but neither focused on knowing work, nor the business environment, a small scale experiment was developed by Dervin (1998, p. 44, 2003i/1999, p. 335) using Sense-Making Methodology. The approach created an overlay to a common noun-based knowledge base. Traditional abstracts were annotated with their author's answers to a few Sense-Making questions such as "What was it that you hoped to accomplish with this article? What led you to write it? How did writing help you? How do you think it will help others? What was your major struggle with this article? What remains unresolved?" (Dervin, 2003i/1999, p. 335). However, the approach proposed by the present study differs from the above experiment. The present study proposed to communicate knowledge by indicating three components of a sense-making or knowing situation in an integrated way (the four Knowing Situation Building Blocks), articulating a situational meaning creation act. This means that the Situation Focus, the Critical Question (entity-attribute), and the Help Building Blocks are articulated as a whole, integrated with each other, rather than independently. The current study aimed to incorporate the situationality of meaning creation into the communication of knowledge. As such, it is believed this situational meaning creation can only be articulated if all the three elements of this meaning creation (or sense-making) are communicated together.

In sum, the communication of knowledge in documents can be enriched if it is attuned to the situational meaning creation. The sense-giving process gains an instrument to evidence the connections of knowledge with knowings, helping individuals in intellectually accessing

⁵⁶ The description of the information resources based on the domain of knowledge is not the concern of this research. Despite acknowledging its crucial role in the information access, the proposal in the present research is not related to the access to knowledge on the basis of the domain level, but rather on the basis of knowing situations.

knowledge. More than just one more way of communicating knowledge, the approach proposed here attempts to improve the sense-giving process by connecting communicated knowledge to the situational practices it is part of.

Communicating Needs of the Explicit Dimension of Knowledge

In relation to the whole process of accessing documents in consonance with situational meaning creation, the present study *focuses only on how the communication of the needs* can be made to a corporate system. In this process, Building Blocks are flexibly combined and informed by knowledge workers in order to articulate the Final Knowing Situations Positioning, which represents a situational meaning creation act and specific needs in it. This is possible by means of an adaptive user modeling component that can be incorporated in a corporate system.

The present study proposes only a conceptual framework for the process of communicating the knowing needs to a corporate system. The technical details regarding how the articulation of these knowing needs is provided to systems, how inputs are technically selected accordingly, and how they are sorted and presented are excluded from the present study.

The Knowing Situation Building Blocks are used by knowledge workers to communicate to a corporate system the critical questions they need to answer, and how they need to be helped in a specific meaning creation, within a knowing situation, by the documents they are looking for. The Knowing Situations Dynamics and Positionings are also used for the communication of needs, but from the side of the system, rather than by knowledge workers. The Dynamics and Positionings function as background knowledge for the user modeling component in the process of articulation of a knowing need.

In what follows, the communication of needs to corporate systems by means of user modeling is explained.

The Knowing-Situations-Based User Modeling

The proposed user modeling component that is based on needs in situated meaning creation is referred to as the '*Knowing Situations Based User Modeling*' (hereafter

KSITUM). It helps to elicit a particular need in situated meaning creation. The final result of the user modeling process, i.e. the user model, is the Final Knowing Situation Positioning. It enables knowledge workers to explain and articulate their knowing needs.

KSITUM is a user modeling component that equips an enterprise information retrieval of a corporate system. KSITUM works together with the enterprise information retrieval and aims to enrich the traditional content-based process of accessing documents.

What it is ‘modeled’ is a specific need in a meaning creation act: a critical question that is needed to be answered, and a help that is needed to be obtained for the creation of meaning in a specific situation focus. This is the user model⁵⁷; a Final Knowing Situation Positioning, which reflects the knowledge workers’ situated needs in their meaning creation.

Figure 26 illustrates the user modeling process or the construction of a user model that is a Final Knowing Situation Positioning. The application of the present research findings in order to propose KSITUM is related to the highlighted in the left part of Figure 26.

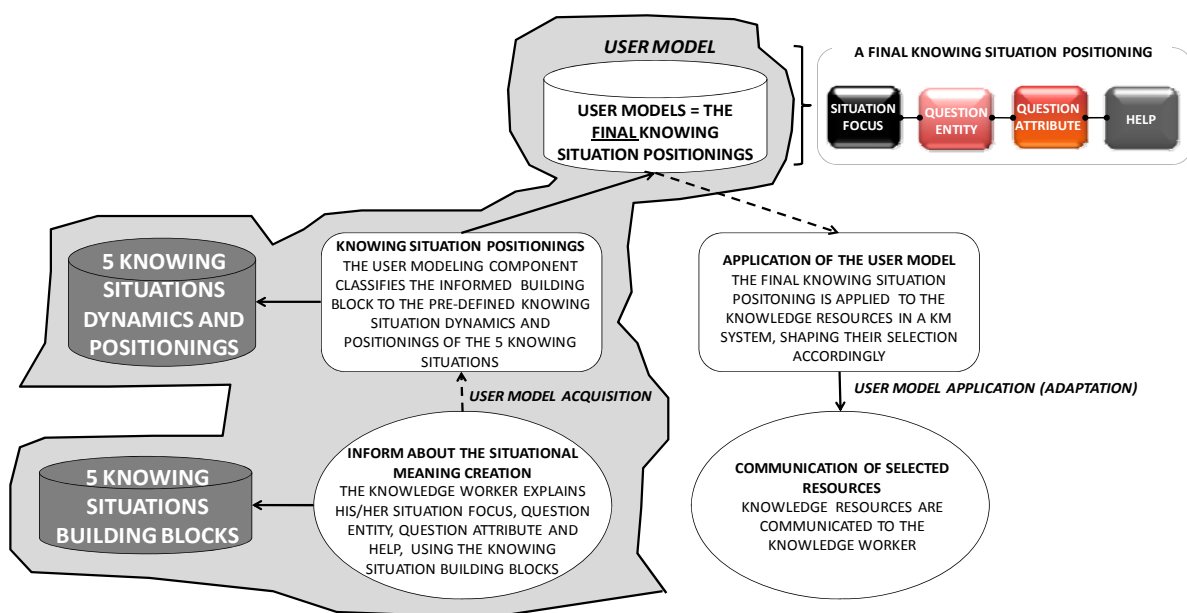


Figure 26 : The user modeling process and the user model (Final Knowing Situation Positioning).

⁵⁷ Baldoni et al. (2005, p. 190) discriminated user model from user profile as follows: “a user profile provides access to certain characteristics of a user. These characteristics are modeled as attributes of the user... Instead, the task of the user model is to ascertain the values in the user profile of a user U”.

To build the user models (Final Knowing Situation Positioning) by means of KSITUM the following procedures are performed (Figure 26):

(a) Acquiring Information about the Situated Meaning Creation and its Needs (Knowing Needs). Knowledge workers elicit, and communicate their situated knowing needs to KSITUM by using and combining the Knowing Situations Buildings Blocks. This explanation is built up conjointly with the system and the final product of this process is the Final Knowing Situation Positioning (the user model).

A specific need in situational meaning creation (the Final Knowing Situation Positioning) is explicitly provided by knowledge workers (it is a self-report) to KSITUM, using a dialogic data-entry protocol that is designed with a basis on the Knowing Situations Buildings Blocks.

The articulation of a knowing need is made interactively and iteratively. It begins with the knowledge worker communicating to KSITUM at least one of the Building Blocks (Situation Focus, Question-Entity, Question-Attribute or Help)⁵⁸. The Building Block that was informed by a knowledge worker to the system is what triggers the user modeling process.

The knowledge worker does not need to provide all the Building Blocks, but at least one, because KSITUM will subsequently help the knowledge worker to identify the other Building Blocks that are associated to the Block given by the knowledge worker. If knowledge workers want to provide the systems with more than one Building Block, these do not need to be the sequential ones, such as providing first the Situation Focus, then Question, then the Help. They can provide whichever at any moment of their interaction. The elicitation is gradual and occurs with the aid of the system that by knowing one Building Block proposes the others that are most frequently associated with it.

(b) Constructing and getting the Final Knowing Situations Positioning (User Model)

After having at least one of the Building Blocks – e.g. a Situation Focus – KSITUM maps and checks this provided Building Block against all the Knowing Situation

⁵⁸ The technical aspects of the data-entry interaction and the interface will not be addressed in the present study.

Dynamics and Positionings of the five knowing situations that were identified by the present study. KSITUM maps the provided Building Block (e.g. Situation Focus 3) in relation to the Knowing Situation Dynamics and Positionings to find the other Building Blocks that most frequently occur with the one that was provided by the knowledge worker (e.g. the help categories that most frequently occur in Situation Focus 3). Then, it timely communicates these other Building Blocks to the knowledge worker, suggesting them as possible connections to the one s/he previously provided. Basically, what the user modeling system does is to propose possible Positionings in relation to the provided Building Block. The Building Blocks that are related to those provided by a knowledge worker are always proposed (not imposed) by KSITUM because they are the most frequent ones that can occur with the Building Block specified by a knowledge worker.

In the process above, the Knowing Situation Dynamics and Positionings of the five knowing situations are employed as the background information that the user-modeling consults to gradually get the Positionings, and the Final Positioning.

The knowledge worker needs to validate the Building Blocks suggested by the system. The knowledge worker can confirm one of the suggested Building Blocks, or modify them by suggesting another Building Block in association to the previously provided. Changes are allowed to be done by knowledge workers at any point of the explanation and construction of the Final Knowing Situation Positioning. Decisions of validation or changes influence the next step in the construction of the user model.

If, instead of selecting one of those Building Blocks or Positionings identified by KSITUM, the knowledge worker communicates a new Building Block to be connected with the previously informed, e.g. a different question attribute, KSITUM begins the process again. It reinitiates the process and tries to find the other Building Blocks associated to the new Building Block communicated by the knowledge worker. This is done until the system gets all the necessary Positionings (e.g. Critical-Question-Entity with Situation-Focus, Critical-Question-Entity with Critical-Question-Attribute), and as a result get the Final Knowing Situation Positioning.

After interactively checking and validating the Positionings that were gradually and conjointly constructed by the user modeling component and the knowledge worker, the system finally gets the complete Final Knowing Situation Positioning (Figure 26). This is compounded by one Situation-Focus with one Question-Entity with one Question Attribute, with one Help. This is the user model that is provided to the information

retrieval system (Figure 26) in order to guide the selection of documents according to the situated meaning creation (the Final Knowing Situation Positioning).

Any change in individual Building Blocks configures on a new Final Knowing Situation Positioning. Thus, to get the user model (the Final Knowing Situation Positioning) KSITUM *requires that all four Knowing Situation Building Blocks are known*. This is an essential requirement in the process of communicating needs in situational meaning creation. Otherwise the knowing needs would not be situated.

Once the Final Knowing Situation Positioning is provided to the information retrieval tool, it guides the selection of documents in the corporate system. The effect is that a knowledge worker gets documents according to how s/he needs them for her/his meaning creation, i.e. according to the questions they need to answer, and the help they need to get in a specific situation focus.

A knowledge worker can have as many Final Knowing Situation Positionings in the same or different knowing situations as s/he needs. A specific document can fit to more than one Final Knowing Situation Positioning.

The difference between KSITUM and the typical approaches to communicate needs with a user modeling component is that users' needs are understood by their association with situational meaning creation actions, rather than by users' socio-demographic characteristics, or by their topical interests. What matters in the proposed user modeling is a knowledge worker 'A' with needs 'XYZ' in her/his situational meaning creation, rather than the knowledge worker 'A' her/himself. For example, the concern is not if it the user is a senior analyst, but if it is a senior analyst who is trying to create knowledge about a product to create a business plan, and who needs to understand the problems related to this product in order to avoid future problems.

KSITUM aims to be system and domain independent in the knowing work accomplished in for-profit knowledge-intensive organizations. The aim is that it can facilitate the communication of situational meaning creation to the information retrieval of corporate systems. It is also aimed that this is done independently of the domain of knowledge in which the knowing work is accomplished, i.e. independent if knowledge workers need documents about oil and gas, mobile telecommunications, or health for their situational meaning creation.

Significantly, KSITUM enables the incorporation of the ‘knowing’ practice in the communication of needs. KSITUM enables the incorporation of the ‘knowing’ part of the ‘knowing-inputs’ connections in the access to documents within knowing work. In previous studies, no similar user modeling system has been developed to date, thus, limiting comparisons, but nevertheless evidencing the uniqueness of KSITUM.

In the context of communicating needs, KSITUM brings a significant change in relation to the aspects that are typically used to explain and model users’ needs. KSITUM shifts the focus from communicating needs on the basis of characteristics that were far removed from the knowing action in which knowledge is needed and used (e.g. socio-demographics, topical interests). It incorporates the characteristics of individuals’ situational meaning creation actions for which knowing needs should be fulfilled.

7.7 Summarizing

The present study was driven by the disconnection between how knowing work is performed in practice and how knowledge had been communicated for such work. It was argued that such disconnection is due to some limitations in the communication of knowledge and its needs when individuals access knowledge for knowing work. The purpose was to identify how the communication of knowledge could be made in consonance with how such knowledge (inputs) is situationally needed and used for knowing.

To these ends, the knowing work practice was studied at the level of meaning creation, as a situated sense-making practice, using Sense-Making Methodology. The purpose was to understand how knowledge workers situationally create meaning by using knowledge as inputs for their knowing. Informed by this study, the current research aimed to provide an approach that could facilitate the communication of knowledge to be attuned to how it is needed and used for meaning creation actions, and consequently, to the situationality of these actions.

The study of the knowing work practice showed that knowledge workers construct meaning in an unplanned, unstructured, emergent and situational way. They most frequently interpreted the tacit dimension of their own and others’ knowledge. In addition, they also synergistically interpreted the explicit dimension of knowledge communicated by documents.

One of the key findings of the study concerned the ways in which knowledge workers needed, intersected and were helped by knowledge at the level of meaning creation, rather than by content in itself. The navigation and encounters with knowledge as input to knowing went beyond the appropriateness of the content of the input. It was based on the meaning that inputs contribute to be created, as suggested by Polanyi (1958; 1966; 1969; Polanyi & Prosch, 1975). This approach significantly enhances the understanding about how knowledge workers need and use knowledge for their knowing work.

Another significant contribution was the elaboration of the situational meaning creation acts and situations, and the consequent generation of practical frameworks – the *Knowing Situation Building Blocks*, the *Situational Conversation for Tacit<ing>*, and the *Knowing-Situations-Based User Modeling* – that are based on the interpretive study of knowing as situational meaning creation. These frameworks can be used to help attuning the communication of knowledge and needs to such situational practice.

The use of the Building Blocks to attune the communication of knowledge to the situational meaning creation is the main application of the present research findings. When they are applied to the limitations of the communication of knowledge and needs that were argued by the present study, the knower-in-knowing and knowledge connections occur on the basis of situational meaning creation actions. This is because it is possible to communicate the meaning a knowledge worker needs to create with knowledge, and knowledge can be communicated based on the meaning creation actions that it can contribute to be created. Then, the access and communication of knowledge occurs at the meaning creation level.

A significant contribution of such application is that the communication of knowledge for knowing work practice becomes anchored in what matters to knowledge workers: how they need to be helped in their creation of meaning by the knowledge (inputs) that the system can communicate to them. This is what makes the approach proposed by the present study unique. Significantly, more than being a different proposition to facilitate the way knowledge can be communicated and accessed for knowing work, the approach proposed by the present study reincorporates the human interpretive actions and their differences into the communication of knowledge.

7.8 Contributions

7.8.1 Theoretical Contributions

The present study advances the understanding of the work practice which primarily involves the knowledge creation to ground business strategies in for-profit knowledge-intensive organizations. The present study contributes to the understanding of the knowing work practice, of how meaning is situationally created in it, and how knowledge is situationally used for such practice. These understandings indicate ways to facilitate and support knowing work by means of the communication of knowledge as sense-giving.

In relation to Polanyi's tacit knowing theory, the present study evidenced how knowing is accomplished as a situational meaning creation practice, as a gap-bridging act in time and space. The knowing process as a work practice to ground business strategies was disclosed and the situationality of such a process was clearly evidenced.

Significantly, the understanding of knowing as a work practice was used to elaborate Polanyi's picture of the sense-giving process or the communication of knowledge. Particularly important is the contribution made to the communication of knowledge, for which the present study provided ways to enable its accomplishment in harmony with situational knowing needs. The sense-giving process become enriched, given that individuals can indicate how a particular knowledge can contribute to situational meaning creation. Most important, sense-giving can be made in consonance with knowing needs.

In relation to Sense-Making Methodology, the findings add value to the understanding of the sense-making practice in the knowing work that should ground business strategies within for-profit business organizations. In addition, the categorizations of the situational components of the SMM metaphor (situation, gap, verbing, help) contribute to Sense-Making studies. Furthermore, the current research provided empirical support for the assumption of situationality of knowing in the business context. The findings showed the situational logic in the ways that knowledge workers construct meaning, and the patterns in the ways they act and respond to distinct knowing situations and situated gaps. Furthermore, the study proved the value of an approach focused on situational practices.

Importantly, the five knowing situations and their configurations also disclosed the patterns and the differences in knowing work, which is a considerable contribution to SMM.

In this sense, the study empirically showed the ‘in-between’ assumption of SMM, in which a human being “is also ordered in part, chaotic in part, evolving in part” (Dervin, 1999, p. 730).

The study generated concrete evidence of the practical applicability of Sense-Making Methodology to improve the communication of and access to knowledge in business environments. It was also evidenced how the results of a Sense-Making study can contribute to and concretely be used for the creation of more responsive technology-based systems, and practices in a business context.

Besides contributing to Sense-Making Methodology and Polanyi’s knowing theory, the current study contributed to make the dialogue between research fields, proving the synergistic value of interdisciplinarity in studying knowing and knowledge. The present study attempted to contribute to the Information Science, Communication of Knowledge, Organizational Knowledge, and Knowledge Management fields and research streams. The findings serve as basis for future studies in the knowing work practices, organizational learning, knowledge work, knowledge management, and sense-making in business organizations. Thus, the study not only addressed the research problem in an interdisciplinary way, but it also proved the value of such dialogue between disciplines to address practical issues in knowledge creation of business organizations.

Specific to the Information Science field, the contributions of the study are concentrated on the evidence that in knowing work, knowledge is situationally needed and used at the meaning creation level. The present study enriches the typical approaches to access and communicate knowledge only on the basis of characteristics of knowledge itself, its content or subject matter.

Methodologically, the study also showed the value of using an interpretive and practice-based perspective to study knowing and to create approaches to facilitate the communication of knowledge for knowing work.

7.8.2 Practical Contributions

Particularly contributive is how the study generated a structured way to improve the communication of knowledge beyond its content-based criteria. It provides ways to indicate the association of a particular knowledge to the situational meaning creation that it contributes to. The uses of the findings add substantial value in enriching the traditional

approaches for communicating knowledge in business contexts that are focused only on indicating what a particular knowledge is about (subject matter) detachedly from the knowing actions.

Besides enriching the way that knowledge can be communicated, the indicators based on the situational meaning creation (based on the Building Blocks) make knowledge intellectually more accessible in relation to the knowing practice it can serve. In practical terms, this helps to smoothly and swiftly recognize if an input is appropriate and if it can be potentially helpful for a specific knowing need. Time, efforts, and complexity in intellectually accessing helpful knowledge for knowing work can be reduced.

First, the study provided ways to make the communication process in tacit<ing> conversations to be more structured, facilitating the generation of focused contributions and reusable outcomes from tacit<ing> conversations. Mainly, the Building Blocks allow attuning the communication to the needs of the knowledge workers' situational meaning creation. Second, the present study addressed an actual issue in knowledge-intensive organizations, more specifically in knowing work. This issue is the communication that enables the access to knowledge for the creation of new knowledge. The suggested frameworks - the Knowing Situation Building Blocks, the Situational Conversation for Tacit<ing>, and the Knowing-Situations-Based User Modeling – materialize approaches that can be used in the daily knowing work activities.

In addition, there is a high probability that the final knowledge created from knowing be intellectually richer and insightful for knowledge workers' customers. There are more chances of getting worthy contributions from inputs. This is because the proposed frameworks facilitate the access to and communication of the tacit dimension of individuals' knowledge. This increases the probability of getting valuable inputs for the knowing work.

More than just proposing a new way of communicating knowledge, this situational meaning-creation-based approach brings back the human action and interpretation into the process. This perspective would bring efforts and investments closer to how knowledge workers do things in practice, increasing the chances of technology and human-based communication systems to be more responsive and adaptive to how knowing work is done and what matters to who performs it.

7.9 Limitations of the Study

The applicability or transferability of results is limited to the knowing work practices. Therefore, what is generalizable or transferable are the main characteristics and dynamics of knowing practice work to other cases or practices of the same kind (Gobo, 2006. p. 423). The findings are neither generalizable as descriptions of knowledge workers, nor of knowledge-intensive organizations. The findings of the present study are generalizable and transferable as how knowledge workers create meaning or knowledge as a work practice in for-profit business organizations.

7.10 Future Work

The findings show that knowing work and the uses of knowledge in knowing are worthy to be studied from a practice-based perspective in the field of Information Science, as well as Knowledge Management and Organizational Knowledge. So far, these issues of knowing and knowledge in knowing have been rarely explored. The present study adopted a practice-based perspective to these issues and showed how such a perspective can be used to advance understanding related to knowing and knowledge uses.

Future studies with a focus on the approaches proposed by the present study – Situational Conversation for Tacit<ing>and KSITUM – will be developed. The development of prototypes of KSITUM and the appropriate evaluation of its results from the point of view of knowledge workers are topics for future research. Equally, the application of the Situational Conversation for Tacit<ing> will be implemented and evaluated by the present researcher, in order to move the approach further. In addition, the knowing situations will be reexamined with knowing workers of other countries, in the same kind of knowledge-intensive sectors and organizations.

Further research should be done to investigate the knowing situations in knowing work developed in non-profit organizations, to see if there any differences in the practice of creating knowledge.

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Zukerman I, Albrecht, D., (2001). Predictive statistical models for user modeling. *User Modeling and User Adaptive Interaction*, 11(1-2), pp. 5-18.

Appendices

Appendix I: The seminal approaches of user modeling in Information Retrieval.

APPROACH / SYSTEM	WHAT IS COMMUNICATED ABOUT THE NEED (THE USER MODEL)	PUBLICATIONS
GRUNDY	Characteristics such as age, sex, perseverance, independence, interests (in sports, romance etc.) and political preferences, and each of these characteristics is rated (the user model is created, updated and maintained by a stereotyping, i.e. by stereotypes hierarchically organized that contain the characteristics above).	Rich (1979)
I ³ R	User's interests related to the domain of knowledge. Concepts are derived from the queries and the domain of knowledge, and their relationships (use of statistical methods to identify terms and weights, and it also obtains relevance assessments about the documents retrieved).	Croft and Thompson (1987)
PLEXUS	User's answers to some questions before the explanation of the information problem itself. The questions made before the statement of the problem include the following: (a) "the extent of the user's knowledge of the PLEXUS system", (b) "the relationship between the topic of the query and the user's employment is explored", (c) "the extent of the user's practical experience in gardening", (d) "user's familiarity with resources in the subject domain", (e) "what advice-seeking activities have been carried out by the user prior to the session in connection with the user's current problem", and (f) "the user's geographical location" (Vickery and Brooks, 1987, pp. 101-103). After these questions, Plexus begins to acquire information about the user's problem. The statement about the problem is made in natural language and the semantic meaning of the terms used by the user to describe her/his problems are identified, mapping each term into a semantic category.	Vickery and Brooks (1987)
EUROMATH	User's background knowledge regarding a topic, her/his seeking preference, her/his estimated answers.	McAlpine and Ingwersen (1989)
MEDIATOR	General knowledge of seeking behavior, user preferences, values and expectations, user intentionality in relation to work tasks in domain (s), as well as user knowledge status and levels". The dimensions of the user model: users' status (e.g. student, PhD student), users' background (e.g. department, branch), user's goals (the intentionality behind tasks in work domain that may lead to information searching behavior, e.g. writing a paper, and subtasks, e.g. submission in 2 weeks to a conference), users' search behavior in relation to users' goals, users' search preferences and values in relation to search behavior (e.g., citation, from known author), types of knowledge related to IR, and levels of states of knowledge found in domain (e.g.	Ingwersen (1992)

	subject specialist, non-specialist) (e.g. expert, specialist).	
THOMAS/ASK	User's problem state in an unstructured format of text (e.g. writing 2 to 3 paragraphs) and this text was converted to a structured representation of the user's anomalous state of knowledge, by using a text analysis program. This analysis was made with basis on a structural characterization of the text, on a linguistic level (strength of association between words, number of nodes, degree of coherence etc.), building a network association between words present on the user's statement. Thus, the analysis was made on a linguistic level and no syntactic analysis was performed. There was also no effort to identify and represent the nature of association among the words.	Belkin et al. (1982a, 1982b)

Appendix II: Use of Context in IR

LEVELS OF CONTEXT IN IR Cool and Spink (2002)	CONTEXT MEANING	PUBLICATIONS
(1) Information environment level of context		None
(2) Information seeking level of context	user's background when conducting a search: degree area (electrical engineering), degree level (master), work area (electronics)	Newell, 1997
	contextual information can be identified: location in time (used for refining resource selection), location in space, and roles (predefined views)	Baldoni et al., 2005
	user profile, user knowledge and information retrieval experience	Brajnik et al., 1987
(3) Information retrieval interaction		None
(4) query level of context	queries and queries history - words, topicality	Martin and Jose, 2004
	queries and queries history, topicality of previous and current queries, browsing behavior	Gena and Ardissono, 2004
	documents accessed, representations of documents accessed	Budzik and Hammond, 1999
	queries	Tanudjaja and Mui, 2002
	the context given to a query is derived from topicality of the previous queries.	Parent et al., 2001
	query and relevant documents (not very clear)	Santos et al., 2005
	submitted queries (and queries history) and clicked search results	Shen et al., 2005a
	semantic concepts from viewed documents	Castells et al., 2005
	query terms / past search behaviors and selected pages also form the context for subsequent queries.	Smyth et al., 2004
topical interests, concepts context is represented as (is approximated by) a set of weighted concepts from the domain ontology	Vallet et al., 2006a	

LEVELS OF CONTEXT IN IR Cool and Spink (2002)	CONTEXT MEANING	PUBLICATIONS
	Topical interests: topic of the web pages visited, derived by words present in these pages	Kim and Chan, 2003
	semantic context - user's interest on a concept, which is derived from web pages browsed by them, and arranged in their personal ontology	Gauch et al., 2003
	context derived from the words extracted from the accessed / viewed / clicked content of documents or any of its representations (title, summary, snippets)	White et al., 2003
(4) query level of context	topic of interests derived from abstracts read / downloaded or from documents representations accessed during a session	Warren and Alsmeyer, 2005
	short-term context (session): category of a user's information need (e.g., kids or sports), previous queries, and recently viewed documents long-term context (all sessions): education level and general interest, accumulated user query history and past user clickthrough information	Shen et al., 2005b
	The context model is based on the features of the Ubisworld "ontology of context conditions: usage environment (place, motion, etc.), physical environment (temperature, weather, etc.), social environment (close people, current interactions, etc.), time (day, hour, etc.)" (p.10)	Carmagnola et al., 2005
	relevance feedback - documents accessed	Belew, 1989
	relevance feedback - documents accessed	Teevan et al., 2005b
	relevance feedback - documents accessed	Speretta and Gauch, 2004
	relevance feedback - documents accessed	Kima et al., 2002
	relevance feedback - documents accessed	Leuski and Allan, 2004
	relevance feedback - documents accessed	Mathe and Chen, 1994; Mathe and Chen, J.: 1996
	what surrounds browsing behavior (pages visited, links clicked), user's interests derived from the browsed pages	Mladenic, 1996
	browsing history 'context'- sequence of the nodes browsed	Hirashima et al., 1997
	user's interests derived from the browsed pages	Lieberman et al. (2001a, 2001b), Lieberman (1995; 1997) (system: Letizia)
(4) query level of context	user's interests derived from the browsed pages	(Lieberman et al., 2001a: 2001b) (system: Powerscout)
	content of visited pages	Chan (2000)
	words in the user's query history, which is comprised of the queries terms, relevant documents (clicked documents on search results list), mapped to a set of hierarchical categories (semantic relationship)	Liu et al., (2004)

Table 41 : The users' characteristics used to adapt the access to information in the analyzed studies.

Appendix III: Epitomes of Tacit Knowledge

The Systematization of epitomes of tacit knowledge according to level of abstraction and actors involved, developed by Haldin-Herrgard (2001, p. 108).

<p>COLLECTIVE ↑</p> <p>INDIVIDUAL/TEAM</p> <p>INDIVIDUAL</p>	<p>common sense common beliefs shared meanings common in experience</p>	<p>culture collective know-how genres</p>	<p>best practice</p>
	<p>unconscious norms mental models attitudes opinions group sense "inexplicable mental processes"</p>	<p>org. memories values perspective judgment non-canonical practice rule-of-thumb knowledge base predictions routinized knowledge thinking in practice</p>	<p>life examples creativity patterns of experience improvisation tricks crafts intimiation "look, sound, feel of" non-analytical behavior</p>
	<p>intuition feeling for beliefs hunch gut-feeling emotional knowing flashes of inspiration percepts</p>	<p>know-how insight second nature talent practical intelligence masters sureness of action action slips unarticulated preferences</p>	<p>sense making instinctive reaction artistic vision ability taste after the fact awareness</p>
	INTANGIBLE		TANGIBLE →

Appendix IV: Epitomes of Tacit Knowledge

The systematization of epitomes of tacit knowledge according to human competence that is affected, developed by Haldin-Herrgard (2001, p. 109).

MENTAL	EMOTIONAL	SOCIAL	PRACTICAL
<p>intuition mental models insight beliefs creativity ability judgement opinion hunch org. memories perspective insight talent "after-the-fact-awareness" cognitive skills indictive skills "inexplicable mental processes" percepts predictions sense making</p>	<p>"feeling" emotions artistic vision taste attitudes gut-feeling unarticulated preferences "get a feel for" emotional knowing "oneness of body and mind" "know in ones body" look, sound and feel of"</p>	<p>common beliefs values culture unconscious norms common sense life examples negotiation skills</p>	<p>know-how physical skills best-practice rule-of-thumb practical intelligence tricks crafts ability talent action slips "after-the-fact-awareness" automatic knowledge intimiation "a masters sureness of action" non-canonical practices routinized knowledge thinking in practice</p>
<p>inner competence, personal competence, ability, non-analytic behavior, instinctive reaction, second nature, experience</p>			

Appendix V: Interview Protocol

INTERVIEW SCRIPT – V36

PATRICIA C. NSC. SOUTO

Hello, _____ [say informant's real name. Do not write it on this page].

I'm _____ from Loughborough University, and I will interview you for my PhD research, which is about how knowledge workers seek and use inputs to create knowledge-based products.

I will be asking you to tell me more about situations in which you have sought and used inputs.

Thank you so much for agreeing to help me. During this interview, I will not refer to your real name and I want to assure you that your ALIAS _____ [REPEAT ALIAS] is the only name attached to your final interview. Your real name and its connection to your alias will be kept in a separate locked file.

I will be using a digital recorder so please speak freely about your situations.

What you say here will be kept entirely anonymous and the recording will be listened to only by me and/or by a transcription assistant. Your consent to interview will be securely stored with the recording of your interview and only I will have access to them. If you have any questions or concerns, please call 07738559097, or email P.C.Nascimento-Souto@lboro.ac.uk

The questions may sometimes seem repetitive but over 30 years we have found that what seems repetitive to one person is not to another. Are we ready to begin? I am turning on the recorder.

SITUATION CRITICAL ENTRY

Think about all the situations in your work in which you used inputs to create any kind of 'knowledge-based' outputs to internal and/or external customers, such as reports, recommendations, strategies, plans, designs, articles, books, etc.

Now, please select from these situations a single one in which

(1) ...the output you created was used by the customer and you consider that the results (of your output) influenced or impacted you, the customer's business and contributed to your organization. [situation critical entry – the heaven]. By 'impacting you' we mean that the output you created affected you in some important way, perhaps cognitively, emotionally or in other way...e.g. it improved your current understanding, you acquired new understandings, it added value to your career, you felt you did your best, you got acknowledgement, it helped to achieve personal/professional objectives etc. By 'impacting your customer' we mean that the output you created was used by the customer (internal and/or external) and it generated some kind of results for the customer's business (hard and/or soft results) or had some kind of impact e.g. it modified a process, triggered or enabled new business, field of research, studies, actions, events, helped achieving a better performance, to be more competitive etc.

SITUATION BRIEF DESCRIPTION

1. Describe a situation in which you were looking for inputs to create a knowledge-based product.

What happened? What did this situation involve?

2. As you look at the situation _____, what struggles did you face and handle?

3. What constraints or barriers did you see as blocking your journey / moving in the situation _____?

3.1 How did they constrain or block you in the situation _____?

4. These are some pictures that illustrate how people have described their journeys through situations as 'stopped' or 'blocked'. Please, rank each picture from 1 to 10 (10 = the maximum and 1 = not at all) in terms of how well it fits your experiences in this situation at this point in time.

5. How experienced or knowledgeable were you in the situation ____? (10-point scale, 10 = the maximum and 1 = not at all)

6. As you look at the situation ____, what were the core understandings you needed to construct for yourself in order to create the knowledge-based product?

UNDERSTANDINGS-QUESTIONS

7. What were the most critical [specific...] and demanding questions that you needed to answer when you were trying to understand ____?

For each most critical question

7.1. How critical and demanding to you was the question ____ in the understanding of ____? (10-point scale – 1= not at all, 10= maximum criticality/importance)

8. How experienced or knowledgeable were you about the question ____ when you were trying to understand ____? (10-point scale, 10-at the maximum; 1- not at all)

9. What were the best inputs that you used to answer the question ____ when you were trying to understand ____?

QUESTION - INPUT (FOR 5 MOST CRITICAL QUESTIONS/INPUTS INTERSECTION)

10. What led you to consider using the input ____ when you had the question ____?

11. What was it about your understanding of ____ that led you to think the input ____ could be helpful to you?

12. Looking at the input ____ you used when you had the question ____, how did you identify / conclude / find out that the input would be helpful for you?

13. How did the input ____ help you in answering the question ____ in the situation ____?

13a. What made the input ____ most useful in helping you to answer the question ____?

13b. How helpful was this input in answering this question? Would you say that the input ____ to question ____ was: Completely helpful / Partial helpful

13c. If completely helpful: what made it completely helpful?

13d. If partially helpful: what prevented it being completely helpful?

13e. Was there help you wanted but did not get from the input ____ when you had the question ____? What was it?

14. Would you say you got answers to the question ____ when you used the input ____

No answer at all / Partial answer / Complete answer

14a. If partial or no answer: what prevented you from getting a complete answer to the question ____ when you used the input ____?

14b. How did the answers you got help you in understanding ____? What did it allow you to conclude or do?

14c. Did the answers help you in other ways? What ways?

15. If you could have a magic wand, what would have been the best help you could have received from the input _____ when you had the question _____?

Appendix VI: Socio-Demographic Form

INFORMANT ALIAS (fill out by the interviewer): _____

INFORMANT ID (fill out by the interviewer): _____

In the last section of this interview, we need to know about a bit more about you. Again, i want to reinforce that your real name will never be attached to these answers.

Please fill out and/ or check:

1. Gender Female Male

2. Would you classify yourself as married or single? Single Married

3. Do you have children?

Yes → How many? _____

No

4. In which year were you born? _____

5. Of which country are you citizen? _____

6. How would you describe the highest level of education you have completed up to this date?

Doctoral degree, eg. PhD, Mphil etc

Higher degree, eg. MSc, MA, MBA

First degree/Postgraduate Diplomas/PGCE/Professional qualifications at degree level/NVQ/SVQ Level 4 or 5

Diplomas in higher education/HNC/HND/BTEC Higher/ Teaching, nursing or medical qualifications below degree level/RSA Higher Diploma

A/AS Levels/SCE Higher/Scottish Certificate 6th Year Studies/NVQ Level

3/BTEC National/City and Guilds Advanced/RSA Advanced Diploma

Trade Apprenticeships

A Level/GCSE Grades A*-C/SCE Standard/Ordinary Grades 1-3/NVQ Level

2/BTEC First/general diploma/City and Guilds Craft/Ordinary/RSA Diploma

O Level/GCSE Grades D-G/SCE Standard/Ordinary Grades below 3/NVQ Level

1/ BTEC First/general certificate/City and Guilds Part 1/RSA stage 1-3

Other: _____

7. Please tell us how you identify yourself when asked your ethnic heritage:

(e.g. White British, White Irish*, Other White background; Mixed (White and Black Caribbean, White and Black African, White and Asian, Other Mixed background); Asian Or Asian British, Black or Black British, Chinese or Other Ethnic Group)

8. Please, describe in general terms the employment of the highest wage/salary earner in your household:

EMPLOYED AT: _____

(E.g. large organizations, a city government, a small college)

AS A: _____

(kind of job)

9. Where do you reside?

City _____

County/Village _____

10. What is the sector in which you work? _____

11. At what company are you employed at the moment? _____

12. In which department? _____

13. You are working as a _____ *(your job, occupation or function)*

14. How long have you been employed / in practice in the current activity?

15. What is the knowledge domain or field that you have been working in during the last 5 years?

16. Please tell us how you identify yourself when asked your current knowledge level of the domain you cited above:

17. What is your academic major or area of interest?

(e.g. sociology, engineering, business, etc.)

Appendix VII : Consent Form

CONSENT FOR PARTICIPATION IN RESEARCH INTERVIEW

2007 – LOUGHBOROUGH UNIVERSITY

PATRICIA C. SOUTO – P.C.Nascimento-Souto@lboro.ac.uk

INTERVIEW OBJECTIVE

THIS INTERVIEW IS FOCUSED ON EXPERIENCES AND EVALUATIONS RELATING TO THE USE OF INFORMATION BY KNOWLEDGE WORKERS IN THE PRIVATE SECTOR, IN THE UNITED KINGDOM.

INFORMANT CONSENT

WHAT YOU CONSENT TO IS DESCRIBED BELOW.

_____ I consent to be interviewed by Patricia Cristina Nascimento Souto. I understand that my identity will be kept entirely anonymous and that all names of places and people to whom I refer in my stories will be removed or changed so that my identity and those of others whom I refer to can in no way be connected to the interview. I understand that only Patricia Cristina Nascimento Souto or her assistant will be allowed to listen and/or read the interview while the interviewer's name is still attached to it, with purpose of transcription.

_____ I agree that my interview be used for research and for training purposes providing that my identity is kept entirely anonymous.

Patricia Cristina Nascimento Souto has explained me the purpose of the interview, the procedures to be followed, and the expected duration of my participation. Possible benefits of the research have been described.

I acknowledge that I have had the opportunity to obtain additional information regarding the interview and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am free to withdraw consent at any time and to discontinue participation in the study without prejudice to me and/or to the student conducting the interview.

Finally, I acknowledge that I have read and fully understand this consent form.

I sign it freely and voluntarily. A copy of this consent form has been given to me.

SIGNED BY	SIGNATURE	ON THE DATE
Person interviewed		
Interviewer		

Appendix VIII : Publications

Souto, P. C., (2009). Communicating for Knowledge Creation: Beyond Content, Towards Meaning. *In: Proceedings of the 10th. European Conference on Knowledge Management*, Università Degli Studi Di Padova, Vicenza, Italy, 3-4 September 2009.

Souto, P. C. N., (2009). Knowledge management beyond keywords: studying knowing and designing to meet sense-making needs in it using Dervin's SMM. *SMM Workshop in ICA Conference*, Chicago, 2009.

Souto, P. C. N., Dervin, B., Savolainen, R. (2008). Designing for knowledge worker informings: an exemplar application of sense-making methodology. [Best paper award], *In: Proceedings of the ASIST 2008 Annual Meeting*.

Souto, P. C. N., Oppenheim, C., (2008) Copyright in an open access world. *In: Ferreira, S.M.S.P, Targino, M.G. (Eds.), Mais sobre revistas científicas: em foco a gestão*, Senac and Sangage Publications, São Paulo, S.P, Brazil.

Souto, P. C. N., (2007). Knowledge Management: uncovering risky gaps underlying the criticisms and moving to another perspective. *Ciência da Informação*, 36(2), p. 64-73.

Souto, P. C. N., (2007). E-publishing development and changes in the scholarly communication system. *Ciência da Informação*, 36(1), p. 158-166.

Souto, Patricia (2007). Using knowledge workers sense-making situationality as a tool for adapting to what matters. Presented at *Non-Divisional Working Symposium on "Making communication studies matter: Field relevance/irrelevance to media, library, electronic, communication system designs, policies, practices*. May 24, San Francisco. Available at: http://communication.sbs.ohio-state.edu/sense-making/meet/2007/meet07_souto2.pdf.

Souto, P. C. N., (2007). Impacting user's information use: adaptive user-information access and interaction based on the situationality of information seeking and use behavior. *In: Proceedings of the i3 Information: Interactions and Impact Conference*, Aberdeen, 25-29 June.

Souto, P. C. N., (2007). User-adaptive information access supported by situational predictors: applying user's sense making behavior to adaptivity. *In: Proceedings of the International Conference Human-Computer Interaction*, Beijing (China), 23-27 July.

Souto, P. C. N., (2007). Impacting user's information use: adaptive user-information access and interaction based on the situationality of information needs and information seeking behavior. Doctoral Consortium of the Connections 2007 Conference, Philadelphia, USA.

Souto, P. C. N., (2006). User-Adaptive information access supported by situational predictors: applying user's sense making process and moments to user-adaptive interactions. *In: Proceedings of the European Conference on Research and Advanced Technology for Digital Libraries (ECDL 06)*, Alicante, Spain, 17-22 September.

Souto, P. C. N., (2006). User-adaptive information access supported by situational predictors: applying user's sense making behavior to support adaptivity. *In: Proceedings of the Information Interaction in Context Conference (IiX 06)*, Copenhagen, 17 October.

ⁱ The most important of the criticisms regarding the approach of Nonaka and Takeuchi, their SECI Model, and their interpretation of Polanyi's tacit knowledge were made by Spender (1996b), Tsoukas (1996, 2003), Nahapiet and Ghoshal (1998, p. 248), Cook and Brown (1999, p. 384), Brown and Duguid (2001, p. 203), Tsoukas and Vladimirou (2001), Orlikowski (2002, p. 250), Zhu (2006), and Gourlay (2006a; 2006b).

ⁱⁱ Gourlay (2003) highlighted that there was no authoritative evidence for the combination and internalization processes of Nonaka's SECI model. Gourlay and Nurse (2005) also identified several other scholars who analyzed the theory of knowledge creation proposed by Nonaka and also found inconsistencies. The analysis developed by Gourlay and Nurse (2005, pp. 295-296) revealed that "Nonaka's theory of organizational knowledge creation is fundamentally flawed on both empirical and theoretical grounds. As such, its utility-especially as a guide for organizational intervention and knowledge development-is questionable."

ⁱⁱⁱ The knowledge creation practice at the organization level has been investigated by different perspectives in a considerable number of studies, such as Nonaka (1990a, 1994), Brown and Duguid (1991), Kogut and Zander (1992), Hedlund (1994), Nonaka and Takeuchi (1995), Weick (1995), Nonaka et al. (1996), Tsoukas (1996, 2005), Choo (1998), Davenport and Prusak (1998), Nonaka and Konno (1998), Von Krogh (1998), Von Krogh (1998), Von Krogh et al. (2000), Crossan et al. (1999), Zack (1999), Bhatt (2000), Nonaka et al. (2000), Cross et al. (2001), Sanchez (2001), Zollo and

Winter (2002), Nonaka and Toyama (2003; 2005), Fong (2003), Tsoukas and Mylonopoulos (2004), Nonaka et al. (2006), Castro et al. (2007), Hindmarsh and Pilnick (2007), Salmador and Bueno (2007). Other approaches to organizational knowledge creation draw on the SECI model developed by Nonaka and Takeuchi (1995), such as Zollo and Winter (2002), Li and Gao (2003), Rice and Rice (2005), Castro et al. (2007), Salmador and Bueno (2007), who developed similar or complementary models to the SECI. For example, Zollo and Winter (2002) proposed the knowledge transformation process such as variation, selection, replication and retention.

^{iv} The differences between knowing, knowledge and learning were clearly by Vera and Crossan (2003, p. 126).

^v Sanders (1988, p.1) highlighted that Polanyi “pioneered the notion of tacit knowing as such”. Sanders (1988, p.1) added that “the broad contours of Polanyi's TTK [theory of tacit knowing] are already to be found in *Science, Faith and Society* (1945), where he introduced the faculty of intuition in order to explain how successful discovery comes about, particularly in the (natural) sciences”.

^{vi} From a deep analysis of 52 papers that cite Polanyi as a source, Grant (2007, p. 176) summarized that the typical misinterpretations that occurred include: “the most frequent occurrence is the suggestion that Polanyi identifies two types of knowledge – tacit and explicit – and that this is an either/or state. This is really in direct contradiction to his view that all knowledge has a tacit element and that the degree of tacitness varies; the suggestion that Polanyi was writing about knowledge in a corporate or organisational context; that it is impossible to convert tacit knowledge to explicit knowledge; that tacit knowledge is embedded in corporate processes and routines; that tacit knowledge is the same as implicit knowledge; that explicit knowledge is the same as information; that explicit knowledge can be expressed in computer systems”.

^{vii} According to Gourlay (2002) this information is derived from the content analysis of the following Polanyi's publications: Polanyi, 1966; 1968; and 1969, pp. 123-207.

^{viii} It was difficult to find knowledge use studies in the information use stream of research (Information Science), more specifically in the corporate environment, that were not addressing sources or channels selection and use, corporate uses of tools and technology, sources and strategies to find information (Auster & Choo, 1994; Auster & Choo, 1996; Choo et al., 2000; Allard et al., 2009), modes of organizational information use (Choo, 1998), or types of information that are used (Werr & Stjernberg, 2003). The level and focus of these analyses are different from the adopted by the present research.

^{ix} The 675 respondents of the survey performed for this study were compounded by 360 in organizations in the USA, and 315 in Europe. They represented a broad range of vertical industries and sizes of organizations. More than 50% of the respondents were from organizations that have 1,000 or more employees (Hammond, 2004).

^x The research involved 660 respondents at management level from organizations in Australia, the UK, and across Europe. They were manager level or above in organizations ranging from not-for-profit to over 5 billion euro in revenues. The study involved respondents from different industries including business and professional services, chemicals, pharmaceuticals, financial services, healthcare, manufacturing, retail, distribution and logistics, technology, telecoms and utilities (Information Builders, 2007, p. 3).

^{xi} Paulo Freire and his pioneering work in education and literacy emphasized that the creation of knowledge (in educational context) begins with making questions or curiosity (Freire & Faundez, 1989). Briefly, his conscientization method for literacy education includes the use of words generated by people, words which were commonly used by them and reflected their lives. These words are called generative words because by combining their basic components, other words are generated

(Freire, 1970). Through dialogue with the individuals, each generative word works as a key to develop, construct or enrich topics, stimulating discussion from the generative words. The decoding process of the generative words and of situations represented by them enable the individual to integrate the meaning of these words in his own context and life, and lead to a rediscovering of the world by his own point of view and experience, opening the doors for communicating his own thoughts. Conscientization is the continuous process of discovering own thoughts, values, beliefs and perspectives and get free from and breaking through the prevailing conscience or dominant consciousness, reaching then, new levels of awareness, i.e. a critical consciousness (Freire, 1970). In this emerging of one's own world, the subjects are not objects or passive actors, but on the contrary, they are the active and powerful owners of their own experience and world.

^{xii} These methods are called indirect and they were explained by Ratkic (2006, p. 53) as being useful because "...both the responses and the researcher's questions gradually emerge in the course of conversations, conversations that may go on for several years and whose purpose is for the researcher to develop his ability to identify the interaction of the dynamic skill with a changing context. The gradual emergence of appropriate interpretations and composite pictures is something different to responses to direct questions in ready-made questionnaires or pre-planned interviews".

^{xiii} Opposed to these systemic questions are the linear questions which have a focus on causality, thus, limiting the responses and consequently the surfacing of individuals' knowledge. The complex, synergistic, interconnected and dynamic practice of knowledge creation cannot be facilitated by linear and cause-and-effects analytics.

^{xiv} Swap et al. (2001, p. 103) defined organizational story as the "detailed narrative of past management actions, employee interactions, or other intra- or extra-organizational events that are communicated informally within the organization".

^{xv} Gourlay (2004, p. 91, 101) explained that the term 'explicit knowledge' appeared only nine times in Polanyi's publications (1966; 1968; 1969, pp. 123-207).

^{xvi} In Polanyi's view, explicit inference or explicit logic is a mechanical procedure (Polanyi & Prosch, 1975, p. 41). Sanders (1988, p. 15) explained that in Polanyi's perspective, the explicit inference follow formal rules, and that "by 'explicit inference' is meant any kind of proof that can be given by the use of an algorithm. Operating on such a program, a correctly working computing machine is guaranteed to obtain the solution to particular kind of problems. In Polanyi's view, inferences like this only do not require any heuristic effort, creativity and originality on the part of the problem solver, they also cannot be expected to lead to discoveries of any real significance".

^{xvii} The findings are from the research performed by Accenture in 2006 about the attitudes of middle managers at large companies in U.S and U.K, in relation to receiving information that is necessary to their jobs.

^{xviii} An investigation into 3000 interactions with knowledge of 200 knowledge workers in different organizations (U.S. Defense Intelligence Agency, the testing service ETS, the drug firm Novartis, and the research institute Battelle).

^{xix} This research was conducted by IDC in 2004.

^{xx} This research was accomplished by the Delphi Group in 2006.

^{xxi} See also Information Builders (2007), Feldman and Villars (2006), Delphi Group (2004).

^{xxii} The best positioned enterprise search engines according to Andrews and Knox (2006) that were analyzed were the following: Autonomy, OmniFind, WebSphere Portal V6.0, Endeca, Inxight (It was acquired by the company Business Objects), Inqira (Inqira Intelligent Search 8.0), Recommind (MindServer Enterprise Search), Coveo, Microsoft (Microsoft Sharepoint Portal), Entopia, Convera (vertical search with focus on the publishing industry) The analysis of these enterprise search tools

was made with basis on public information and product information available on the respective websites, in 2006.

^{xxiii} The selection of information resources and ranking of search results has been performed according to the following factors: individual's profile; individuals' topical interests based on browsing, content consumption or content contribution; similar content based on their search patterns and on patterns of other users with similar interests; geography, age, browser version, content interests and needs, selection of content based on any content's metadata such as title, publish date, or author; semantic context; content interest patterns of community of users; role or the job of the person conducting the search (executive management, sales, marketing, accounting).

^{xxiv} According to Cool and Spink (2002), the 'query level of context' is focused on the linguistic level. Research on this level is focused on techniques to help information retrieval problems at the linguistic level of analysis (e.g. suggestion of terms, statistical language modeling). Studies made at this level investigate the information retrieval system performance regarding user's queries, query disambiguation and the correct interpretation of the terms used by the user. A classic problem addressed at this level is the correct understanding about the context of the search terms used, because often the document which will be retrieved has the right term, but in another context (linguistic semantics). According to Cool and Spink (2002, p.607), "a remaining problem to be addressed at this level is the development of appropriate elicitation techniques to disambiguate user queries through better representations of their context". Research made at the 'information seeking level of context' considers the tasks, goals and intentions applied to an individual's problematic situation. Thus, the focus is on the "goal(s) that a person is trying to achieve, or some problem resolution task that influences the IR interaction level" (Cool and Spink, 2002, p.606). This level of analysis is highly pertinent to information retrieval, and it includes concerns about the search process steps and stages, and consequent information behavior people associate and engage in these stages, given a problematic situation and a task/goal environment. This is a cognitive level of context and the approaches to information retrieval that are based on the nature of tasks, user's goals, user's problematic situation and anomalous state of knowledge are included in this level.

^{xxv} The polyrepresentation model has not had "a large body of empirical research that deal with its all elements" (Larsen & Ingwersen, 2005, p. 53). Four studies implemented forms of polyrepresentation of documents (cf. in Larsen & Ingwersen, 2005), but "none attempted to represent the user's cognitive space in several ways – only a single, static version of the information need was used".

^{xxvi} The type of user model and user modeling which is the concern of the current research are those related to adaptivity and adaptive systems, rather than those related to the traditional software design methodologies and HCI literature. McTear (2000, p. 325) explained the difference.

^{xxvii} For 'reconstructing the search by means of query enhancement, enrichment, expansion or refinement', see Chen and Kuo (2000), Torres and Parkes (2000), Kelly and Belkin (2002), Liu et al. (2002), Mizzarro and Tasso (2002), White et al. (2003), Leuski and Allan (2004), Castells et al. (2005), Chirita et al. (2006), Vallet et al. (2006a), White et al. (2006), and Loew et al. (2007). For 'reordering search results', see Kelly and Belkin (2002), McKeown et al. (2003), Ruvini (2003), Leuski and Allan (2004), Smyth et al. (2004), Speretta and Gauch (2004), Shen et al. (2005a), Teevan et al. (2005a), Teevan et al. (2005b), Vallet et al. (2005), Radlinsk and Dumais (2006), Vallet et al., (2006a), Vallet et al., (2006b). For 'adapting the search results presentation by using different visualization techniques', see Torres and Parkes (2000), McKeown et al. (2003), and Leuski and Allan (2004).

^{xxviii} The approaches to the concept of situation in theoretical and empirical literature in Information Science vary and they were identified by Cool (2001) as being the following: (a) situation

as a problematic situation, (b) situation in the cognitive sociology and social interaction theory, (c) situated action, (c) person-in-situation, and (e) situation environments (ecological perspective). Despite all approaches reviewed by Cool (2001) are contributive, they are different from the one used by the present study, which is rooted on the Sense-Making Methodology.

^{xxix} The other categorizations of knowledge workers made by Davenport (2005, pp. 28-29) were the following: (a) those involved in finding knowledge (who find knowledge which exists “need to understand knowledge requirements, search for it among multiple sources, and pass it along to the requester or user”), (b) packaging knowledge (who “put together knowledge created by others”, e.g. publishing), (c) distributing knowledge (who distribute knowledge “create systems and processes to increase access to knowledge for others, and get it to those who need it”), and (e) those involved in applying knowledge (who apply knowledge “use and reuse knowledge in the course of their work, but don’t generally create a lot of new knowledge”, e.g. accountants, auditors, most low-level professionals).

^{xxx} Alvesson (2004, pp. 26-30) after discussing the problem with the concept of knowledge-intensive firms (KIF), pointed out that one key element on his approach is the knowledge-intensiveness of the organization, which is higher in KIF than in other companies, and that a KIF “is an organization broadly recognized as creating value through the use of advanced knowledge” (Alvesson, 2004, p. 29).

^{xxxi} The Sense-Making Methodology was responsible for the foundational call for a change of paradigms in the Information Science field, when it demanded a more user-centered perspective to information needs and uses studies (Dervin and Nilan, 1986). The Sense-Making Methodology is one of the so called ‘alternative paradigms’ (Dervin and Nilan, 1986) for the information needs and uses studies. The founder of the Sense-Making Methodology, Professor Brenda Dervin, was the responsible for the turning point in information needs and uses studies, since a remarkable call for an alternative perspective to understand users and their uses of information (Dervin and Nilan, 1986). Together with scholars such as Robert Taylor, and Carol Kuhlthau, they initiate a set of more user-oriented approaches to user studies. The initialization of a call for more user-centered perspectives was given by the critique to the narrowness of the system-centered approaches first made by Douglas Zweig and Brenda Dervin (since 1970s). They were the “precursors of a user-centred approach to information seeking and use” (Savolainen, 1993, p. 14).

^{xxxii} Gourlay (2004b, p.9) synthesized how ‘tacit knowledge’ in empirical research. He identified that the term has been used in at least six distinct ways regarding individuals as follows: (a) someone can do something, but apparently cannot give an account; (b) someone claims they feel something of which they cannot give an account, but it is not clear if subsequent events validate the claim; (c) someone can do something, but not give an account at that moment, but can, if pressed, recall the explicit knowledge that was used tacitly when acting; (d) knowledge existing prior to the situation in which it is effective, and due to innate (biological) characteristics; (e) knowledge existing prior to the situation in which it is effective, and due to cultural factors; and (f) situations where A knows something that B does not, but where it could be argued A and B share the same practice.

^{xxxiii} For detailed explanation regarding the common use of the term ‘information’ see Dervin (2003a, 1999).

^{xxxiv} The use of internal knowledge-based inputs is an important aspect of knowing. In the current business scenario, organizations have increasingly demanded to reuse internally created knowledge. The competitiveness pressure for not reinventing the wheel and reusing and sharing intra-organizational knowledge has been largely discussed (Apostolou & Mentzas, 1999a; 1999b; Fischer, 2001; Lynne, 2001, Tsai, 2001; Swart & Kinnie, 2003; Thomas-Hunt et al., 2003; Majchrzak et al.,

2004; Widén-Wulff & Ginman, 2004; Laycock, 2005; Chua, et al., 2006; Demian and Fruchter, 2006; Watson and Hewett, 2006; Widén-Wulff, 2007; Cheung et al., 2008, Van Wijk et al., 2008).

^{xxxv} A second level of indexing made by users was foundationally used in the adaptive hypermedia field by Mathé and Chen (1996), who developed the Adaptive HyperMan system (AHM) for NASA, a “user-centered indexing approach to adaptive information access” (Mathé and Chen, 1996, 233). In the AHM “users select and mark any part of a document as interesting, and index that part with user-defined concepts”, and these marked parts can be subsequently retrieved by other users” (Mathé and Chen, 1996, 233).

^{xxxvi} Indicating characteristics of explicit knowledge that is communicated by documents is a common and a critical procedure in knowing work within knowledge-intensive organizations. This is because in this kind of work organizations are highly dependable on the knowledge they create, and also on its access and reuse. For example, Overman (2003) explained that in the management consulting firm Mckinsey, they use editors to convert codified knowledge into context-rich documents. Issues regarding the time and willingness have been claimed as obstacles for describing knowledge-based products in knowing work within knowledge-intensive organizations. However, findings of a study conducted by Kankanhalli et al. (2005) showed that “the relationship between codification effort and knowledge contribution to EKRs [Electronic Knowledge Repositories] is salient when generalized trust is weak”.