TAMPERE UNIVERSITY OF TECHNOLOGY

PATRICIA LÓPEZ PEÑA

MANAGEMENT ACCOUNTING SYSTEMS AND OPEN INNOVATION

Master of Science Thesis

Prof. Petri Suomala has been appointed as the examiner at the Council Meeting of the Faculty of Business and Technology Management on March 5th, 2014.

ABSTRACT

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Management controls systems have been used in companies for decades in small, medium or big companies. The first control systems were based on the most basic way of keep the accounts of a company. From that moment on, management control systems evolved dramatically from that basic way of accounting until the complex computed systems of now a day. While society evolves, the markets, products and services offered to the end consumers also evolved to fulfill their needs.

In the same way as societies evolved to adapt to their current needs, companies also have to adapt their products and be able to offer competitive products with more value added than their competitors. To be able to innovate with new products, technologies and ways of doing things, companies need to do research and innovate. R&D investment can be very high in the case of some companies and the outcome and benefits obtained from the innovation sometimes do not fulfill the expectations of return on investment. Companies sometimes have a problem of innovations that lack value to the company, consequently those innovations become unused. Companies found that one way to overcome that problem was to start selling these innovations to companies that seemed to be interested on them. On the same way, companies started buying innovation that was using the so-called open innovation paradigm.

The problem with innovation according to some authors is that if it has too many constraints, then the imagination of researchers can be lost, consequently, there is a huge community of people that claims that innovation cannot be controlled. On the other hand, when innovation is properly controlled, especially in environments like the open innovation paradigm, where different stakeholders come to play, it is extremely important to define who does what. This thesis conducts a review on papers which support the idea on how management control systems can successfully support open innovation. Moreover, the thesis proposes a new framework to map how the different management control systems support different sources of innovation on companies with different business strategies.

ACKNOWLEDGEMENT

Management accounting systems are a topic that is slightly covered during the studies on the master degree, but nevertheless a very interesting area for research. Along the courses, it can be noticed how management accounting systems are present in any firm and in any aspect of a company. Having a technical background on IT helped choosing the topic for starting the research on how management accounting systems and open innovation are related and treated on the existing literature. It is a complex topic to research on, since open innovation paradigm involves a great number of stakeholders taking part of the collaboration and management accounting systems covers a huge amount of systems that can be used within a company. Having the intention of continuing my professional career on the IT sector, the knowledge on how to manage systematically a new paradigm on technical innovation is what motivated me most to carried out the research for the present thesis.

I would like to thank both my supervisors Professor Petri Suomala and co-supervisor Santiago Velasquez Franco for their guidance and meaningful suggestions throughout the process of my research, as well as for their passionate sharing of knowledge. Furthermore, I am also really thankful to my family and their incredible support during all the years of my studies. Finally, I must thank my friends and colleagues for their great support, help and feedback I received from them during the process of my studies in Tampere. I found really great professionals and persons from which I have learnt really valuable lessons.

Tampere, September 25th, 2013

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Patricia López Peña

TABLE OF CONTENTS

ABBREVIATIONS AND NOTATION

IP	Intellectual Property
MACS	Management Accounting Systems
MAPs	Management Accounting Practices
MATs	Management Accounting Theories
MCS	Management Control Systems
OCSs	Open Control Systems
OI	Open Innovation
R&D	Research and Development

1. INTRODUCTION

Accounting systems first appeared with the purpose of guiding an organization towards achieving their objectives. Ideas coming from the strategic planning process have to be implemented in order to make the ideas being a successful source of revenue for the company. In order for a company to successfully implement an idea they use management control systems. While ideas emerge during the planning stage; control is used during the latter stage to reduce variation. Deviation from the established guidelines is not welcome. Those deviations are kept under control with the use of well-designed management control systems as they help to quickly bring back the deviations to the designed path (Davila et al., 2009 p.288).

In the case of start up companies, in order to be able to have any chance to grow and succeed, it is important to use accounting and control. Despite the huge range of systems accounting and control offer to manage a company, in the case of start up companies, what they need to do is to innovate in order to succeed. Innovation is associated with taking advantage of unexpected opportunities, new relationships, uncertain outputs, risks and the possibility of failure. All those tools designed to reduce or eliminate variation and establish a control routine on the company activities have small room on start up companies. It is believed that traditional control tools encourage a command and control approach based on explicit contracts, hierarchical organizations and extrinsic motivation. They are designed to cut innovation, since innovation increases the chances of failure. Traditional controls offer pre-determined objectives, which are efficient. Control has often been perceived as a hindrance to innovation efforts that rely on intrinsic motivation, freedom, experimentation and flexibility. Hence many researchers agree that the role of management control systems in this entrepreneurial and innovative environment should be minimal (Davila and Foster, 2005, 2007).

On the other hand, there are some researchers as Davila et al. (2009) who support the ides that management control systems can help to enhance the performance of innovation. Davila et al. (2009) among other authors agree that with a working

environment with more complex requirements, uncertainty, and changing aspects, control systems have to be flexible and informal. Control must come in the form of social control systems that allow direct autonomy and rely on the judgment of employees informed by clarity about the vision and objectives of the business.

Davila et al. (2009) support that incremental and radical innovation requires formal tools to structure the process of innovation itself. Those tools cannot be rigid; instead they must be flexible enough to take advantage of unexpected opportunities yet strong enough to keep the expected direction. Moreover, the authors argue that the role that control should have over innovation is as supporting mechanisms that enhance the user capabilities and abilities to leverage their knowledge and be more effective in terms on innovation.

According to Cunningham (1992), "*management control systems represent the techniques and mechanisms which companies use to pursue objectives, accomplish goals and successfully follow strategies*". Management control systems (MCS) have different purposes, which include activities to integrate, motivate, assist decision-making, communicate objectives, provide feedback, etc.

Davila et al. (2009) focus in their work into a new paradigm within innovation, open innovation. OI is a term first introduced by Henry Chesbrough in 2003 defined as a paradigm used by companies that use and create innovation. The idea underneath open innovation is the use of external innovation as well as internal ideas of a company to develop their strategy. Companies should also find external paths to market to license technology that do not compromise either in the present or in the future their intellectual property, but at the same time that generates additional value to the company (Chesbrough, 2003).

By using OI, companies with low possibilities of innovation, can go out to the market and acquire the necessary resources that others develop. From the point of view of companies that do innovation, sometimes they do not find the real use within their company for some of the innovations that they create in-house. The solution for those innovations that are left aside is to license them so other companies can buy the licenses. In this way innovations bring back to the company benefits that otherwise would not even be considered. Also, not only unused innovations are the ones to be

sold; companies who have research centers have the know-how that other companies do not. Yet it is also a good way to bring benefits to the company by helping other companies with innovations (Chesbrough, 2003).

The idea of OI may seem at first sight a straightforward concept, although actually, it is not. It is not easy to manage and control IO while making it a profitable business model. It may seem reasonable that such structure with so many stakeholders involved needs proper MCS to help the paradigm work out.

The aim of using MCS within the OI paradigm is to create a mixture of the rigid behavior that MCS provide with extensive communication and sense of freedom that OI requires. Yet, the combination of MCS with OI results in an organized combination, but not so rigid that does not allow innovation to happen. At the same time, MCS provide the sufficient mechanisms to avoid ruining innovation due to its implicit chaos implicit. It can be understood the great importance and benefits that MCS have over the OI paradigm. Yet, the study of the present thesis is intended to go deeper into MCS. Within MCS, the present study wants to specifically focus into management accounting systems, systems that are classified within the formal systems of MCS.

1.1. Objective of the Paper

It has been explained before how some authors support that MCS or mananagement accounting control systems (MACS) support OI in a successful way by enhancing the performance of the OI process. On the other hand, there are other authors that support that control, in any sense, prevents innovation to evolve and produceany successful result.

Through the present thesis, the idea is to find existing literature that supports the idea that MCS, if successfully implemented, can enhance the performance of OI. Therefore, the objectives of this master thesis are:

1.To review the literature on MCS and MACS aiming to analyze how these systems are involved in OI environments.

2. Provide a new dimension to an existing framework to provide a better understanding of the relationship between MCS and OI.

1.2. Structure of the Thesis

In achieving the objectives of this Thesis , it is necessary to start analyzing the concepts of accounting systems and their relationships with MCS. The differences and relationships between MACS and MCS is an open debate among the scientific community. Hence, Chapter 3 analyzes the two concepts.

Chapter 4 analyzes the OI concept with particular focus on how it may be managed, and its implementation related challenges. In addition, the chapter discusses how some companies have successfully implemented OI.

Chapter 5 covers the relationship between MCS and OI. To do so it is discussed the types of innovation and control framework with particular focus on the framework introduced by Davila et al. (2009). This chapter also presents a modification to Davila's framework where it is compared different types of control with different types of innovation. In order to illustrate the use of the modified framework, the chapter will present three cases of companies that have successfully implemented OI where MCS play interesting and valuable roles.The companies used for the illustration are Fiat, P&G and InnoCentive. It will be used then the modified framework to analyze these cases. Finally, chapter 6 discusses the conclusions that can be obtained from the present study.

2. RESEARCH METHOD AND MATERIAL

Hart (1998) defines literature review as "*The selection of available documents (published and unpublished) on the topic, which contain information, ideas, data and evidence written from a particular standpoint to fulfill certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed.*"

As Hart (1998) states, doing a literature review is important since it allows the researcher to acquired the necessary understanding of the topic to research. Doing literature review can also evidence to the researcher the existence of previous studies related to the topic, so it may help to have a starting point where to continue the study. Doing a literature review has different stages that can be seen in Figure 2.1.

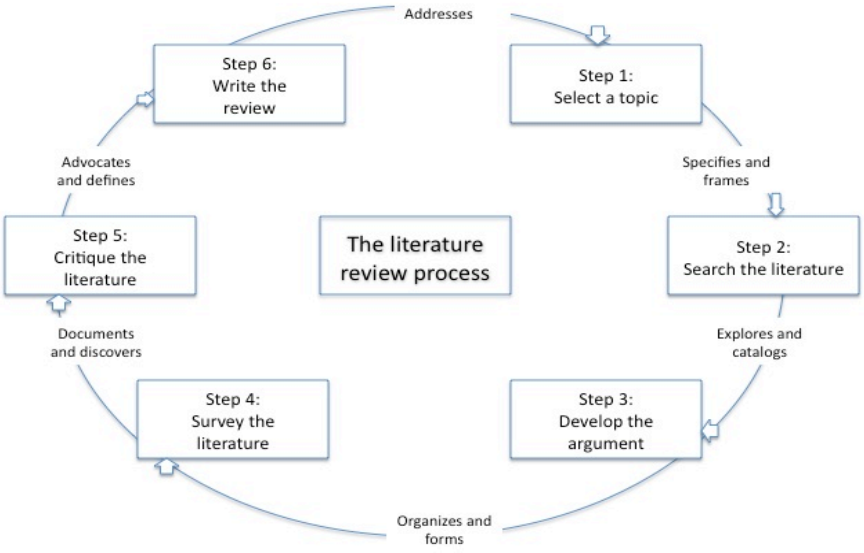

Figure 2.1. The literature review process (Machi & McEvoy, 2009)

According to Machi & McEvoy (2009), doing a literature review is an incremental process that has to be followed carefully to provide the topic selected with the proper argumentation. Figure 2.1. shows six steps that conforms the literature review process.

In the first step, it is necessary to identify a practical problem that is important to a specific discipline. In the second step, the literature search will determine the information that the document will have. During this second step it is important for the researcher to be able to skim through and get the important information out form them. It is also crucial for the researcher to be able to do good summaries about the topic selected. The third step, the development of the argument, is where the problem is presented and the author gives evidence of the acquired knowledge. During the fourth step the author needs to do a survey of the literature to be able to create a logical set of conclusions regarding the problem addressed. In the fifth step, the literature critique, the aim is to acquire the understanding of how the problem is addressed by the existing literature. Finally, in the sixth step, writing the review, the author communicates the research to others.

> *1.To review the literature on MCS and MACS aiming to analyze how these systems are involved in OI environments.*

One of the objectives of the Master Thesis is to review the literature on MCS and MACS aiming to analyze how these systems are involved in OI environments. The research method was done in three different stages; the first part of the literature review focused in management control systems and the definitions given by the authors that have studied them. Moreover, different authors classify the MCS in different subsystems according to their typology, their purpose and the results that can be obtained from each of them. The second stage of the literature review focuses on the open innovation paradigm. After Chesbrough (2033) introduced the concept of OI, several companies have successfully implemented the paradigm, redefining then the first definition that Chesbrough elaborated. Finally, the last part of the literature review focuses on the existing relationship between management accounting systems and open innovation, more specifically the formal systems that support open innovation. Even when the relationship is not theoretically very well defined, the actual relationship between MACS and OI can be outlined through different case studies.

All of the literature review was an interdisciplinary search with the use of the following databases: ABI, EBSCO, Elsevier Science Direct, Emerald and JSTOR during the period between the months of November 2012 and April 2013. During the review, different searches were conducted in each database. The aim of the first research was to focus on "management control systems" and also on "management accounting systems". It is noticeable how different authors treat both terms, thus it was mandatory to conduct a research on both terms to point out the difference. The second research focused on "open innovation". Finally, the third research focused on "open innovation" and "management accounting systems". The searches were not limited to particular sections of the articles (e.g. abstract, keywords, title). Hence, the results included various articles where the keywords only appeared in the reference list or in the description of the authors. Table 1 summarizes the results.

Table 1. Results of the literature review

Key words	ABI	EBSCO	ELSEVIER	EMERALD	GOOGLE SCHOLAR	JSTOR
Management Control Systems	28	27	15	17	8	7
Management Accounting Systems	19	15	12	12	5	9
Open Innovation	18	22	8	13	5	4
MACS and Open Innovation	13	13	2	9	1	0

Besides the articles, several books have been consulted, since both management accounting systems and management control systems are two concepts broadly studied by different authors and there are several books written regarding both concepts.

3. MANAGEMENT CONTROL SYSTEMS

The concept of MACS is a broad concept that can include several definitions and classifications, all depending on the author that defines them. But before defining MACS, it is better to start defining *accounting*, the general concept that includes all accounting systems.

Accounting is the central activity of any kind of organization, but probably because it is such a broad concept, it is difficult to define in a single sentence. The definition given by Glautier and Underdown (1991, p.3) can help to understand the concept: "*Accounting is the art of recording, classifying and summarizing in a significant manner and in terms of money, transactions, and events, which are, in part at least, of financial character, and interpreting the result there of.*" Weetman (2003, p. 450) provides with a shorter definition of what accounting is: "*Accounting is the process of identifying, measuring and communicating financial information about an entity to permit informed judgments and decisions by users of the information*".

Since accounting is such a broad term, it is common sense to have it divided into different categories. The branch of accounting that concerns the study of the present thesis is management accounting. Several authors provide definitions of what management accounting is, as Atkinson et al. (2004, p. 3) states, the Institute of Management Accounting Information defines management accounting as: "*A value-adding continuous improvement process of planning, designing, measuring, and operating both nonfinancial information systems and financial information systems that guides management action, motivates behavior, and supports and creates the cultural values necessary to achieve an organization's strategic, tactical, and operating objectives*." Management accounting tries to help and meet the specific decision-making needed at all levels of the organization; it also provides measures to assess the economic performance of its units, as for example its departments or its business units.

While management accounting is the process of planning, designing, measuring and operating, management accounting systems are the tangible tools to actually measure

the performance of the company by providing information to both, managers and employees within the organization (Atkinson et al., 2004). On the other hand financial accounting provides economic information to organizations and individuals outside it that are external to the direct operations of the company such as stakeholders or creditors (Atkinson et al. 2004, p. 4). By the previous definition it can be seen that management accounting then, can be divided into two differentiated branches, as Drury (2004) states: external or financial accounting and internal or management accounting. Figure 3.1 illustrates the relationship between the concepts previously discussed.

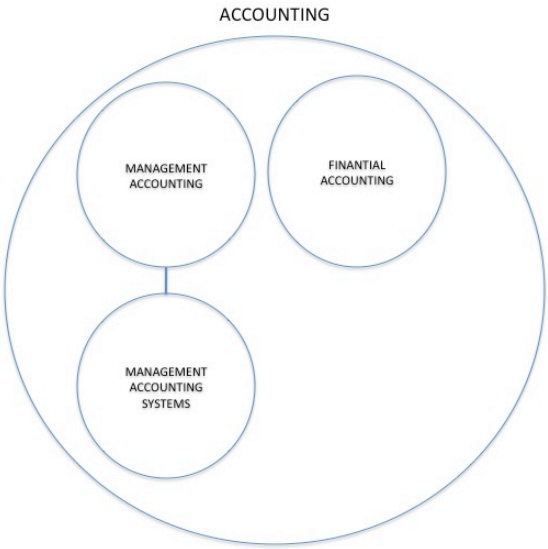

Figure 3.1. Accounting and its relationship with other systems.

Horngren et al. (1999, p. 6) provides a more specific definition of management accounting. The author states that management accounting requires the identification, generation, presentation, interpretation and use of information relevant to formulating different activities such as business strategy, planning and controlling activities, decision making, efficient resource usage, performance improvement and value enhancement, safeguarding tangible and intangible assets and finally, corporate governance and internal control.

According to Atkinson et al. (2004, p. 283), there is a bigger group than the management accounting systems (MACS), which is known as *management control systems* (MCS). Simons (1995, p.5) adopts the following definition of management control systems: ”*management control systems are the formal, informational-based*

routines and procedures managers use to maintain or alter patters in organizational activities". Formal routines include plans, budgets and market share monitoring systems. The patters of the organizational activities Simons refers to include goal-oriented activities as well as unanticipated innovation. In-line with Simons' definition, Atkinson et al (2004, p.283) defines MCS as the larger entity of central performance measurement systems. According to the authors, they play an important role within the organization in helping the decision makers to determine if the different strategies coming from the three levels of the organization are aligned in the same direction and under the same common objective. The three levels of the organization that have to be aligned are: the organization level, the business level and the operational level. Figure 3.2. shows the relationship of MCS with the accounting, management systems and MACS.

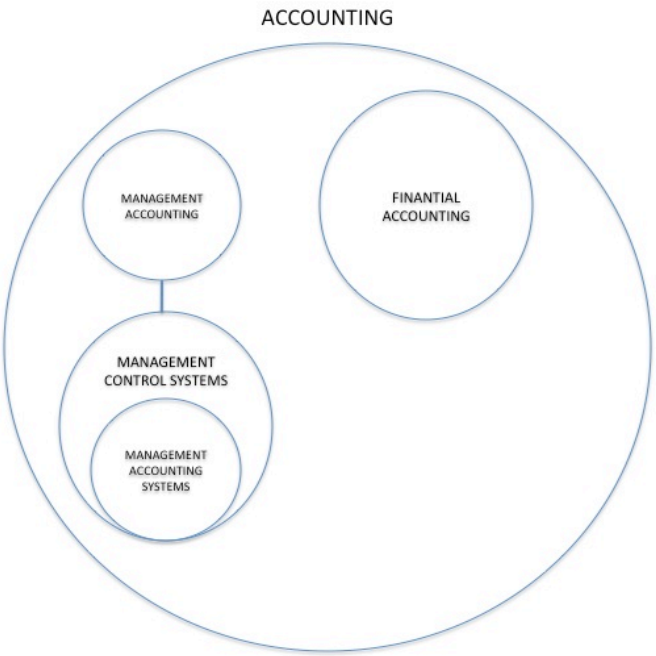

Figure 3.2. Accounting and its relationship with MACS.

Atkinson et al. (2004, p. 283) use the term *control* within the management accounting and control systems to define the group of tools, procedures, measures used to analyze the performance of the company and systems that organizations use to guide and motivate all employees to achieve the objectives that the organization has established. Consequently, any tool that the company uses to achieve an objective that is aligned with the main objectives of the organization is in control. On the contrary, a system is

out of control when the outcome of it is not aligned with the objectives of the organization. With independence of the task a company does, there are five stages that conforms a process of keeping the organization in control. Figure 3.3. outlines the process of control.

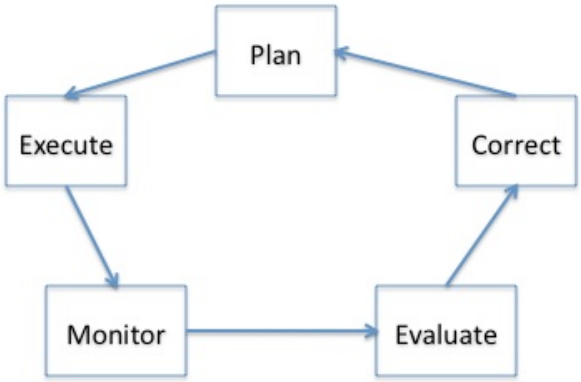

Figure 3.3. The cycle of control (Atkinson et al. 2004, p. 284)

The first stage planning, aims to develop the objectives of the organization. To reach them, it is important to outline the activities that allow reaching the objectives as well as measurement performance tools to be able to get a feedback afterwards. During the second stage, on the execution the plan outlined is implemented following the previous guidelines. During the third stage, the monitoring is when the whole process and activities planned should be measured. The evaluations of these metrics are done in the fourth stage, to determine the actual level of performance of the system. This is the moment when to determine if there is the need to introduce any possible change in case there is a deviation from the original plan. Finally, the fifth step consists on correcting the necessary processes to bring back the system to an in-control state.

3.1. Difference between MCS and MACS

During the previous section, the relationship between the two concepts has been briefly explained. Nevertheless, due to the different definitions authors give about management control systems (from now on, the concept will be referred to as MCS) and management accounting systems (from now on MACS) it is important to clearly define the relationship between these.

When reviewing different definitions of MCS and MACS, some authors define what management accounting systems are but then they provide the elements of management control systems, consequently making their distinction difficult to understand.

On the other hand there are other authors as Chenhall (2003), makes the difference between them clear by describing management accounting systems as the systematic use of management accounting (collection of practices that includes, for instance, budgeting or product costing), to achieve some organizational goal. Chenhall (2003) agrees with Cunningham (1992) in defining management control systems as a broader term of management accounting systems that includes other controls such as personal and clan controls. The relationship between MACS and MCS given by Chenhall is illustrated in Figure 3.4.

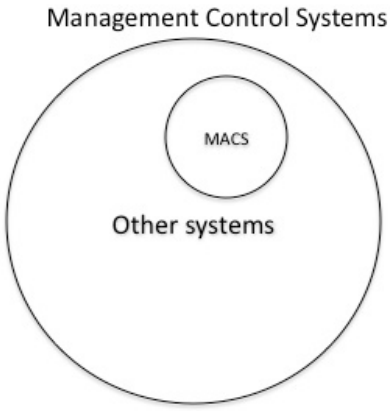

Figure 3.4. Relationship between management control systems and management accounting systems given by Chenhall (2003).

Horngren et al. (1999, p.611) establish the same kind of relationship between MACS and MCS. Horngren et al. (1999) consider MCS as the largest classification that gathers all the other systems. MCS is divided into two different kinds of components: formal and informal components. Formal MCS include all of the explicit rules of an organization, as well as the procedures, performance measures and incentive plans that helps managers and guide their behavior as well as their employees behavior.

The formal control system is also divided itself into different systems. One of them is the management accounting system, which provides cost, revenues and income information. Formal control systems also include the human resource system (in charge of providing information about the recruiting process, the training of the employee, their absenteeism and accidents) and the quality systems (with important information about defects, rework, late deliveries to customers and so on).

The informal control system includes all of the existing relationships that can be established between employees and between the employee and the company, such as shared values, loyalties and mutual commitments among members and the unwritten norms that are well accepted by all members of the organization.

The classification given by Horngren et al. (1999) can be graphically depicted in Figure 3.5.

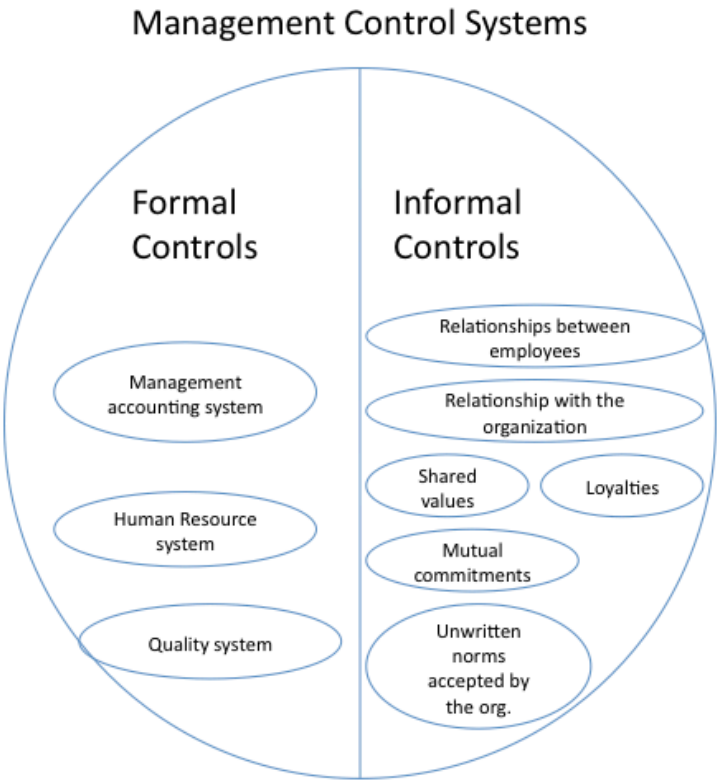

Figure 3.5. Relationship between management control systems and management accounting systems given by Horngren et al. (1999).

As stated previously, depending on each author, they provide different definitions for MCS and include different subsystems that are part of MCS. Authors even differ from each other with respect to the purposes of MCS.

Nevertheless, in the present study, the convention used is the definition of MACS as an integral part of MCS that Cunningham (1992) states. More specifically, in the study, the purposes of MCS are related with output or administrative controls, due to their nature of controlling the outputs, specifically in the budgeting process.

It is important to mention that not all MACS are an integral part of MCS, which will be explained later on this study. Since MCS can involve so many different concepts, the following subchapters cover a review through the different authors that deal with the definition of MCS.

3.2. Management Control Systems

3.2.1. MCS: output controls and behavior controls

According to Cunningham (1992), "*management control systems represent the techniques and mechanisms which companies use to pursue objectives, accomplish goals and successfully follow strategies*". MCS have different purposes, including integration, motivation, support on decision-making, communication of objectives or feedback provisioning. MCS can be divided into two different categories: output controls and behavior controls.

Output controls measure outcomes as profit or budget. Administrative controls (which are part of the output controls), involve formal rules, procedures and manuals. On the other hand, behavior controls also involve personnel and social controls. The behavioral types of systems include shared values and norms, and the group interaction to keep them alive. Both systems are not mutually exclusive; they can also complement each other (Cunningham, 1992). This classification of MCS given by Cunningham (1992) is shown by Figure 3.6.

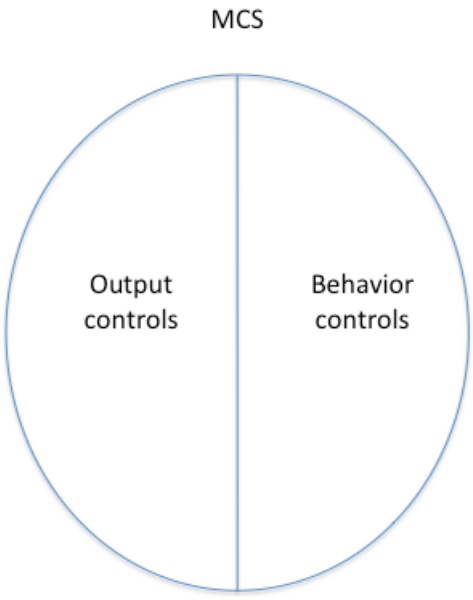

Figure 3.6. Classification of MCS by Cunningham (1992).

3.2.2. Dimensions of MCS

Chenhall et al. (2011) investigate three dimensions of MCS, social networking, organic innovative culture and formal controls. Those three dimensions conform a package of control. Malmi and Brown (2008) introduced the idea of MCS as a package first as a response to the call to study packages of controls when investigating the role of MCS in business.

Throughout the study that Chenhall et al. (2011) carry out, they describe first, social networking as the way the organization manage their relationships with outside organisms, focusing primarily on personal and socials connections. The relationships established between two organizations are meant to be long-term relationships and based on mutual trust. Secondly, the authors refer to organic innovative cultures as the informal processes that have the sufficient mechanisms to enable an open and flexible communication within the organization. Finally, Chenhall et al. (2011) refer to formal controls as the controls for planning and controlling. Formal controls include mechanisms such as budgets and variance analysis, costing, and investment appraisal techniques. Figure 3.7 shows the three dimensions of MCS given by Chenhall et al. (2011)

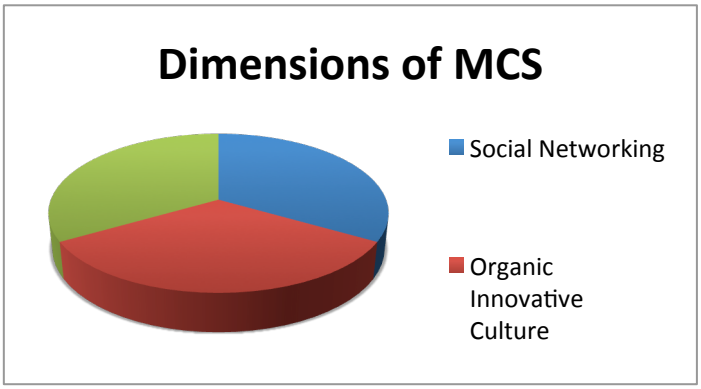

Figure 3.7. Dimensions of Management Control Systems

According to the definition provided by Chenhall et al. (2011), the dimensions of MCS can be divided into the mechanisms that enable communication to and from outside the company (social networking) and the internal communication (organic innovative

culture), defining in that way all possible relationships that a company can have. The third dimension, as seen before, has the purpose to manage internal controls (formal controls).

3.2.3. MCS as a package

Malmi and Brown (2008) define MCSs as a package as a collection or set of controls and control systems. There are five groups of controls systems that can be considered to be part of the MCS defined by the authors as a package, which are: planning, cybernetic, reward and compensation, administrative and cultural controls. The controls are classified due to the purpose they have, either decision-making or control systems. The classification addresses the controls that managers usually need to direct employee behavior.

As a difference with MCS as a package, Malmi and Brown (2008) define individual controls as the controls that are considered to be more classic controls. These controls are usually the ones, which focus in accounting systems, such as budgets and financial measurements. Also included in this group are administrative and socially based controls, which include values and organizational culture.

As the authors define, the individual controls are the ones that are more traditional accounting controls. As can be noticed from the definition before, they include budgets, financial measurements, administrative and socially based controls. Since MCS need to operate in conjunction with other MCS, they have to be studied as a whole; nevertheless it comes along with some problems, as for example the difficulty to recognize the links between MCS. Much of the management accounting studies have been done in the accounting-based control field, focusing on formal systems. Consequently, there is a lack of understanding of how other controls influence each other. Malmi and Brown (2008) emphasize the importance to study more deeply MCS as a package in order to take full advantage of them when supporting company objectives and driving organizational performance.

Although the benefits of studying MCS as a package are high, they also bring some challenges, for instance, to establish the limit between MCS and information/decision support; to define the components of a MCS package; and the difficulty in studying

empirically MCS as a package due to their size and complexity. In Figure 3.8, it can be seen the classification of MCS package.

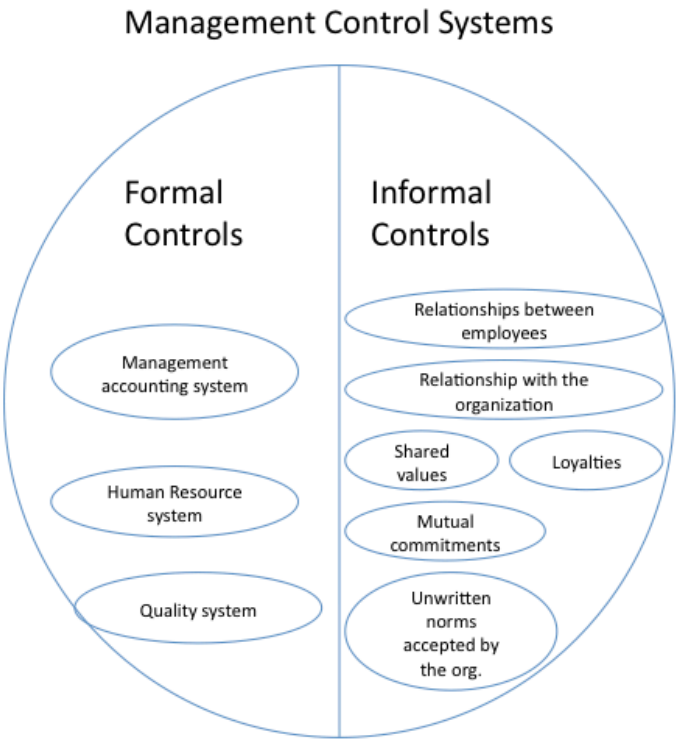

Figure 3.8. Management control system package (Malmi and Brown, 2003)

3.2.4. Formal and Informal components of MCS

Horngren et al. (1999) defines a management control system as "*a means of gathering and using information to aid and coordinate the process of making planning and control decisions throughout the organization and to guide employee behavior. The goal of the system is to improve the collective decisions within an organization.* "

Besides the definition that Horngren et al. (1999) provides on his book, the author also defines the two main kinds of components that MCS can be divided into: formal and informal systems. The formal components include the written rules existing within a company, the procedures, performance measures, as well as the incentive plans that motivate managers and employees behavior towards the company. According to the author, formal systems are composed of a series of systems; parts of those systems are management accounting systems, human resource systems or quality systems.

Horngren et al. (1999) states that management accounting systems are in charge of providing information on costs, revenues and income. On the other hand, human resource systems provide information related to the personnel of the company as the recruiting process, training programs, holidays, or absenteeism. Quality systems manage information of the defects, bugs or problems in deliveries of the company products or services.

Unlike the formal systems, informal systems include those non-written rules, behaviors, and values that are shared among the members of the company and accepted as best practices to follow in that specific company. Informal systems change from one company to another and are built along the years of company activity while formal systems can be the same from one company to another (Horngren et al., 1999).

The systems described before helps managers and employees to be able to develop successfully the activity of the company. For doing that, Horngren et al. (1999) describes different levels of information required to work with management control systems:

- Total organization level
- Customer/market level
- Individual-facility level
- Individual-activity level

An important aspect to take into account with management control systems to be effective is that, whichever is the management control system selected by the company, it should be aligned to the organizations' strategies and goals. The author also states that they should be designed to fit the organization's structure and the decision-making of managers. When management control systems are effectively used in an organization, they help to motivate human resources of the company, which turns in better and more effective activities of the company.

3.2.5. MCS as tool for implementing business strategies

Similarly to Horngren et al. (1999), Simons (1995, p-19) states that MCS are tools for implementing business strategies. This assumption from Simons is taken from the

definitions of management control that Anthony and Govindarajan (1995) gives as the "*process by which managers influence other members of the organization to implement the organization's strategies.*" Lorange et al. (1986, p.19) define a strategic control system as a "*system to support managers in assessing the relevance of the organization's strategy to its progress in the accomplishment of its goals and, where discrepancies exist, to support areas needing attention.*" The second assumption is that strategy for action is a top-down process.

According to Simons (1995) there are inherent tensions inside a company. These tensions appear when the needs of one aspect of the company influences negatively to other aspect of the company. Simons (1995) define three types of tension that occur between:

1) Unlimited opportunity and limited attention
2) Intended and emergent strategy, and
3) Self-interest and the desire to contribute

To be able to balance the tensions between the previous aspects, Simons (1995) suggests to the use of control systems from the management point of view. According to Simons (1995) management control systems play an important role in the process of overcoming organizational blocks. MCS can be use to the following:

- To specify the business strategy of the company, reducing the risk of pressure.
- To build and support the evolutionary purposes of the company.
- To inspire and motivate employees to look for new opportunities and challenges on the market.
- To trigger an organizational change, so stakeholders of a company are open to new business concepts.

According to Simons (1995), using control systems mean that they will help to implement the plan of the company. Furthermore, control systems help to manage the existing problems between creative innovation and the achievement of the goals of the organization, so both are transformed into profitable growth. To implement the strategy, it is necessary to give employees the freedom to innovate but at the same time, managers must know that individuals are working productively towards the predefined goals.

Simons (1995) define four kinds of systems to deal with the tensions that arise in a company. The systems are: belief systems, boundary systems, diagnostic systems, and interactive control systems. Belief and interactive systems define the possibilities of expansion that a company has. Boundary and diagnostic systems focus on the company strategic domains and opportunities.

3.3. Management Accounting Systems

MACS have been explained briefly on the previous sections as a fundamental part of formal controls within the MCS. Authors as Horgren et al. (1999), Chenhall (2003) or Atkinson et al. (2004) describe MACS as an integral part of MCS, being part of their formal controls. Nevertheless below, the reader may find some definitions that different authors provided for the concept of MACS.

3.3.1. Definitions of MACS

MACS are normally used as sources of information for evaluating the performance of the company, in terms of employee performance due to the fact that they are the main source of formal information in business organizations. For that purpose companies use accounting numbers (Penno, 1990). According to the author, MACS measure the company financial information, recording costs, revenues and all kind of physical quantities needed for financial evaluation.

As Penno (1990) describes, financial performance in a company can come from direct or indirect activities. An indirect activity is an activity that is required by the company to make sales but it does not influence revenues of the company once the activity is done. On the other hand, direct activities, are the ones that influence the production and sales of the company as well as the revenue of it.

According to Chenhall (1999, p.2), traditional MACS include different techniques and tools such as traditional volume-based costing systems, budgeting, variance analysis and responsibility accounting.

Chenhall et al. (2011) also includes management accounting practices into the formal controls of MCS that are important to innovation. Those practices help in planning relevant activities to the company as investment appraisal techniques or activity-based costing methodologies. Activities as budgeting, production scheduling and controlling

(both quality and inventory), internal auditing and performance appraisal are on the scope of MACS.

Busco and Scapens (2011) align their discussion of MACs with the idea stated previously that accounting systems help and enhance the activities needed to align business processes with corporate strategies. By using those systems align with the business strategy, they help the company to continuously evolve and transform their processes.

Cunningham (1992) describes MACS as an integral part of management controls systems. Management accounting is traditionally associated with output or administrative controls due to the importance they give to the output, specially in terms of finances.

MACS have been supporting financial activities from ancient times, and consequently it has evolved over the years to adapt the systems to the real need organizations present. Some innovations that have been introduced to management accounting systems in the last decades is activity-based costing (ABC) techniques, just in time (JIT) technology, total quality management (TQM) or business process reengineering (BPR) among others (Sisaye and Birnberg, 2010).

3.3.2. MACS and their interaction with cultural change

Busco and Scapens (2011) support in their investigation that accounting systems evolve over time to contribute to the ongoing creation and redefinition of organizational culture. When leaders in companies envision the mission and strategy of the company, they have to translate their vision into specific goals and their associated performance measures to communicate it to the whole organization. For that purpose, managers rely on performance measurement systems, which comprise traditional financial measurements systems along with modern financial techniques, which bring up the idea that MACS play an important role on organizational culture changes. As discussed by other authors, MACS gives support to organizational change, by providing with organizational, monitoring and management techniques.

According to Busco and Scapens (2011) accounting systems are usually based on taken for granted assumptions that, when shared throughout the organization, accounting

systems can provide a way of coping with processes of organizational learning and change.

3.3.3. MACS in an Environment of Change

Chenhall (1999, p. 1-2) explains that the effectiveness of traditional management accounting systems fails when they come to play in fast changing environments. When these systems are needed to reduce costs and improve productivity, instead of helping with the tasks, they distract their attention from more relevant factors. MACS have been modified and new techniques developed to focus on supporting strategic activities and changes in process and structures. The new techniques, as stated before, include activity-based costing and activity-based management, strategic performance measurement systems, benchmarking and value-chain analysis. The most dramatic changes have been in activity-based costing (ABC) and activity-based management (ABM), which have changed their approach from techniques mainly focused on developing accurate products costs to include also nonmanufacturing costs, analysis of the most profitable customers, product groups or distribution networks and channels. ABM on the other hand, has been used for cost management and to enhance competitive advantage through the analysis of cost drivers and activities, and the development of activity-based performance measures (Chenhall, 1999, p. 1-2).

There are examples of companies, as manufacturing ones, which face high levels of competition and thus, their activities are required to be highly efficient to face the innovations of other global competitors. Global markets force companies to operate with customers that require high quality at low prices. Many companies have responded to that competitive environment by introducing new management practices such as just-in-time (JM) systems or total quality management (TQM) (Chenhall, 1999, p. 1-2).

3.3.4. Elements of MACS

According to Horngren et al. (1999) MCS are divided into two main separate functions: planning and control. Planning is defined by the authors as the activity where to choose the goals of the company, predict the results that would be obtained through the different ways of achieving the goals and then to decide how to achieve these goals.

Control covers the action that implements the planning decision and also deciding on performance evaluation and the related feedback that will help future decision-making.

The planning and control activities within an organization are supported by different management accounting systems, as can be seen in Figure 3.9 (Horngren et al., 1999).

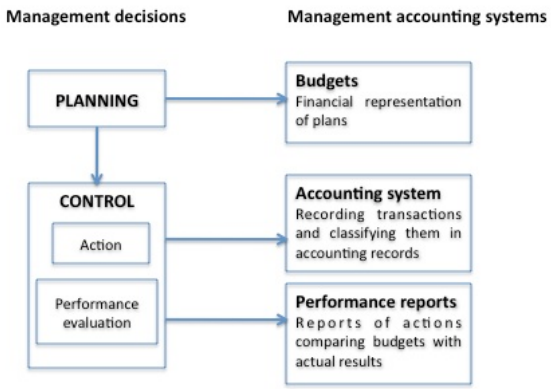

Figure 3.9 Elements of MACS (modified from Horngren et al., 1999 p. 9)

4. OPEN INNOVATION

When talking about OI, there is one author that can be considered to be the father of it, Henry Chesbrough. Chesbrough coined the term of Open Innovation back in 2003 and after that, he has been publishing several books articles, giving conferences, and interviews about the topic.

In order to understand the concept, Chesbrough (2003) stated "*The Open Innovation paradigm assumes that firms can and should use external as well as internal ideas, and internal and external paths to market, as they look to advance their technology. Open Innovation assumes that internal ideas can also be taken to market through external channels, outside a firm's current business, to generate additional value*."

Innovations have been traditionally considered as internally investing on research and development to try to discover new ways of doing things. If an innovation was not invented within the boundaries of the company, then the innovation was not considered to be good enough for the company to implement. However, not all resources that companies invest produce something useful for them, bring some benefits or even get back some of the resources invested.

Usually companies produce innovations that they just simply do not know what to do with. Those innovations are left beside on a shelf within the company and do not produce any benefit at all to the company in years, or maybe they never produce any benefit at all.

The traditional or classical innovation is coined by Chesbrough (2003) as close innovation. That model is the old model of innovation, where firms followed the philosophy that successful innovation required control. That means that companies must generate their own ideas that they would then develop, manufactures, market, distribute and service themselves. This way they follow the principle that "*if you want something done right, you've got to do it yourself*." Figure 4.1 depicts the model of what Chesbrough (2003) considered close innovation.

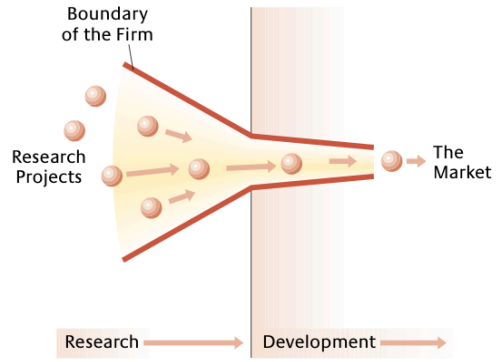

Figure 4.1 The Closed Innovation Model (Chesbrough 2003, p. 36)

On the basics of the close innovation model, companies consider that the smartest people have to work in their company. When someone is considered to be good in a job, in public institutions (such as universities or research centers), companies try to persuade these people to be part of their company. That way, a company would follow the rule that if they have the smartest people working for them, they would have more chances of discovering an innovation first and consequently, getting into the market the first ones as market leaders.

According to Chesbrough (2003), the Intellectual Property (IP) of a company consists on the ideas that are generated in the company by the employees. It is believed that the smartest and brightest people are the ones who have the best ideas, consequently these people contribute further to the IP of the company. IP is considered to be a high valuable asset of the company that has to be kept fiercely within the boundaries of the company.

Another characteristic of close innovation companies is that when a company gets into the market first, companies consider that they are winning, that the main objective was to get to the market first with the best ideas on the market. Also the objective of companies following the close innovation model is to generate as much ideas as possible. That means that the more ideas the company has, the more possibilities it will have to produce at least one brilliant idea that brings them an innovation that no other company has. Yet the innovation would allow the company to go into the market first and become market leader.

For an innovation to be considered profitable from the R&D point of view, companies have to take part of the whole process, from having the right people (as explained before) to discovering, developing and shipping the innovation. Otherwise, the company would consider that the profit that the innovation generates is not a complete success.

All the principles that characterized companies following the old way of innovation are summarized following by Table 2.

Table 2. Principles of Closed Innovation (Chesbrough 2003, p. 38)

Close Innovation Principles
The smart people in the field, work for the company.
To profit from R&D, a company must take part of the whole process.
If a company discovers and innovation first, they will be the firsts to get to the market.
If a company is the first to commercialize an innovation, they will win.
By creating the most and best ideas in the industry, the company wins.
Intellectual Property (IP) should be controlled to avoid competitor's profit from it.

On the other hand, there are companies that even when knowing the tools or procedures that they would need in order to solve any problem that they are facing, they do not count with enough resources to invest on research to get the innovation that would solve their problem (Chesbrough, 2003).

Traditionally, companies did not consider other possibilities of what to do with innovation that were not useful for them, such as selling the unused innovation to other companies, helping those companies with fewer resources for innovation to be able to solve their problem (Chesbrough, 2003).

According to Chesbrough (2003) in the new model of OI, firms commercialize external (as well as internal) ideas by deploying outside (as well as in-house) pathways to the market. Specifically, companies can commercialize internal ideas through channels outside of their current businesses in order to generate value for the organization. In

addition, ideas can also be originated outside the firm's own labs and be brought inside for commercialization. That means that the boundary between a firm and its surroundings is more porous, enabling innovation to move easily between the two. Figure 4.2 shows how the open innovation model means, in contrast to the close innovation model showed in Figure 4.2.

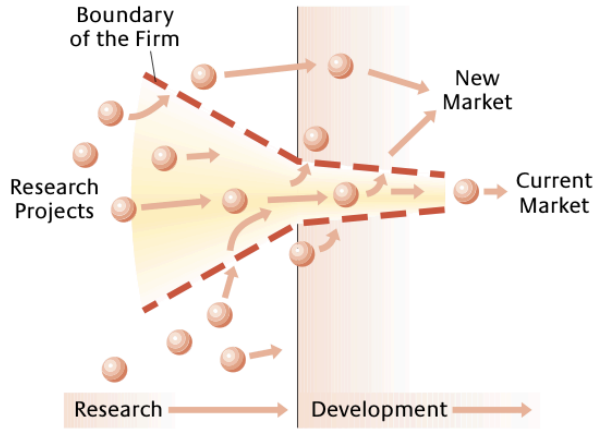

Figure 4.2. The Open Innovation Model (Chesbrough 2003, p. 37)

On the OI model, one of the principles that it follows it the fact that not all of the smartest people of a field work together for the company. That means that companies have to look for outside expertise to find the brightest people (Chesbrough, 2003).

But not only external R&D can provide the company with significant value; it is also necessary to contribute with the R&D and to have some internal know-how to be able to handle the R&D coming from the outside and adapt it to the internal needs of the company. Following that principle, it is understandable that companies do not find it necessary for the innovation to be created indoors to be profitable for the company. Yet, it is important for companies to make the best use of internal as well as external ideas. The join of both ideas is what make the company get the best of them and enjoy a win situation (Chesbrough, 2003).

Chesbrough (2003) states that the objective of a company that follows the open innovation model is to have better business model rather than to get to the market first. Getting into the market first, gives the company the competitive advantage of being the

market leader, nevertheless, companies can enjoy from the mistakes that market leaders do by being the followers and creating better products, services or offering the customer more attractive choices.

One of the very basic principles of the open innovation model is the exchange of IP, that means that the win-win situation is the one in which a company profits from the external use by other companies of the internal IP. Also, a company should buy or acquire other's IP whenever it is necessary to benefit their business model (Chesbrough, 2003).

All the previous characteristics typical from the open innovation model are summarized in Table 3.

Table 3. Principles of Open Innovation (Chesbrough 2003, p. 38)

Open Innovation Principles
Not all the smartest people work the company, so the company must find and tap into the knowledge and expertise of bright individuals outside the company.
External R&D can create significant value; internal R&D is needed to claim some portion of that value.
A company does not have to originate the research in order to profit from it.
Building a better business model is better than getting to market first.
By making the best use of internal and external ideas, a company wins.
A company should profit from others' use of their IP, and they should buy other's IP whenever it advances their own business model.

To be able to make a comparison between close and open innovation model, Table 4 shows the contrasting principles of both of them. It can be seen how the principles are completely the opposite from one model to the other. That way it is relatively easy to realize when a company is following the close innovation model or the open one.

Table 4. Contrasting Principles of Close and Open Innovation (Adaptation of Chesbrough 2003, p. 38)

Close Innovation Principles	Open Innovation Principles
The smart people in the fieldwork for the company.	Not all the smartest people work the company, so the company must find and tap into the knowledge and expertise of bright individuals outside the company.
To profit from R&D, a company must take part of the whole process.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If a company discovers and innovation first, they will be the firsts to get to the market.	A company does not have to originate the research in order to profit from it.
By creating the most and best ideas in the industry, the company wins.	Building a better business model is better than getting to market first.
By creating the most and best ideas in the industry, the company wins.	By making the best use of internal and external ideas, a company wins.
Intellectual Property (IP) should be controlled to avoid competitors profit from it.	A company should profit from others' use of their IP, and they should buy other's IP whenever it advances their own business model.

Chesbrough (2004) states how firms are currently changing the way they manage innovation. Knowledge coming from external sources is more prominent, while external channels to market also offer a great promise.

Today, the former leading industrial companies are facing strong competition coming from many newer companies, with little or no basic research of their own. These companies have been very innovative with the discoveries that others have done. Some companies making big investments in research find that some of the resulting output, even when brilliant, is not useful for them. Some of these works have been moved away

from the company turning into very promising and valuable projects in an external company. According to Chesbrough (2004), when new sources of technology are included into a company's innovation process, it increases the number of possible sources of innovation.

4.1. OI Technical and Market Uncertainty Problem

When a company develops their strategy on a market they know, with a technology they perfectly control, it is easier to know how to face competitors and the possibilities they have in the market. Chesbrough (2004) citates Jim McGroddy, the former head of IBM'S Watson Research Center who once stated, "*when a company is targeting their technology in their current business they know which the technology they are handling is, what they can do with it and what not. They know what their competitors are going to do, and they know what their customers need. The movements have to be planned well in advanced to be able to win*". But when a company is entering new markets, the game they play is absolutely different.

Continuing with Chesbrough (2004), the author states that when a new technology faces a market, it involves managing technical and market uncertainty, because resolving the technical uncertainty depends on which market the technology is intended to serve. A firm then, must experiment, adapt and adjust in response to early feedback. The author introduces the metaphor of poker, which according to him perfectly suits the conditions of high technical and market uncertainty.

When playing poker, as well as when facing technical and market uncertainties, there is a possibility that Chesbrough (2004) calls *false negatives,* which is the case when a project looks unpromising from the very beginning due to the lack of fit with the company's business model. In the end, contrary to any prediction, the project turns out to be commercially valuable.

In these situations of false negatives, companies must develop a second process for managing innovation, a process that the author compares with playing poker. In that situation, a company must adapt and adjust the habits, procedures and some other measures as new information arrives. A company has to take into account that resources emerge over time, so they can be used to adjust and adapt to the new upcoming situations. But companies must be aware of the resources, they emerge over time, or can

also dissapear. Competitors' resources and opportunities are available for almost everyone. Therefore a company must be aware that new resources are as well available for competitors.

When entering into new markets, not all the information is known beforehand, decisions have to be taken during the course of events and money have to be continuously spent (Chesbrough, 2004).

When companies face the false negatives (having the feeling of just negative projects), before forgetting the idea of the project, one approach that they can do is to out-license the rejected project, which allows another firms to use the ideas and see if they are valuable. This gives the original company additional funding that otherwise would not get by leaving the project apart. On the other hand, it also gives the original company the possibility to see and learn from the experience of the licensee (Chesbroug, 2004).

Forming an external spin-off venture is another possibility that Chesbrough (2004) proposes. If the venture becomes profitable, the equity owned by the originating firm may become valuable. Besides, spin-offs allow a company to make new learning to happen.

4.2. Managing OI

Chesbrough (2004) continues explaining the differences between a close innovation model and an open innovation one, but when it comes to terms of managing it. When a company has the possibility of handling any false negative, is when they have to vary their metrics for managing innovation. These conditions will help companies to be in new uncertain markets with high technical requirements; yet it is possible for companies to continue doing businesses in normal and stable situations.

When using new metrics for managing the open innovation, there are more options for future businesses. Also, it is possible to extend the market segmentation of the company and get into a new business model. The metrics to manage innovation are different and diverse, as Chesbrough (2004) explains in his study carried out at the Industrial Research Institute's Spring Meeting in May 2003.

There are some metrics that focus their management attention on the outputs of the OI process, even when the growth comes from sales or from licensing activities. On these

metrics, companies check the percentage of their products and services that come from external technology licenses. Companies also check the percentage of the net income from the previous year that come from technology licensed out to other companies when using this metric.

Another metric to use is the one than calculates the time-to-market for new products and services. This time to market is the rate of learning from R&D for the company and increased the productivity and effectiveness of R&D.

On the workshop discussed by Chesbrough (2004), there was no useful metric to detect false negatives, since once the decision of rejecting a project was taken, there were no more resources invested in tracking how or which was the eventual outcome of the project. Nevertheless, there are companies than even when not detecting false negatives, they were actually using metrics to try to find false negatives by focusing on recording the incident and building a tracking system to follow them after the initial decision to terminate further support. Other variant of the metrics evaluating false negatives is to evaluate if the project really deserves founding or those should be terminated.

As Chesbrough (2004) argues, when a project continues and makes further progress that exceeds expectations, there is the need to re-assess technical and market potential of the project. In this situation, the company should suspect that a false negative might exist.

4.3. Challengues of OI

Throughout the present chapter, it has been stated the benefits of OI, the differences with the old way of doing innovation, how to manage it and which metrics fit better each specific purpose of a company. Nevertheless, it is easy to start thinking that when competitiveness, money, market leaders, win situation and competitor come to play, the game is not that simple. OI has a vast number of benefits and ways to help companies but it also has challenges that companies have to deal with.

López and García (2003) identify in their article two main problems that companies have to face when dealing with OI: coordination and incentive problems.

4.3.1. Coordination Problems in OI

After talking about what the OI is, it is easy to image the problems that may arise from a company's point of view when trying to coordinate internal efforts to do R&D with external efforts to license a technology trying to avoid the problem of loosing IP. López and García (2003) state that coordination implies the design of mechanisms to enable the existing relationships between the activities of the company with different firms and organizations for innovation. Coordination also implies searching and selecting ideas, and knowledge collaboration for carry out the innovation activities. According to the authors, coordination presents three main problems:

1. The problem of searching valuable ideas outside the company.
2. The problem of networking.
3. The problem of divergence.

The first problem is the problem with the increase of costs that searching for ideas produce. Valuable ideas can be found outside the boundaries of the company, but there are a lot of resources that have to be invested to find them. The costs are variable depending on the type and nature of the innovation process, having higher costs when the innovation is more complex.

The second problem involves the coordination of companies when several organizations come to play. The coordination of tasks and the development of a good networking environment is complex due to the high number of participants.

Different participants also carry the problem that each of them has different objectives and aim different things with the networking. This leads to the third problem: the problem of divergence. An open product means that there will be some parts that are provided by third party companies, each of them looking for their own interest. Thus, openness can generate costs of suboptimal coordination due to divergent objectives of firms (López and García, 2003).

Even when there are problems of coordination, López and García (2003) claim that those measures have to be undertaken, since the lack of it, or even the failure in the coordination tasks can cause incalculable loses for the companies involved. It has to be taken into account that the bigger the project is, the bigger the coordination must be.

4.3.2. Incentive Problems in OI

According to López and García (2003), the main problems inside the incentive problems usually come from the opportunistic behavior from people from inside and outside the companies. The opportunistic behavior has to do with the attitude some people show towards the ideas and knowledge management of innovation. Some times their attitude seems to be selfish or overprotected towards an innovation, not allowing completely other companies to collaborate with the innovation. Other times it has to do with the outsiders' behavior, trying to take advantage or the innovation as unique authors themselves. These attitudes may affect negatively the creation of innvation and the generation of ideas.

López and García (2003) classify four main problems that may arise within the incentive problems:

1. The problem of left ideas inside the firm.
2. The problem of revelation (economic formation).
3. The problem of team production.
4. The problem of commercialization/exploitation.

The first of the problems occur when there valuable ideas inside the company that are left inside the company without taking them further to the market, favoring meanwhile other ideas. These left-aside ideas could be developed by some employees or even by some external companies, which sometimes may become competitors of the original company.

The problem of revelation has to do with the amount of information shared to other companies. IP cannot be completely shared with potential customers or with partner companies. By sharing all the information, a company is changing an asset into a something public without any kind of compensation. Moreover, what is even more dangerous is the possibility for other companies or employees (either internal or external) to get to be the competitors of the first company. One way of losing or sharing IP without even noticing is the movement of employees from company to company. Sometimes employees are forced to sign contracts that explicitly forbid employees to share personal information related with the company; or even employees are forbidden

the possibility to work for another company of the same sector in some year's time after working for a first company that develops their business model in the same field.

The third problem is the problem of team production. When working in a team it is difficult to measure the contribution of each participant for the overall solution. This may lead to the problem of some participants doing too much while other do not collaborate enough, gaining the benefits of the final product as their own. It is a difficult thing to measure, which could be solved by using proper management systems that adapt to each specific situation. Also, motivation incentives should be taken into account if companies are to avoid free riders.

The fourth and last problem that López and García (2003) define in their article is the problem of who commercializes and exploits the innovation. In OI environments, there is the possibility of exploit property rights by other firms that can damage the IP of the firm. If the buyer's use of IP is for competing in the same market as the licensing firm, this can produce a reduction of the benefits. Chesbrough (2006) also claims that OI may raise a problem of imitation and devaluation of ideas that is not beneficial at all for the companies. Thus, firms must take care of that and manage the IP properly.

In order to solve the problems mentioned above, companies have to use different systems to control people involved in the projects. IP also needs to be taken care as well so to be able to establish a situation in which all participants in the innovation process will benefit and gain get something out of the relationship.

To sum up the challenges discussed throughout the section, Table 5 shows the three problems López and García (2003) include within the coordination problems as well as the four problems within the classification of incentive problems.

Table 5. Challenges of OI

Coordination Problems	Incentive Problems
The problems of searching valuable ideas outside the company	The problem of left ideas inside the firm
The problem of networking	The problem of revelation
The problem of divergence	The problem of team production
	The problem of commercialization/exploitation

4.4. Paradoxical tensions in OI networks

According to Jarvenpaa and Wernick (2011), OI has become a way to invest in potential markets. The OI paradigm implies a way to exchange ideas, resources and individuals in and out of the organization.

Innovative networks gather together within the same environment rival companies, suppliers, customers, and research personnel either from private institutions or from research centers and universities. What all that people aim with OI is to discover new technology, services and businesses that would be difficult for them to find when working alone.

The authors of the study try to explain that within the OI paradigm, there are paradoxical tensions, which they explain as "*contradictory yet interrelated elements that on the one hand can enhance value while also fostering opposite, seemingly contradictory consequences.*" (Jarvenpaa and Wernick, 2011). The tensions are seen as paradoxical when they reveal contradiction of interrelated things, which may be caused by different perspectives, feelings, messages, demands, identities, interests and practices. Within the OI context, tensions come by the continued changes that the network has to face, as well as by the multifaceted relationships both inside and outside the organizations that takes part of the OI network. To be able to work on these complex relationships, members of the network should learn how to minimize the opportunistic

behaviors of others as well as learn how to avoid keeping any knowledge related to the innovation that would prevent it to continue growing.

Jarvenpaa and Wernick (2011) identify three types of tensions within the OI which are:

- Boundary
- Relationships
- Organizing

Firstly, the boundary dimensions are related with the inward and outward activities in which the company is involved. The tensions arise when companies try to protect their internal resources while asking for other resources.

Secondly, relationships depict who interacts with whom. As has been explained throughout the present chapter, OI has to do with relationships among firms, institutions and individuals. IP has to be protected in those relationships, but also it has to be shared among the network, which is the ultimate motivation to build the innovative network.

Finally, the third kind of tension arises when trying to manage the organization of the OI paradigm. Each member involved into the network has a different way of organizing things, and establish a common organization system may not be comfortable for everyone. Also, managing and organizing may be seen by some people involved into the OI paradigm as a maneuver from the managers to take advantage over the relationship..

4.5. Implementing OI

Chiaroni et al. (2011) explain and develop in their paper a framework of how companies implement OI in practice. For developing the framework, the authors divide it in three different components for the dynamic implementation of OI. The framework proposed by Chiaroni et al. (2011) can be seen in Figure 4.3.

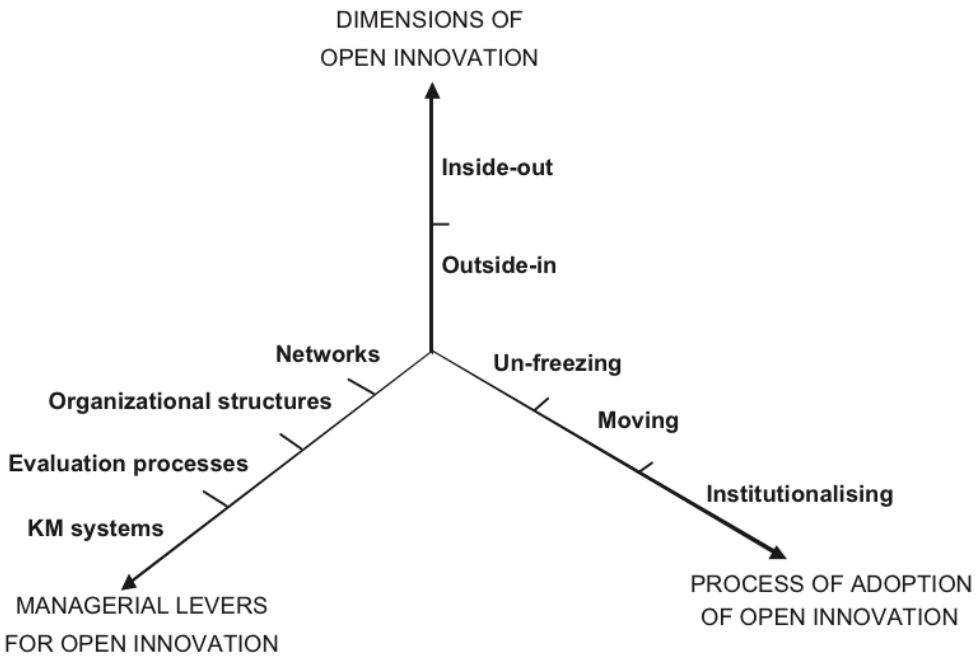

Figure 4.3. Dynamic Implementation of OI (Chiaroni et al. 2011, p. 36)

Chiaroni et al. (2011) define the two main principles of what OI is by defining two dimensions;

1. Inbound or outside-in
2. Outbound or inside-out

According to the authors, inbound OI is the practice of exploiting the innovations of others and enrolling into relationships with external organizations to get the best of their technical and scientific know-how.

On the other hand, outbound OI is the concept of companies looking for external organizations with business models that are better suited to commercialize a given technology.

In the paper the authors show how OI is implemented along a three-phase process that comprises the stages of:

- Unfreezing
- Moving
- Institutionalizing.

Firstly, the unfreezing phase describes the very first moment when a company comes up with a new product coming from R&D. Usually companies encounter a lot of problems in diffusing the innovation even internally. During this first step, it is important for companies to establish a need for change within the company by creating a group or a person that champions the innovation within the company and guides its employees and external stakeholder towards the innovation.

Chiaroni et al. (2011) describe the second phase, the moving step, as the implementation of change through the establishment of new procedures and methods that are aligned with the new business model. The new procedures and methods usually include budget constraints, targets, schedules and reward systems. Since the new vision of the company is new for everyone, it is very common to experiment and use the trial and error method, since it allows the company to identify the best approach that fits better the new organizational objective.

The third and last phase is the phase where the steps, methods and procedures acquired during the previous steps are settled and consolidated. Institutionalizing the new order helps the company to prevent rolling back to the previous stages.

As Figure 4.3 shows, the implementation of OI according to Chiaroni et al. (2011) requires the innovation firm to act upon on a number of managerial levers, along which the change process unravels. It is possible to identify four key levers where the implementation of OI has an impact:

1. Networks
2. Organizational structures
3. Evaluation processes
4. Knowledge management systems.

For a company to be able to in-source external ideas, the use of extensive inter-organizational relationships are required. Firms have to establish relationships with partners where ideas flow, such as universities, research institutions, suppliers and final users to be able to acquire external ideas to the company. When implementing OI, companies have to be ready to manage different networks meant for different purposes.

Companies need to handle the knowledge coming from the outside with internal structures. These structures differ from one company to another since they are internal tools created by each company to fit their needs in the best way possible. Nevertheless, the structures need to include some minimum information to fulfill their purpose. Within the organizational structures the following needs to be included…

i. Organizational roles supporting the implementation of OI (Chiaroni et al. 2011).
ii. Rewarding systems to support the new paradigm (Chiaroni et al. 2011).

There has to be a champion supporting the implementation of the new innovation to lead the rest of the company toward the objectives proposed for the innovation. Also, gatekeepers are important for managing the communication with the external environment.

In order to favor the outside-in and inside-out OI schema, it is important to create an independent business unit to manage collaborative relationships and research contacts with Universities. This independent unit allows the company to adapt the external knowledge to the company needs (Chiaroni et al. 2011).

The third process that suffers an impact due to the implementation of OI is the evaluation process. With the new OI paradigm, it gets difficult to evaluate certain innovations due to their open character and the technical and market uncertainty. Besides, several people and even organizations are involved into the OI model, making it really challenging to evaluate the processes (Chiaroni et al. 2011)..

It seems clear that typical evaluation metrics do not fit into the new model, thus it is necessary to introduce new metrics of evaluation to focus more into external sources and the methods on how to exploit paths of innovation. Examples of these metrics include procedures to systematically scan and monitor the range of technologies available in the external environment, as well as new forms for the involvement of external sources of innovation through the strategic use of corporate venturing (Chiaroni et al. 2011).

On the other hand, inside-out OI requires that external exploitation alternatives are considered since the very beginning of the evaluation process as they might have a relevant impact on the potential profits resulting from innovation.

The new innovation management paradigm affects directly on how companies manage their knowledge. As Chiaroni et al. (2011) state "*knowledge management systems have to be able to foster the diffusion, sharing of transfer of knowledge internally and with external companies*". Knowledge management includes the use of technological platforms, ICT tools and the proper management of IP of the company. When properly managed, IP allows the company to transfer knowledge assets coming from the company in a way that prevents the opportunistic behaviors of the partners with which the firm collaborates.

4.6. How to start doing OI

It has been discussed several aspects of the new paradigm of OI such as dynamic frameworks to implement OI or the challenges that it may present when implementing OI. The question, tough, is how to actually start doing OI. In an interview to Henry Chesbrough done by James Euchner (2011), he explains how he considers is the best way to start doing OI in a company. Before making a big and a strong case out from an OI project, it is better to start by doing tests while the company learns first how to handle the new paradigm. Second it is important to understand how to start working with a network from the OI model. Once the tests are done and the mechanism of OI are understood, then it is time to start the real process of OI.

For starting the process of OI, the company needs the support from the managers and the commitment and involvement of the whole organizations. For that, as previously stated it is necessary the figure of a champion to promote the innovation among the members of the company, from the senior manager to the last employee, to align forces and work together for the same goal.

Chesbrough states that to start doing OI it is important to release the things that are stuck inside the company and that are not producing any benefit. Releasing these projects may bring back to the company some licensing revenue or some equity, while tiding up resources from the inside of the company.

Chesbroughs states in the interview that one of the basic problems of OI is the misunderstanding that internal R&D is the same as outsourcing. Even when innovations are captured outside the company, they are not ready to be used in all companies. The innovation has to be adapted to fulfill the requirements of each specific company. For that purpose it is necessary to still maintain a great number of internal R&D to be able to modify the external innovations in a way that adapts to the business model of the company. R&D cannot be completely outsourced from a company, since companies have to be up to date to be able to define and identify which are the current needs and the actual innovations of the field.

In some cases Chesbrough argues that OI just does not work, as in the case of companies where the product development process is very congested. When bringing new inputs into the company, they are thrown into an already congested pipeline and the result is going to be a more congested process, slowing things down even more.

Another example of companies that just cannot work in an OI environment are those companies that do not share their knowledge openly with their employees. Inevitably, bringing external stuff from the outside is not going to improve the situation at all.

He says that when a company starts adding services to their products and services, inevitably, the company is changing its business model. That means that the business model is really an integral part of innovation. When companies use MCS in an effective way, they are able to manage how their innovation efforts are paid back.

4.7. Companies implementing OI

Chapter 5 covers several examples, deeply explained, of companies that have implemented OI. Nevertheless, this section briefly explains other examples of successful implementations.

One of the examples is Hewlett Packard. In the interview by James Euchner done to Chesbrough in 2011, the author explains how HP included into their R&D department, an OI lab. From their OI lab they do an annual call for proposals from external sources on particular challenges that they find. When people participate in the call with their ideas or initiatives, they use the ones that fit them best within their company.

Even when big companies like P&G (later explained in more detail) implement the OI paradigm, they emphasized that it is just a complementary thing. They still have 9000 researches doing in-house R&D and taking outside innovations to enhance and develop them. With this example Chesbrough tries to illustrate that sometimes companies have the misconception that OI means to outsource the innovation. When an innovation comes in to the company, it is rarely ready to be used or to be placed directly into the market. Companies really need to be able to do a lot of additional internal work for the innovation to be effective. The second reason why Chesbrough states that companies have to maintain internal R&D is because companies have to be up to date, to be an effective and smart customer. Companies need to know which are the trends on the market and the ideas and innovations that really matters. In this way they can make an intelligent decision of buying an innovation that will be an asset for them.

5. MANAGEMENT CONTROL SYSTEMS AND OPEN INNOVATION

The past two chapters explained two concepts that are the objective of the present study: MCS and OI. Chapter 3 explained the definition of MCS according to different authors. These authors also provide a classification of them, the components that conform them and their division.

Chapter 4 analyzed the new paradigm of OI, what it means to companies, frameworks to implement it within a company, some brief examples of companies that have successfully implemented OI and even some cases in which OI simply cannot be implemented due to the internal configuration of the company.

The aim of the thesis is to understand the relationship between MCS and OI. The aim of the thesis thus is to study in which ways they influence each other. MCS are always present in a company in one way or another, using different systems, depending on the requirements of each specific company. What is clear is that nowadays, MCS are needed for the well functioning of a company.

Jarvenpaa and Wernich (2011), identify tensions related on how to organize and manage the work of innovation, on how to manage the dynamic creation of knowledge coming from within the boundaries of a firm and from outside the network. They defend that the existing literature about innovation is a paradox in itself because while innovation is spontaneous, structuring the innovation is an organized task; it is improvisational (through decentralizing decision-making process) and it is integrated (through central control processes, frequent feedbacks and a established time and budget to fulfill the projects).

On the other hand, when historically talking about innovation, some authors defend that innovation is a free expression of the imagination. Imagination flies free when individuals are relaxed and they release their minds. Those authors also defend the idea that when controlling somehow innovation, then it does not flow as smoothly as without

controlling it. Nevertheless, innovation requires resources to do research and develop new ideas, which most of them end up in failures, since it is easier to find 99 different ways of not doing something before the right way is discovered. Resources can come in the way of human resources, economical resources, facilities resources, and so on. Those resources cost money to a company, and usually company budgets are not unlimited, instead, they have to be carefully controlled and assigned to different purposes. This is the reason why even OI has to be controlled somehow with some kind of MCS, either formal or informal.

Jarvenpaa and Wernich (2011) state that OI is "*about reconfiguring and reconceptualizing boundaries, providing freedom from limiting, narrow efficiency and control mentalities*". The authors also defend that some structures are needed to be able to define the work that has to be done and guide people enough so they are able to innovative.

In the moment of doing the present study, there is not specific literature integrating both topics. Thus, it is complicated to actually base all of the explanations that the reader will find in the chapter on author definitions.

Even when there are no so many authors that have carried out research studies about the relationships that concern the present thesis, there are some that have done studies about the topic. One of them is Davila et al. (2009) who present a framework to structure the study of MCS in innovative settings.

Therefore the present chapter is going to be divided into the following structure: first, it is going to explain the above-mentioned study that Davila et al. (2009) analyze how MCS support a company's innovation. Second, the framework introduced by Davila et al. (2009) is going to be introduced and deeply explained to be able to take it as the starting point of the modified framework that is going to be built throughout the chapter. To be able to build a new framework introducing two more dimensions, other external agents and the exploit of innovation, two practical cases of companies that successfully implemented OI will be discussed: Fiat and P&G. In addition, during the implementation of OI within their firms, they used several MCS that, even when not explicitly explained on the cases, they can be relatively easy to extrapolate. Therefore, on the third section of the chapter, the new proposed framework is introduced to later on

be explained through the practical cases of Fiat, on section four and P&G on section five. Finally, section 6 sums up the conclusions obtained through the practical cases that help explaining the new introduced framework.

5.1. Types of innovation and control framework

When companies enter a competitive environment, the three possible competitive strategies that they can be enrolled in are: cost leadership, product or service differentiation and focus on market segment (Cunningham, 1992). To enter a competitive strategy then, either one type or another, is seems to be clear that companies would need some kind of systems to control and measure how well they are doing on the market with difference to their competitors. As has been explained, MCS with both their formal and informal components, are part of a company. Yet, it makes sense that a coherent manager will try to align their MCS with the objectives of the company to try to achieve their strategic goal. If a company belongs or is immerse into the OI environment, that company will also have MCS, either formal, informal or both. Contrary to what some authors and studies state, it is possible that MCS instead of enhancing OI environment, they cancel it. But as MCS evolve and innovate to adapt to the needs of a company, the MCS of an OI company would also need to be adapted accordingly to be aligned with the company's goals. It is common sense to think that the systems needed for a company on the 50's cannot be the same as for a company nowadays, since companies did not have the same needs when compared to a very innovative and high technological company. Consequently, MCS of the latest company will have to innovate as well to support OI activities.

Cunningham (1992, p.88) cites Khanwalla (1972) to indicate that competition in general promotes the use of more elaborated controls. Also, different types of competition based either on promotion, price and product, have different impacts on the company and therefore, depending which kind of competition it is, the type of control used would be different. Cunningham (1992) also bases his statements on Simons (1987) to indicate that companies that perform a competitive strategy, use MCS intensively, with a high frequency of reports, data forecasting, with a high control in their budget and a detail monitoring of the output.

OI can be considered to be another kind of competition that a company follows. In this case, by externalizing some R&D and using at the same time ideas that come from outside their boundaries to perform their business strategy.

Command and control are techniques previously used in traditional management where the establishment of the strategy was a top-down one, the methodology of working was based on standardization and efficiency, and the results were based on the established plans, with no room for surprises but to keep on with the plans. The problem is that the command and control techniques are not useful anymore when the key for a successful business is the employee creativity and initiative (Simons, 1995 p. 3-4). Systems that are designed for ensuring no surprises cannot be used in companies that need continuous innovation and strategies that are focused to the market. Nevertheless, control cannot be denied and dismissed, rather they should be modified in a way that enhances organizations in highly competitive markets. According to Simons (1995, p. 4) there has to be a balance between the freedom of an innovative environment and the inherent constraints of any organization; between empowerment and accountability; between top-down direction and bottom-up creativity; between experimentation and efficiency. When employees come up with new innovations, management control systems should be there to enhance that innovation.Not surprisingly, Simons (1995, p.5) defends that management control systems should be used within an organization not only to ensure the goal-oriented activities but also to pattern unexpected innovation.

5.2. Davila et al. (2009) framework

As stated previously, the aim of the present study is to fully understand and identify different formal systems that give support to OI, as the systems proposed by Davila et al. (2009), where the different types of innovation can be managed by different types of control systems. Figure 5.1 shows the framework proposed by Davila et al. (2009) that includes both relationships between formal control systems and different types of innovation.

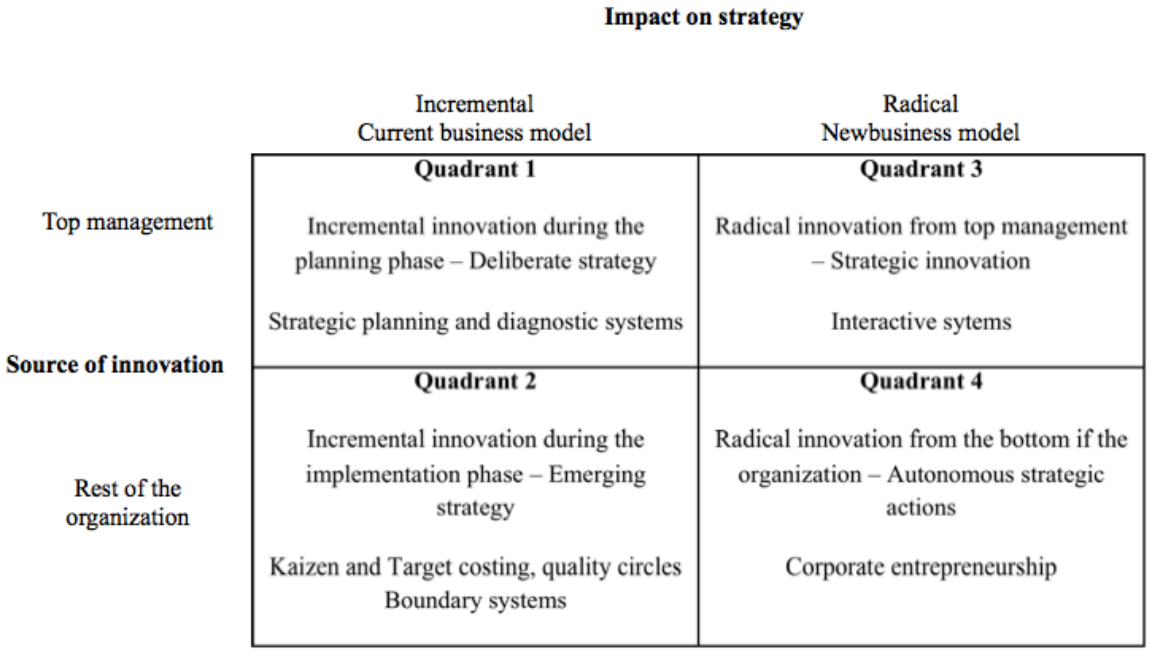

Figure 5.1. Types of innovation and control (Davila et al. 2009, p.299)

The framework proposed by Davila et al. (2009) is divided as follows: first, the rows represent the source of innovation, where the innovation comes from. The authors divide the source of innovation with the sources within the company, thus the innovation can come from top management employees or from anywhere of the rest of the organization. Secondly, the columns are divided depending on the impact the innovation has on the business strategy of the company. The impact on the strategy is classified on an incremental impact or on a radical impact on the organization.

Quadrant one includes the innovation that does not have a high impact on the business model, since it is an incremental innovation coming from the top management levels of the firm. On this quadrant appears traditional control systems where innovation happens during the planning phase driven by the top management, under constant supervision and control. The control here is focused into executing the innovation in an effective way, limiting that way any possible room for experimentation, variation or flexibility that would be the needed ingredient for a real innovation. It allows delegation and control by exception, a quality characteristic of diagnosis systems. This is the typical control method used in situations where the risk is extremely high, since it allows the

company, and specifically the top management layer from the company, to control very closely any possible mistake which turns to be very costly.

On the second quadrant appears the incremental innovation that comes from employees on the organization that do not belong to the top management group. This innovation enables the bureaucracy among the organization, since the decision of what to do or how to innovate does not come as a dictatorial rule coming from upper layers of the company; instead it enhances dynamic capabilities of the employees. The kinds of systems used in this type of organization are boundary systems. Boundary systems are described by Simons (1995) as the constraints in terms of employee behavior, such as forbidden actions.

On the third quadrant appears radical innovations coming from the top management layers of the organization. The control systems used on this type of innovations are the interactive systems, described by Simons (1995) as the systems focus on communicating and implementing the organization's strategy, as well as analyzing the possible imperfections that may exist on the strategy of the company. Their purpose is to create cooperation and debate related to the company's strategy so employees can grow and learn through those debates.

Finally, quadrant four is related with the radical innovation coming from layers of the organization that do not belong to top management layers. In this kind of innovative companies, it is enhanced the autonomous strategic actions that each employee can take within the organization to help the company achieve their goals.

In quadrant three interactive systems are described, which according to Davila et al. (2009) suppose a disruption in the way control was considered, considering even the use of control for innovation, some never done before. The authors provide an argument explaining how innovation was considered to be a task that cannot be controlled, since control was considered a tool that killed innovation. By the introduction of levers of control model by Simons, and more specifically by the introduction of interactive systems, organizations can exploit strategic uncertainties, which means a way to develop an important concept in the control literature whose purpose is to create the variation required to create innovation.

Davila et al. (2009) defends some control systems that can help a company to enhance innovation one way or another. The control systems are:

- Interactive systems
- Enabling bureaucracies
- Adaptive routines
- Evolutionary process
- Organizational theories.

Interactive systems, firstly defined by Simons (1995) help the organization when uncertainties related with the strategy of the company arise. It is a concept that helps to create the variation required for innovation. It helps to break with the traditional control paradigm that believes that control is a very rigid tool, to open new opportunities for control to innovation.

Secondly, enabling bureaucracies support companies to identify and upgrade employee's capabilities, skills and knowledge. Enabling bureaucracies help companies to adapt to highly changing environments, where flexibility and quick response is the key to succeed.

Thirdly, adaptive routines also help companies to adapt to highly changing environments by providing employees with a stable yet adaptive frame of reference.

The fourth control system, the evolutionary processes support companies in the innovation process. These systems are used to manage the organic grow of the company and the challenges that emerge over time. The evolutionary processes consist on a set of four stages which help the company to adopt control systems. The four stages of the evolutionary processes are the same stages that can be found on an innovation process. The stages are the variation, selection, retention and diffusion.

Finally, organizational theories offer other kind of perspectives that can support the development of control systems for innovation (Simons, 1995).

In an innovative environment, the aim is to be creative, to help people to have new ideas. Therefore, the control systems used for that kind of environments are such systems that enable setting objective processes. These systems have to measure the

performance of the employees and the projects. Moreover, the important control systems need to have some kind of compensation schema to motivate employees.

Chenhall et al. (2011) also supports Davila's opinion stating "*formal controls have a main effect on innovation*". When formal controls are combined with organic innovative cultures, they bring incremental benefits to the companies. Chenhall et al. (2011) supports also Davila's work by declaring that formal controls can assist in intelligence gathering when it means establishing processes, or recognizing ideas that require a structured process to transfer the ideas of one person to people with resource allocation rights. Good ideas should be enhanced with formal mechanisms within the company so the idea is fully squeezed to bring back benefits to the company.

Chenhall et al. (2011) support the idea that formal systems, if used properly can identify areas of the business that would require more innovation effort. The formal systems that can be used are techniques such as SWOT analysis or the study of internal capabilities. The authors also state that formal controls can be used to overcome some deviations that may happen with planned activities, so as a tool to motivate employees through different motivational techniques. Rewarding the best ideas in the company is sometimes a good idea to motivate people to generate more innovation.

Davila et al. (2009) continue stating that formal controls balance the focused freedom that creativity needs to expand and develop with the flexible discipline that moving from an idea into value creation demands.

With the explanations and examples that Davila et al. (2009) and Chenhall et al. (2011) provide, it seems clear that formal controls support and enhance innovation. Although, throughout the present study, it has been discussed how formal controls are just a division within MCS, but the range of controls, either formal or informal are very wide to be able to find the most suitable one to fits with the company's strategy to help the company growth. With independence of the company's field, there is always a control system that helps the evolution of the company.

5.3. Evolution to Davila et al. (2009) framework

The framework proposed by Davila et al. (2009) presented before, explains how different types of control systems can manage the different types of innovation.

Nevertheless, even when the framework from Davila is a very good starting point to understand how formal control systems support OI, in the present study, the aim is also to understand not only formal controls, but also to understand how MCS support and enhance the culture of the company that is implementing OI. Most of the times, the intersection between control systems and innovation comes from an economic point of view. Nevertheless, controlling is not only about economic purposes, good control systems can enhance and support psychological perspectives of the company by supporting the organizational creativity. Also, from the social point of view, MCS can have an influence on the OI network; as well as from the strategy point of view, by supporting the dynamic capabilities of the company. MCS can be used to enhance employees innovative initiatives as well as rewarding systems to the best idea.

Taking as a starting point the Davila et. al (2009) framework, the study introduces two more dimensions that are considered to be an important field when talking about OI environment. On Davila's study, the only people that are considered to be the source of innovation are people within a company. That means that the study done by Davila et al. (2009), does not consider some of the main important aspects of OI.

Firstly, on Davila's framework, there is nothing related with the exchange of information and innovation with and/or from the outside boundaries of the companies. As explained in chapter four, OI has to do with the internal ideas that are not a valuable asset per se for the firm's strategy. Even tough, when unused ideas are license to other companies, or even a spin off is created, the revenues to the company can be very high. On the other hand, licensee an external ideas and incorporate it within the internal assets of the company can maximize the performance of a company. That exchange of ideas to the external boundaries of the company and for the outside to internal competences of the company are represented in Figure 5.2 as the source of innovation that come from other agents or from external personnel.

The second dimension of the augmented framework proposed has to do with a different impact on the strategy, creating a new business model that exploits innovation. The new dimension has to do with the concept of OI of exploiting the innovation in a longer period of time. In this case the innovation does not suddenly appear into the company changing everything or maintaining the way things were done, instead, the innovation is worked over a period of time and it becomes part of the business model itself.

The two new dimensions included into Davila's framework explained before are depicted in Figure 5.2 and generates therefore, five new ways of understanding how the innovation is in each company, what kind of strategy the company follows and which is the type of controls systems that best fit them.

		Impact on strategy	
	Incremental Current business model	Radical New business model	Exploit of Innovation Adapted business model
Top management **Source of innovation**	**Quadrant 1** Incremental innovation during the planning phase – Deliberate Strategy Strategic planning and diagnosis systems	**Quadrant 4** Radical Innovation from top management – Strategic Innovation Interactive Systems	**Quadrant 7** Innovation coming from the entrepreneur- Start up company Adaptive routines
Rest of the organization	**Quadrant 2** Incremental innovation during the implementing phase – Emerging strategy Kaizen and Target costing. Quality circles Boundary systems	**Quadrant 5** Radical innovation from the bottom of the organization – Autonomous strategic actions Corporate entrepreneurships	**Quadrant 8** Exploit of innovation coming from R&D Enabling bureaucracies
Other/External agents	**Quadrant 3** Incoming ideas coming from the outside. Purchase of innovative ideas Evolutionary process	**Quadrant 6** Incoming ideas coming from the outside. Radical technology that forces the company adapt to the new business model	**Quadrant 9** Open Innovation Network Exchange of ideas from/with the outside

Figure 5.2. Augmented types of innovation and control

The reader would find here four familiar quadrants: quadrant one, two, four and five. Those quadrants are the ones adopted from Davila's framework, which are not going to be explained again since their bases are the same also in the new introduced framework here. However, it is important to explain theoretically how the rest of the quadrants are conformed.

On quadrant 3, the business is the same, but the way the things are done is different. It has to do with the new technology incorporated to the company that forces the company to use new technology to continue doing the same. One example of that can be found when companies adapted their communication systems from analog to digital. Or when, due to the new technology, and the telecommunication systems, there is no need

anymore to travel all around the world to hold meetings. With communicating systems it is easy to hold conferences with the other part of the world just by sitting in an office. The conferences are still held, and the meetings are still needed, but the way meetings are done changes due to the external innovations that force companies to move from old ways of doing things to new innovative ways. The strategies that those kinds of companies can use are the evolutionary processes, that help companies to evolve with innovation. At the same time, this theory can be applied to the dynamic process of the adoption of control systems. These processes are characterized by four stages through which the innovation goes through: variation (where the company identifies different technologies and ways of doing things), selection (when the company decides which technology to incorporate to the company), retention (when the company starts adapting, learning and establishing the new incorporated technology) and finally diffusion (when the company finally has the new technology established and the time to spread the new strategy to the whole company starts).

Quadrant 6 is where external ideas are introduced into the company and force the company to change even the things they were used to do, introducing that way with an external technology also a new business model. That is the case of companies that with the arrival of a new technology, find no need any more to continue doing the things that were done before and the business model changes to introduce a whole new business model to the company. That is the case of a big multinational company as IBM, that after the external market force to create microchips on a different way, using new technologies, their services were no longer needed, forcing them to change their business model to a different one, jumping into their current services and consulting business.

On Quadrant 7, an innovation is exploited by a company that is going to build their entire strategy on making the innovation work so the company can build a real business strategy later on based on the innovation and the first results coming out from it. The strategy on a start up company is based on giving freedom so they can innovate, find ways of building their own environment and consequently, building the organization's structure. Therefore, adaptive routines can be used on start up environments to provide with the freedom and flexibility needed. Freedom on these stages are the key for employees so they can experiment ways of doing things that at this point of the company, are still allowed to do. Adaptive routines help the company to absorb

employees that do not have an extensive work experience. On the other hand, even when innovation and freedom is the key to make a start up exploit the innovation on which they are trying to build a new company, the need and urgency of start selling and generating revenue comes quite early on these stages, since start ups need to generate a portfolio of clients and products or projects as soon as possible based on the innovation they are using as a core competence.

On quadrant 8, the idea is to exploit the innovation that comes from one part of the organization that does not belong to the top management, instead, the innovation comes from the R&D department, where the innovation is found and really tested to be possible. The best possible system to support that quadrant is the enabling bureaucracies, since they support the innovation process by enhancing employees' skills and capabilities. Enabling bureaucracies work well on environments where flexibility and adaptability is required to be able to face unexpected events.

Quadrant 9 maps the innovation coming from outside the company with the business strategy of exploiting the innovation; this is the quadrant where OI characteristics and the MCS explained through the cases fit better. A proper explanation of this quadrant is explained after the cases, on section 5.7 since there is no a specific literature resource that can explicitly state the concrete MCS used for OI.

After the previous theoretical explanation of each quadrant, three business cases are analyzed, where OI was successfully implemented. Through the three cases, it can be noticed some of the characteristics explained before, even though the practical explanation is going to be explained also later on this thesis.

5.4. Practical case of implementing OI: Fiat

The case of FIAT is an important business case to study from the OI implementation point of view, since it helped the company to make a turn in the worst moment when they were going through troubling times. During the 1990s, *Centro Ricerche Fiat* (CRF) the center of R&D and technology development of FIAT Group suffered a turn around in its organization and innovation strategy guided by Gian Carlo Michellone. This change allowed Fiat to continue with their R&D in even higher levels despite the downturn in the automotive industry during the 1990s. This guided change allowed Fiat to maintain and reinforce its in-house R&D activities, build their networking

capabilities not only in the automotive sector but also across other industries (*Di Minin et al., 2011*).

Traditionally, Fiat followed a close innovation model, where technologies developed by CRF were just transferred or used by any of Fiat's subsidiaries to improve their products and technologies. If any of the technologies produced by CRF were not useful for the group or any of the subsidiaries, then the technologies would remain in a warehouse waiting to be eventually used. Following that model, CRF funding came completely from the corporate level. That means that the income would come when any of Fiat subsidiaries would use the technology. CRF used to be very defensive with their IP, refusing even to participate on research challenges at universities or innovative conventions (*Di Minin et al., 2011*).

All that close innovation model changed in 1993 when Michellone traced a plan to change the whole innovation model. Michellone noticed that the reduction on R&D investments would result in the dismissal of 12,000 workers in Fiat. After such possible situation, Michellone traced a radical plan to move their close innovation model. The new model proposed by Michellone consisted in opening their R&D efforts to external companies and clients to be able to exploit their technologies and obtain significant financing from external sources. Moreover, CRF would start creating a network of relationships with other leading firms in their field, but also with universities and research centers to be able to take part into EU funding research projects.

To start the project, Michellone dedicated four years of building and nurturing an extensive network of relationships with firms working in very heterogeneous industries, to explore opportunities to transfer CRF knowledge to them, to improve competitivenes and negotiate possible funding partnerships.

CRF changed their way of addressing innovation. Instead of simply selling innovation and technology, CRF dedicated their resources to improve customers' competitiveness by a close cooperation with them, trying to make them understand what was the real value of the work they were doing. In fact, their mission was CCCP: "*Competitiveness for Customers at Competitive Prices*". Transfer competitiveness required from CRF to understand the needs of the customers and partners that would become the receivers of the technology done by CRF.

But the first years they had a crucial drawback that cost them to sell a monopoly of the direct injection diesel engines for many years to Bosh. Due to a reduction of the capabilities of CRF to gain value from their technologies, they lost control over the development of critical know-how and this guided them to sell critical know-how, making this technology no longer part of the company. They lost in 1994 one critical patent related to diesel direct injection to Bosh. It allowed later Bosh to develop the Common Rail Diesel injection and gave BOSH a high position in the automotive industry. From that moment on, more controls were established to avoid losing again a key technology for the company (*Di Minin et al., 2011*).

Michellone acted in two levels to avoid losing IP: he introduced a taxonomy for the strategic planning of CRF technologies and he negotiated with the headquarters for more autonomy on IP management and out-licensing decisions to ensure an adequate use of the recently created taxonomy (*Di Minin et al., 2011*).

The taxonomy introduced by Michellone included dividing the technology on three different types:

- Distinctive technology
- Standard technology and
- Actual technology

Distinctive technology is the technology that creates real and unique value to Fiat in the long term. Standard technology included the technology that can be acquired relatively easily and was not critical for the future evolution of the group. Finally, actual technology is the technology that improves the competitiveness of the outputs from Fiat group but is not critical for the long-term success of the group (*Di Minin et al., 2011*).

Consequently, the focus was to transfer technology that was classified within the standard or the actual technology. Classifying the technology was not an easy task, nevertheless it was an extremely important task to do in order to avoid making the same mistake they did with Bosh group. Evaluating a technology inappropriately was the result of firstly a bad evaluation and secondly, an evaluation from someone that was not really up-to-dated on the topic. Michellone also outlined a continuous, structured and distributed competence assessment process across different CRF technological areas that directly involved top management, since top management were the ones previously

taking the decisions on which technology to sell, being the ones who were more distant to understanding the real meaning of selling one specific technology.

In order to make it easier for employees at CRF to use the taxonomy in a proper way, Michellone improved the IP management capabilities. R&D managers received clear instructions on how to start implementing patenting, since within CRF they believed that patents were extremely important, not only as a competitive tool but also as a source of information when negotiating alliances with partners or competitors.

After these organizational and managerial arrangements were established, CRF increased the way that they were taking advantage of technology transfer avoiding the risk of losing critical IP. This suggests that establishing an adequate control system allows identifying which is the critical IP that a company cannot allow themselves losing.

5.4.1. The clients

Once the kind of technology that was possible to be transferred was settled, it was time for them to negotiate with customers the actual transfer. For evaluating and making a proper technology transfer, they required negotiating with customers. For doing so, CRF started using a tool called "*Output sheet*", a document that was supposed to be filled in when an R&D project was finished. The outcome of an R&D could be more than just one technology, and it could be a product, a process technology or a methodology. Each of the outcomes of the R&D had to be specified on the output sheet along with the value that the new R&D would create to the client, the effect on their business and the competitive advantage that the client would enjoy with the use of the R&D (*Di Minin et al., 2011*). Also, in the output sheet, it was necessary to include the expected impact on the organization and on the business processes. This output forced the researchers on the CRF to be prepared to analyze the technical, economical and organizational aspects that the R&D implied.

The outputs of the CRF are divided into four categories:

1. Generic product
2. Expected product
3. Integrated product

4. Potential product

The first one, generic product constitutes the basic requirements that a customer would have when acquiring a new technology. The most important thing for those kinds of customers are the time and costs that the new R&D implies to the company, and the outputs impact on the market.

The second product is the expected one, the product that contains the specifications of the client and follows the design standards of the market. The third product, the integrated product is a more elaborated product that includes the integration with the systems of the customer and a closer collaboration between the client and the CRF to find a better solution. The last one, the potential product includes all of the business potential, the synergies that are done between CRF and the customer and a clear definition of all of the benefits obtained by the client when acquiring the new product.

This classification required researchers to develop a set of skills to be able to take into account how new developed technologies would influence the customers' business model, their impact on the market, the competitive advantages in comparison with their competitors and the customer's business strategy.

The previous classification done by CRF to differentiate their outputs is depicted on Figure 5.3.

OUTPUT	Generic Product	Expected Product	Integrated Product	Potential Product
DESCRIPTION	Basic requirements from the customer	Impact on the customer company	Integration at different company levels	Further product developments, synergy with customer products, opportunity for customer diversification.....
Which are the implications?	• Time and costs of R&D •Outputs impact on the market (functional specifications, quality and reliability)	• Specifications: design standards, testing, production... •Organization: training, new professional profiles... •Information Systems: databases, CAD, CAD/ CAM... •Investments	• Technical: integration between computing, design and testing •Technical/Technological: simultaneous engineering, co-design with suppliers •Technical/Technological/ Marketing	

Figure 5.3. The Product Chain Model (Adapted from Di Minin et al. 2011)

This model was difficult to apply since the internal structure of FIAT group only wanted to recognize the direct costs of the technology and not the rest of the costs related with the technologies.

As can be noticed from the definition of the different types of products, each of them requires a different degree of collaboration and implication with the customers: from the simple purchase transaction of the generic product to the close hand-in-hand collaboration of the potential products. The different types of products imply also different types of customer. The ideal customers that CRF looks for are those characterized by high-mutual co-dependence with CRF. The objective of CRF was to have as many customers with mutual co-dependence as possible. Nevertheless, it was also important to handle the rest of the customers.

The challenge and interest of CRF has two purposes: first to generate enough cash from the exploitation of their technologies and from market-oriented R&D and second, to continue looking for the kind of customer with mutual co-dependence with CRF. Those potential customers were looked for in both, internal customer portfolio and outside the portfolio of customers.

In order to motivate researchers within CRF, they promote a program called “researcher with a briefcase” in which they rewarded researchers that actively looked for new potential customers, visiting their facilities, studying their technological needs and visiting partners of EU projects.

5.4.2. EU Projects

As mentioned earlier, CRF took part in EU or government funded research projects in order to be able to finance their long-term, non-market research projects. The reason for relying so much on EU projects was that it was proved that the benefits/cost ratio from taking part on EU projects was higher on companies under the OI approach. CRF was known to have an orientation towards transferring competitiveness, more advanced and rapid than any other competitors, this is why they enjoyed a competitive advantage on the market and made then an ideal candidate for joining EU projects. But there were other benefits in addition to long-term financing from participating in these kinds of research projects.

An additional benefit is that it encouraged young researchers to take part on EU projects and submit their proposals to introduce themselves into the European research community. Secondly, while preparing the proposal and the projects with leading research institutions, it was possible for CRF to do free benchmarking with competitors and companies from other kind of industries. And finally, it allowed Fiat to establish a great network of relationships with European Universities, carmakers and firms from other industries, which were more difficult to establish a contact otherwise.

5.4.3. Internal Organization of CRM

To be able to manage all those activities, it was important to have a good internal organization. For this reason CRF was structured internally according to a matrix that allowed having a deep specialization in key technological areas, while at the same time enabling them with high flexibility. The matrix looks like Figure 5.4

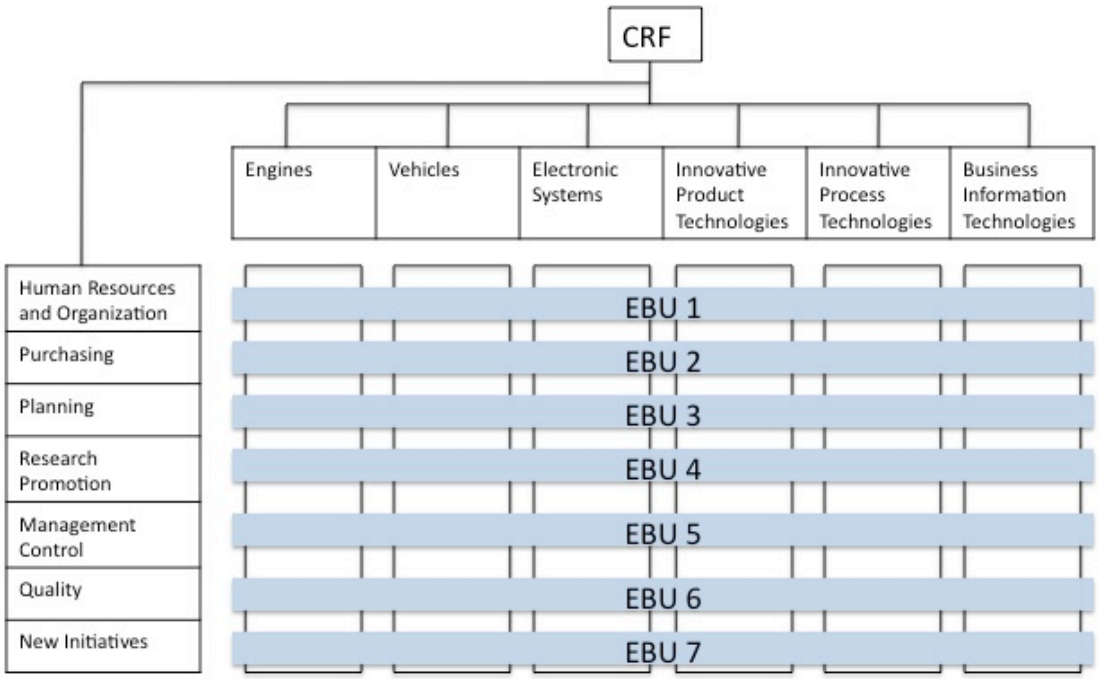

Figure 5.4. Organizational Structure of CRF (Di Minin et al. 2011)

The matrix is divided into six technological areas: engines, vehicles, electronic systems, innovative product technologies, innovative process technologies and business

information technologies. There are also seven supportive functions, which are: human resources and organization, purchasing, planning, research promotion, management control, quality and new initiatives. Horizontally, there are 16 EBUs (external business units) which intersect with the six technological areas. The responsibility of the EBUs lies on the external client acquisition and retention for a precise market segment. Each EBU could have different professionals from different technical areas. Therefore, the development of new products was entirely developed within an EBU (*Di Minin et al., 2011)*.

Introducing a horizontal dimension allowed CRF to improve the research center's ability to quickly respond to different types of external clients' requests. The problem with that structure was the difficulty in coordinating the relationships between CRF and the external customers. A specific unit was created within the Research Promotion staff to be able to overcome the difficulties and gain with the possible synergies. This unit has the responsibility of a set of activities needed to create, maintain and manage relationships with external organizations, extremely important to CRF for both European projects and external transfer of technologies. This unit was also divided into three subdivisions: DEI (External Diffusion of Innovation), the Office of Public Funded Projects and the Office of Marketing and Communication.

While the function of DEI was to work on identifying the internal technologies could be transferred to clients in new industries, the function of the Marketing and Communication was to manage the communications and advertising activities that CRF systematically undertook. The three subdivisions worked together to support and integrate the different horizontal activities carried out throughout the different EBUs.

5.4.4. Planning, Control and Performance Management

The case of CRF emphasizes first, the importance of MCS and second the proactive role that they play when trying to change the innovation strategy of a company, exactly the concept that concerns the topic of the present thesis.

The introduction of the new planning and control system had the aim to encourage the organization towards a company strategy of technology transfer and sales of technological competitiveness to different clients. The main focus of the planning

systems was the project sheet obtained after each innovation. The main objectives of the sheet were:

- Control the progress of the project
- Proper allocation of people on the different projects
- Provide and input for the operation of the corporate-level management control system.

With each output from the R&D center, there was an output sheet which contained the general characteristics of the output, the phases and economics, the resource consumption and the costs. The responsibility of the sheet relied in a junior researcher while the organization of the entire innovation project was responsibility of senior researchers. As explained above, each sheet included the business model that the output would provide to the client and the competitive advantages that they would enjoy over their competitors.

But not only output sheets were used for the projects, also top management layers of CRF had output sheets to evaluate the performance objectives of a whole year. Thus, it was important that top managers, output managers and project managers contributed to the sheet by explaining their contribution to the competitiveness of their clients.

The innovation network and the set of activities that were part of the CRF were constantly monitored. Those indicators were constantly updated, contributing to a great network of communication influencing directly on the high motivation and commitment of the employees.

5.4.5. New Profile for CRF Researchers

With the new change from close to open innovation, the researchers inside CRF suffered hopelessly a change in their way of working that in turn gave them a large range of skills. First of all, the researches started seeing how their competences and capabilities were increased to provide them with full responsibility of their innovations, which lead them to start being risk takers. They were enhanced to look for new clients and do “field research”, exploring for new markets, new opportunities and new clients besides from the usual business field. The research was no longer done in isolation

inside a lab, instead, they had to work closely with the client to provide them with competitive advantages.

The different responsibilities of the researchers also implied different training methods for them to be able to adapt to the needs of CRF. Junior researchers were trained with both technical and specific capabilities. They received an integrated body of know-how on product processes and methods, financial and economic evaluations as well as knowledge on market analysis. They received formal training programs whose main focus was to provide the researchers with a plus in their knowledge and capabilities on business related things and IP management issues.

Also, the criteria for hiring new researchers changed, CRF started looking for people with technical and scientific competences and with entrepreneurial.

Transferring capabilities from CRF to clients required making the technology a highly valuable asset within a company to be able to improve the entire business portfolio based on the mentioned technology. The tacit know-how present on the mind of the researchers was a key element to achieve their objectives, since they were the ones acquiring most of the times the new clients, working closely with them and finding the ways on which the new technology would contribute to improve their business strategy (*Di Minin et al., 2011*). This tacit know-how of the researchers with the combination of the "Not-invented-here-syndrome" (NIHS) resulted in CRF transferring the researchers to the clients. In this way both problems were addressed. As can be understood, this implied a considerable turnaround for the researchers within CRF, forcing them to look continuously for new talented people. They offered internships for university students and after the period, the best ones were hired.

In this way the relationship with universities was increased together with the close collaboration with university teachers, who recommended students to CRF.

5.4.6. Summary of Fiat Case

Through the analysis of Fiat case, several controls systems have been explained; nevertheless, it is important to make a summary and to establish a clear structure of the systems:

1. Technology classification to establish the direct impact of IP on the short and long-term strategy of the Fiat Group.
2. Customer classification
3. Internal departments to map the type of technology with the customer classification.
4. An output sheet specifying the business strategy in relation to the client, the value creation, and the competitive advantages which the client could enjoy.
5. Output sheet for the top management where everybody needs to indicate their contribution to the final innovations created by CRF.

The informal systems that made the implementation of OI a success were:

1. The great collaboration network they created with both clients form the field and outside the firm. Also, the collaboration established with universities and EU projects.
2. The high degree of motivation and independence researchers had when looking for new clients, when developing "on the field" work, and when making them responsible of the innovation outputs.
3. The multidisciplinary training researchers received on technical aspects and business related ones.

Through the Fiat case it can also be understood how OI was considered as an strategic approach to protect a firm's technology base. Within the context of OI, it is also important to notice the figure of the champion, in this case, the figure of Mr. Michellone and his leadership in making the OI model work within CRF.

It is important to notice, as explained before, the multidisciplinary knowledge required for the employees with diverse skills on technical, legal and marketing competences. With those competences, researchers were able to think on the production business and IP implications that the transfer of a technology was likely to have. In addition, the introduction of MCS formalized the dimensions of the technological business model in the above-mentioned output sheet.

OI can be considered to be a crucial strategy during tough times, since it can strengthen operational efficiency and also preserve and enhance R&D effectiveness. However, implementing OI implies a change in the whole structure of the organization.

During tough periods of a company strong leadership is needed to anticipate the events and prepare a strategy to overcome the downturns.

5.5. Practical case of implementing OI: P&G

The Protect & Gamble (P&G) case is analyzed from an interview done by Research Technology Management (RTM) to Larry Hudson and Nabil Sakkab, vice-president of innovation and senior vice president, Corporate research and Development and a member of the Leadership Council respectively of P&G (Research Technology Management, 2007).

During the interview, Huston stated that not only a big company such as P&G can start doing OI, in fact, he stated that the smallest companies are the best possible candidates to start doing it. His ideas are similar to the ones Chesbrough gives in the interview done by James Euchner in 2011 (Chesbrough and Euchner, 2011). Chesbrough (Chesbrough and Euchner, 2011) stated in this interview that OI has to start by conducting some small experiments to see if the idea works. If the ideas work, then it is time to keep on expanding.

According to Research Technology Management (2007) Huston states that a company like P&G started they idea with just two people running "*proof-of-concept experiments*" experiments. On words of Huston "*proof-of-concept experiments*" are experiments that demonstrate results. What Huston wants to explain with this idea is that the process should start by identifying the need, create the brief, get a way to distribute it to a reasonable number of people, get proposals back and then determine whether or not it was successful. According to Research Technology Management (2007) Sakkab stated that the only thing a company needs when starting doing OI is just a person with an idea. This person needs to be able to take the time needed to prove that the model can be developed so other people can participate in the idea and learn from it. According to Research Technology Management (2007) Sakkab defends that in a big company with more variety of resources, it is more difficult to start doing OI, since their structures are very well defined from several years. On the other hand, in a small company, they are creating the structures and way of doing things. Consequently it is easier to introduce new ways of doing things, since they are more flexible.

To reach to the "*Connect and Develop*" (C&D) strategy up to the point that they are right now, they started running experiments to see if their retirees would create value to the company and create a pricing model that manage the restrictions around IP. After running the tests, they proved that it worked, creating high value. This allowed them to scale the tests up to a business model.

Both interviewed, Huston and Sakkab (Research Technology Management, 2007) emphasized the fact that sometimes, finding help for your problem is just as simple as making a call. According to Huston and Sakkab (Research Technology Management, 2007) "*knowing who becomes more important than knowing how*". What it is clear is that before looking for a person that can help, it is extremely important to understand the problem that the company is facing, or the problem that needs to be solved. Only after knowing the problem, it is possible to start looking for the person who knows something about the issue. Later on, persons and companies start building infrastructure around the problem to solve.

According to Research Technology Management (2007) Huston asserts that as soon as there is evidence that an idea can create value to the shareholder, it is absolutely important to have support from the top of the organization. Having a single-point leader on the business side is as important as having another leader on the capability side.

Implementing OI is not an easy task, there are drawbacks and barriers to overcome. One of the biggest problem Sakkab stated that they have found in P&G was the execution. Making the connection requires time to polish the relationship, it is not straight forward. The relationship has to be established, then adapted and adjusted to finally start producing. It is also extremely important to manage IP, since whenever there is value creation from an innovation, it has to be perfectly define who owns what part of the innovation (Research Technology Management, 2007).

Contrary to what so many people thinks, doing OI does not mean to outsource innovation; instead, it is in-sourcing creativity by getting more disruptive ideas that come from the outside. Internal R&D has to be kept alive and up-to-date since it is extremely important to know where companies are connecting to, whether the incoming idea is valuable or not (Research Technology Management, 2007).

Working in a co-creation environment needs a change on the mindset on the people that traditionally has been doing in-house innovation. The "not-invented-here" syndrome has to be overcome to embrace a new culture of "*proudly-found-elsewhere*". Researchers need to understand that internal R&D is highly valuable, and also needed in order to be able to work with external ideas and transform it into something valuable to the company (Research Technology Management, 2007).

According to Research Technology Management (2007) in the four years that P&G had been enrolled into their C&D program, they moved the organization's mind toward understanding that doing OI was an effective way to drive the top-line growth of their company. They wanted with this program to have an in-sourcing strategy, since adding more ideas to try to solve their most challenging consumer problems created a lot of customer value.

According to Research Technology Management (2007) Sakkab stated during the interview that for a company and for the employees to be comfortable with the OI environment, they need to have an entrepreneurial mind set. They needed to be ready and quick when identifying the opportunity, running the test to prove it was valuable and then closing the deal to connect with the people that proposed the solution. They remark again that IP has to be very well managed to have the kind of deals were both parties enjoy a win-win situation.

According to Research Technology Management (2007) Huston also explains what kind of controls they used to be able to manage an environment that from a first look, seems to be difficult to manage. He stated that when a company is inventing something "in-house" it is quite easy to control. A manager within the company has a position of power, where command and control are hierarchical situations. The problem arises when the people you are working with are not under a direct control, then there is not other way than to build relationships of trust. People have to be motivated to work together in a global network. Building good relationships based on trust and alliance is the most important kind of control that those relationships can have. The ideal situation is to be the partner that outside people goes to, to be the preferable choice of others due to the good people. This is possible only if people know that a company is fair to be trustable.

Relationships of trust work if the relationships themselves are really valuable and productive. Therefore, it is important to really understand which of the relationships is producing any result. It is really important for a company to get the best of these kind of relationships to configure the global external organization through these networks and maximize the values that are created (Research Technology Management ,2007).

When P&G started their C&D strategy for OI, they also used outside assets and infrastructure as InnoCentive, whose case is presented in the next section.

5.6. Practical case of implementing OI: InnoCentive

The case of InnoCentive is analyzed from the interview done by Allio (2004) to Darren J. Carroll, the president and CEO of InnoCentive, a company that connects a virtual global community of 50,000 highly qualified scientists with client companies seeking solutions to high technology problems. Their two main innovations as a company that they present are two: their new strategic management process and the co-creation unique value with customers.

According to Allio (2004) the kind of customers that InnoCentive have are big companies with big R&D departments, like Protect & Gamble. InnoCentive works with scientist of the client to find the problems that need to be resolved. Once the problems are perfectly identified with the client, InnoCentive post the problem into their Web site, without the clients name. InnoCentive takes good care or removing any possible hint of the company that has the problem. This way, anonymity is guaranteed for the client, preserving also possible competitors to know which are the problems or fields a company is working on.

In order to be able to post the problem, it is really necessary for the company to be able to define the boundaries of the problem. Sometimes, InnoCentive face some companies that are not able to establish boundaries to their problems. In most of the cases, the problem is that companies are not able to focus into the real problem and the solution they want to achieve. For that purpose, InnoCentive has employees that work on the clear definition of the problem, the boundaries and the goals that that want to be achieved with the solution (Allio, 2004).

According to Allio (2004), establishing boundaries to the problem, allows InnoCentive to be sure that the problem is attractive enough to motivate a great audience of scientists. This technique allows, in words of Carroll, their scientists to state the problem in its most basic sense.

The potential solvers are a community of 50,000 scientists and scientific organizations. InnoCentive post the problems of their clients on the web site so they are available for the scientist community. The best solution that fits the criteria receives the award.

The problems posted on the web are of two types: the paper problem and the "*reduction to practice*" problem. The first problem requires solving the problem theoretically, coming up with a hypothesis. The second problem requires practical solutions coming from a lab with an experimental strategy, and data. In some cases solvers even have to provide with samples. The rewards vary from the paper problem (usually on a range from $10,000 to $20,000) to the lab solution (on a range from $35,000 to even 100,000) (Allio, 2004).

The solutions proposed are validated with a preliminary certification. InnoCentive carries out some tests to identify if the solutions proposed solve the problem. The final validation of the solution proposed is done by the clients scientists. They have to provide to InnoCentive a feedback explaining how the solution fit their needs. Through this feedback, when a solution is not correct, solvers feel motivated to continue their research and come up with a valuable solution. The use of feedback systems allow scientists to feel motivated and continue looking for new challenges (Allio, 2004).

To protect scientist's ideas, solvers have to submit their solution under an agreement. According to Allio (2004) the agreement that states the following:

1. Solutions sent to InnoCentive are confidential and only InnoCentive have access to their supervision.
2. Communications between solvers and InnoCentive are also confidential.
3. Client companies have 90 days to evaluate the solution proposed. At the end of the period, if the solution fits the criteria, they have to pay the award and the Ip of the solution is transferred into a working product.
4. If solvers have a patent, InnoCentive takes a royalty-free, pay the right to use the patent for the use of their work product.

The way that solvers, InnoCentive and clients have to ensure each other that no one appropriates other rights is by building a network of trusting. Solvers then can trust the companies they are working with. Only through this trusting environment it is possible to build successful relationships.

Through their model, InnoCentive is also helping clients to learn how to ask the right questions to a problem, something critical on R&D environments. InnoCentive also teach management layers to convince their scientists that they do not have to be afraid of getting innovations from the outside, since the greatest value for the company should not be to solve problems but to look for the best possible solutions.

5.7. Explanations to the new framework

What is important to see after the study of the previous cases is that the main focus for the three of them, is the protection and management of IP. Innovations can be sold and license, but the most important thing to keep in-house is the IP. If a company shares "everything" with the rest of the companies, they can easily become their competitors and overcome them.

On OI controls are extremely important to be able to manage the IP of the innovations and to ensure that the relationships are built and maintained in an environment of trust. There are two main ideas to underline when taking about how MACS support OI:

- Adequate management of OI.
- Build network relationships of mutual trust.

From the case study of P&G and their C&D project, the control systems that both Huston and Sakkab mention are the systems based on mutual trust and cooperative relationships. They state that, since there is no direct control over the people working outside the boundaries of the company, formal controls as command and hierarchical control cannot be used. This kind of control is not the only possible way to deal in this OI environment. Nevertheless, it is the best possible way to create new possibilities of new cooperation's, since other companies know that the relationships that companies establish are relationships based on trust and confidence (Research Technology Management ,2007).

Darren J. Carroll, president and CEO of InnoCentive also states that one of the best types of marketing a company can do to themselves in order to get more OI projects is to build relationships of trust (Allio, 2004).

It is important for a company that is involved into OI to clearly identify and classify the relevance that each of their innovations has for their own company. If a company is not able to identify the importance of an innovation within their company, most probably they would commit the mistake Fiat did when selling wrong technologies to external companies. Also, it is important to notice that if a company is not able to know the importance of a technology itself, it is hardly impossible for the company to fully understand how the innovation is going to influence positively to the licensee company. That is why, it is important to know which are the benefits and capabilities one company is transferring to their customers when selling innovation. This is why there has to be formal documents that explain and document the output innovation.

It is extremely important to know the kind of relationships a company has with their customers, which in most of the cases are also other companies. It is also important to identify the kind of relationship a company wants to have with others, since not all the relationships contribute in the same level, and it may be the case that some of the relationships are not beneficial at all.

From what can be understood from the Fiat case is that researchers taking part of OI need to have multidisciplinary capabilities. With multidisciplinary capabilities researchers are able to cover areas that goes from the most technical point of view until the ability to see how the innovation can positively influence the company business strategy.

6. CONCLUSIONS

This thesis has discussed the concepts of MCS, MACS, and OI paradigm. The thesis presented a modified framework, which tries to explain how different MCS can support different sources of innovation. With the objective of explaining better how the different MCS can support OI, the thesis introduces three practical cases of companies that have successfully implemented OI. The reason to cover all that topics is to fulfill the objective of the thesis: which was to…

1.To review the literature on MCS and MACS aiming to analyze how these systems are involved in OI environments.

2. Provide a new dimension to an existing framework to provide a better understanding of the relationship between MCS and OI.

As the reader may note, the title of the thesis is "*Management Accounting Systems and Open Innovation*". However, the review identified very few evidence of a relationship between MACS and OI. Most of the literature has focused on the relationship of MCS and OI. Nevertheless, the title of the thesis has not been changed, since the topic of investigation has been on MACS.

Some authors do not support the use of MCS on environments where innovation is present. Although on the present thesis, the objective was to find evidence that support that MCS should be used in OI.

In the present thesis it has been highlighted how control systems are an important element when shaping the organization, however, as Davila et al. (2009) points out, "*it has been virtually ignored"* how those traditional control systems impact on creativity and consequently on innovation. Usually, financial tools and budgets (used for diagnosis control) are used for managers to assess the financial state of the company. In some organizations, budgetary information is not used to control but to encourage people to develop, to find new trends and to adopt new strategic ways of thinking.

Before attempting to study any further how authors believe MCS supports OI, it may be reasonable to think that powerful organizational stakeholders should have considerable control. Since MCS include many controls to benefit companies, it is reasonable to find studies where authors provide support for the use of MCS in innovation environments as these systems can provide considerable benefits to an organization.

In the examples providing throughout the present thesis, it could be concluded that control systems may ensure the success of OI as they provide:

1. Mutual trust
2. IP protection
3. Knowledge of the technologies and innovation.
4. Capabilities to classify the type of customer and their relationships
5. Multidisciplinary working people

First of all, various authors agree that building a network of mutual trust is the key for the relationship to work. When companies trust each other, they focus on developing the work, on working together for achieving the same common objective; otherwise, they would spend more time competing with each other than doing innovation.

Secondly, it is important to protect the IP of a company. A company's strategy should contemplate the need to secure its IP even if the company joins and OI environment.

Thirdly, it is important for a company to know their own technologies and innovation. This principle is related to the need to protect their IP. A company has to understand the importance of their own technologies and innovation and what do these mean for the company strategy. When this is perfectly understood, then it is easier to sell the technology to other external companies.

Fourthly, a company should be able to classify their customers. Not all customers are the same and not all relationships with customers are equally beneficial for a company. Knowing the importance of each of them and their relationship with the company is the key to build beneficial relationships.

Finally, when working in an environment of OI, it is important to count with people that have a multidisciplinary approach. That means that they will be people who have great technical skills but at the same time hold the know-how to handle the innovations and

understand what they mean for the company and for their environment. They need to know what the potential of the innovation is, and what benefits they may bring.

6.1. Future research

The results of this thesis suggest that not only the MCS which are discussed in this study are the only ones which can support OI. There will probably be much more different management control that can support OI even better. Furthermore, OI is a relatively new concept that is spreading their horizons to new companies willing to try it. With an increasing number of companies doing OI, MCS will consequently evolve to adapt to specific needs, and what now seems to be the right controls to support OI, might change. Future research should focus on empirically testing how MCS support OI.

Also, a possibility for further research would be to study MCS by doing "*reverse engineering*". That means that instead of starting from studying literature and how authors defend that OI can be supported by MCS, a good idea would be to have the possibility to access companies like P&G, InnoCentive or Fiat and study them from the inside. Ideally, the study would be extended during a period of time where people from inside those companies can be interviewed and where they can explain how MCS are used in their daily basis. Also, observation would be a good method to use together with the interviews to analyze how MCS support OI. Even when this idea seems more logical to really understand the relationship between the two concepts, it is out of the scope of a master thesis and of the present thesis; nevertheless it would be a perfect study to carry out during a doctoral thesis.

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