Discovering Correlations between Innovation Capability Data Components: Organizational and Individual

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Abstract: Innovation Capability is an organizational capability consisting of three parts regarding the organization, and one those individuals of the organization. Therefore, Innovation capability can be viewed via two components: organizational and individual, both including features affecting the organization's capability for innovation, which potentially have relations with each other. However, it has not yet been discovered which of the features correlate with each other. Hereby, this research paper focuses on finding correlations while studying the organizational innovation capability data from organizational and individual perspectives.

First the conceptual part of the paper deals with the concepts of organizational innovation capability and individual's innovation competence together with a model of their interrelations. Then the empiric test evidence result of study with 98 people representing five knowledge-intensive organizations is presented. This paper suggests that there are correlations between innovation capability components individual and organizational features, therefore it is also suggested that this subject should be approach holistically both by managers and researchers.

Keywords: Innovation Capability; Innovation Competence; Innovation; Correlation; Innovation Culture; Innovation Climate; Leadership; Innovation Process; Organizational Structure; Self-evaluation

1 Introduction

Success in the future requires that organizations put innovation as their priority and mould it as their core competence [1]. Previously there has been found a connection between organizational innovations and individual's creativity [2]. The literature dealing with human performance or innovations defines and describes numerous characteristics and competencies of creative and innovative individuals [3-5], as well as the organizational characteristics and capabilities e.g. among organizational culture [6, 7] and climate [2, 8, 9] that are significant in inducing the innovation within organizations or supportive to the innovativeness.

However, managing innovation within organizations requires systemic and holistic approach: managing the innovation process, leadership and organization, the culture and climate and additionally the people and their skills, since all these four parts together compose the organizational innovation capability [1].

Nevertheless, there is lack of knowledge about the relationships between the two perspectives: the individual versus the organizational components of organizational innovation capability. Thus, there is a need for empirical evidence of the relationships those two components of organizational innovation capability might encompass.

The goal of this paper is to answer the research question: *"What kind of correlations can be discovered between the features of two components of innovation capability: individual and organizational, when studied with survey including people's self-evaluated data?"* Related to the main question, the attempt of this paper is to find proof of the correlations between the two components of organizational innovation capability.

In answering the research questions, first the paper deals with the concepts of innovation capability, together with its four parts. Then the discussion goes on to describe the potential relations of the features of those two components: organizational and individual. Additionally there is illustrated the method of calculating correlations between the data component features. And after that, due to the need to better understand innovation capability and the correlations between the features of its two components, the results of an empirical study is explained in detail.

The main outcome of this paper is empirical evidence of those existing and also non-existing correlations between the features of the two components of innovation capability: the individual and the organizational. Also the paper contributes to the ways statistical analysis, or further data mining, can be used for discovering valuable knowledge from large data set of human evaluations. The practical implications of this paper, for academics is the empirical perspective of the innovation capability study and for managers the further understanding of the correlations between the innovation capability components: the individual and the organizational.

2 Organizational innovation capability

Individual creativity and Innovation

Creativity and innovation are frequently thought of as exchangeable terms, [e.g. 7, 10], which is understandable due to their interrelated nature [9]: all creative ideas originate from the human mind [11] in any of its fields [9] by being resolved by the quality of the

subjective experience - not by the judgment of the world [12]. Also, individual creativity is a crucial component of organizational creativity [13] and additionally the prerequisite for innovation [14], but it has to imply a process, the outcome of which is an idea or product acknowledged and adopted by others [12]. Mainly studied by psychologists [11] the research on creativity has focused on the individual's perspective [15], somewhat exclusively to the study of mental processes [12, 16] devoted to the steps involved in the individual's creative thought process [17].

Innovation, on the other hand, is the process of transforming an idea into action within the organization [10] or elsewhere as in technology transfer [18]. According to OECD [19] innovation is "...the implementation of a new or significantly improved product (goods or services), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations." However, the definition of OECD including the process and novelty lacks one aspect of innovation: the value. Yet the concept of value itself is complex, but that viewpoint should at least be considered while defining innovation alongside of the implementation process and novelty, as innovation should add or create new value at some point of its existence, even if postponed.

Organizational innovation capability

Managing innovation within organizations requires systemic and holistic approach. Conceptually, there is an understanding that organizational creativity or organization's ability to produce innovations, i.e. innovation capability, consists of several organizational components; additionally, there is also the component of the skills of those individuals employed by the organization. [1, 20]

Andriopoulos [20] has divided the components of organizational creativity into five parts: leadership style, structures and systems of an organization and resources and skills, additionally dividing organizational climate and organisational culture as separate features. Quite similarly Skarzynsky & Gibson [1] see organizational innovation capability consisting of four parts: organizational culture and values, leadership and organization and processes and tools including also people and their skills as the fourth component. These two models have been integrated in the Figure below (Figure 1).

Figure 1. Integrated model of innovation capability [1, 20]
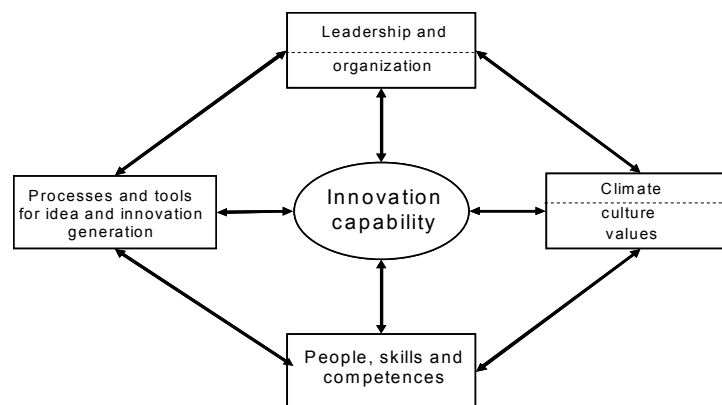
All the components of organizational innovation capability include supports or enablers that foster innovation together with barriers or impediments that hinder it, that both have been previously studied.

Organizations climate and culture

Organizational culture is seen very essential part of organizational innovation generation [6, 7]. Like in general culture, corporate culture is an organization's way of life in business passed on via consecutive "generations" of employees [21]. Additionally, while referring to the culture of organizations and their subcultures, Schein uses the term "group culture" without defining the size of the group [22], i.e. each corporation and similarly organization possessing a culture; though while size expanding radically, so does the variation, leading to questioning the group's unambiguous culture. The concepts of organizational culture and climate regarding innovation are often used interchangeably [10], yet culture includes those hidden elements that remain mostly invisible, thereby normally studied with phenomenological research methods through observation, collecting stories and interpreting. Climate on the other hand is the manifestation of practices and patterns of behaviour established in the assumptions, meanings and beliefs that constitute the culture, leading to research methods such as questionnaires or other survey instruments. However, those characteristics of organizational culture and dimensions of organizational climate mentioned in the literature that either support or impede individual creativity and innovation are consistent, and similar, even the same [10], thus, they are viewed here under the same category. Those enablers that foster innovation climate or culture can be named e.g. freedom, communication and requisite variety (Table 1).

Table 1 Enablers of Innovation in Organization: Climate and Culture

Enablers of Innovation in Organizations Innovation Climate and Culture

1. **Freedom** of organizational climate [8],represented as: autonomy [23], sense of control over one's work [2, 7, 9], freedom to experiment [6] and having time: idea time [8], scheduled incubation period [9] and "slack" [24].
2. Direct, open [8]and transparent **communication**; based on trust, emotional safety and the ability to depend on one another [2, 7]; open-door communication as organizational policy: open at the individual, team and department level [7]. Communication also including accepting disagreement, a chance to expose paradoxes, conflicts and dilemmas [7], also debates [6, 8].
3. **Requisite variety/diversity** of hybrid nature individuals and managers [24] of diverse backgrounds [7], also team diversity [25]. Additionally information combined differently, flexibly and quickly and by allowing equal access [23].

Organizations structure and leadership

Many researchers have studied organizational structure [6, 26] and leadership together with managerial measures that either enable or hinder the innovation within organizations (Table 2).

Table 2 Enablers of Innovation in Organization: Structure and leadership

Enablers of Innovation in Organizations Structure and leadership

4. **Flexibility** as **organizational** structure, rather organic than mechanistic, facilitates innovation activities [6], also structure emphasize certain values e.g. flexibility, freedom and cooperative teamwork that the promotion of creativity and innovation [7]. Is represented in e.g. responsibility for decision making at lower levels, decentralized procedure, quick and flexible decision making as well as minimal bureaucracy [6]; flexible environment enhances the ideas of individuals and teams to be realized as products; which managers support by giving subordinates space [27]

5. **Stress management** as extreme time pressures, unrealistic expectations for productivity and distractions from creative work [2, 18], the impact of change and heavy workloads, yet meeting both organizational and individual needs, may create work pressures, which can be diminished by flexible working[28] with models e.g. job rotation and informal and non-rigid job descriptions[7], work relocating with the help of modern technology [28], e-work, part-time or alternating working hours, and a work hour bank [29]

6. **Change-able** is organizational ability to change fast, requiring flexible and versatile systems, processes and people, also recognizes change when needed [30]; or adaptability, organization's capability to alter ways of working to meet the changing environment i.e. a readiness to accept change [24]. Leaders have to build up the adaptability to ongoing change, for people to willingly change their behavior to suit the circumstances [28, 30], therefore unlearning is essential competence for organizations and individuals, most critical for top executives [31]. Organizational receptivity including externally developed technology, requiring vigilance for monitoring the organization's performance, the awareness of threats and opportunities by entire personnel [24], e.g. by indicating the planned changes in work methods [7].

7. **Challenge** is the member's emotional involvement in organization's operation and goals [8], a willingness to invest energy in the job if feeling satisfaction and meaningfulness [2]. Signs of challenge are e.g. emphasizing results, meeting commitments, being anxious about deadlines and eager to get things done, additionally expecting and appreciating hard work [6] i.a. experiencing a sense of having to work hard on demanding tasks and important projects [2], which requires people to be matched with the right task [9]. "Flow" components determining person's possibility to reach the flow state are the two dimensions of the task: challenges and skills [32].

8. The key challenge for leaders is to create a culture of **empowerment** [30], as it is positively related to the level of creativity and innovation in the organization [7, 30] and additionally required by organization's dynamism and future orientation [6]. Level of empowerment is the degree to which employees have freedom and authority to participate in decision making in solving problems, but not easily to acquire as top management may, both consciously and subconsciously, work against it [33]

9. Using **constructive feedback,** instead of money [6, 9] or even threats [34] as reward and recognition of creative work [2] for individuals and teams [7] and fair evaluation of work [2] including e.g. failures, rewarding for taking risks, experimenting and idea generation [7], which calls for failure tolerant and accepting leadership [35].

10. **Risk tolerance** includes risk taking i.e. the organization's tolerance of uncertainty [8] and behaviour e.g. taking risk and experimenting [7] that represent orientation toward risk, and thus innovation [2]. In a high-risk organization climate, actions and decision-making rapid, emerging opportunities are exploited and concrete experimentation preferred to detailed investigation and analysis [8], therefore as part of initiative taking and the learning experience, prospective success includes also risks, thus tolerating mistakes [7]. Risk is paradoxical, requiring balance with both as little control and harm as possible [7, 24] e.g. calling for communication of goals, risk monitoring and measurement [7] and balance of low and high risk projects [24].

11. **Organization support development** by encouraging people to further their skills when getting training in their tasks [6], for the career development, mentoring [36] i.e. a relationship of interaction between two people which aims to support the learning between

the mentor and the apprentice [37].

12.   **Organization** should **support learning** as expertise is the basis of creative work [2, 9], that should be maintained and enhanced by keeping knowledge and skills updated, learning creative thinking skills [7] and by training, thus facilitating learning and innovation culture aiming for an ongoing process of continuous learning [38]. However, an employee's positive perception of the training is related to the supervisory support for it [38].

13.   **Teamwork and collaboration** generate team creativity [17] by co-operative [7] and cross-functional teams [7], i.a. mutually supportive groups with a diversity of perspectives and backgrounds, various intellectual bases and work approaches i.e. different expertise and creative thinking styles come up with exciting and useful ideas[9], yet call for mutual respect and ability to trust and understanding [7]. Additionally the teams should possess: shared excitement over the team's goal; a display of willingness to help other members through difficulty and setbacks; and identification of the unique qualities of each group member[9]; also team conflict and climate influence creativity in a team [17]. Managers support teams by serving as role models, persevering through tough problems as well as encouraging collaboration and communication [9]; organizational support by mandating information sharing and collaboration together with disabling the build up of political problems [2].

Idea and innovation process

The innovation process comprises more than solely a process of research and development [39] and it can be divided into phases, e.g. *idea generation*, *structured methodology* and *commercialization* [6, 7] or *concept finding, development of innovation elements, achievement of readiness for marketing and market launch* [34] with sequential nature, but in fact they are iterative and simultaneous [6]. Skarzynsky and Gibson [1] regard the implementation of the ideas as the easy part of the innovation process, which mechanisms e.g. marketing, are quite well known, whereas the idea generation is the fuzzy front end. That is why in this paper the idea and innovation process does not include the implementation phase. However, Soo et al. [40] have combined the information seeking and absorptive capacity alongside with networking as an integral part of the innovation process from knowledge management point of view. Therefore here also these organizational features: seeking information, absorptive capacity and networking are part of idea and innovation process along side idea generation (Table 3). Naturally there are also other features of innovation process, yet their connection with individual innovation capability or competence is not so apparent.

Table 3 Enablers of Innovation in Organization: Idea and innovation process front end

Enablers of Innovation in Organizations Innovation Idea and innovation process front end

14.	Organizations should be **seeking information** from multiple sources, both from inside [41] and outside [24] an organization. The requirements for the future are multi-dimensional abilities to exploit various sources and know-how, not just a vast quantity of information [42], which causes redundancy [23], but however crucial is to ensure that employees have the information they need to do their job, otherwise it becomes an inhibiting factor in their work leading to disempowerment instead of empowerment[30].
15.	**Absorptive capacity** is the ability of a business to recognize the value of new, external information, assimilate and apply it to commercial ends [43], furthermore a relative absorptive capacity is a similar capacity to learn from all other organizations [44].
16.	**Idea generation** is the first phase of the innovation process [6] that can benefit all organizational functions and should be everyone's responsibility [2], requires individual imagination [31], is encouraged by innovation enhancing behaviour[7], i.e. idea support[8], and should be rewarded with justified and fair awarding [42].
17.	**Networking,** i.e. the organizations external orientation [6] or network competence, company-specific ability to handle, use and exploit inter-organizational relationships is beneficial for innovation of organizations [45] and teams [25].

Individual innovation capability – Innovation competence view

Competence includes knowledge, skills and personality characteristics, such as motives, traits and self-concept [5, 46]. Furthermore, competence be can identified and measured by input competencies (knowledge and skills), personal competencies (personality characteristics), and output competencies (demonstrable performance) [46]. The innovator's competencies [47] studied here include those input and personal competencies that are emphasized as important attributes of creative and innovative people in the literature. The major attributes of individual creativity necessary in any domain are expertise, creative-thinking skills, and intrinsic task motivation [2] , whereas the major attributes supporting creativity are self-awareness, self-regulation, empathy and relationship management [4]. The Innovator's competencies can be divided into two parts (personal competencies and social competencies) and seven attribute classes (self-awareness, self-regulation, motivation, expertise, creative thinking, empathy and relationship management) including altogether a total of 27 competencies, yet here when combined with organizational component of innovation capability, only 21 of those are presented here (Table 4).

Table 4 Innovation Capability: Individual component – Innovator's competencies

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Innovator's competencies

1. **Absorptive capacity** is the ability to assimilate and exploit external knowledge. [11, 43, 48]
2. **Accurate self-assessment** is the ability to analyze one's strengths and weaknesses accurately, additionally to be open to feedback. [4, 49, 50]
3. **Achievement orientation** is the drive towards a high standard of excellence. Setting challenging goals and working hard to achieve them. [4, 5, 11, 21, 25, 50-52]
4. **Analytical thinking** represents the use of logical, systematic reasoning to understand, analyze, and resolve problems and the ability to break problems into smaller pieces and the ability to discern causal relationships. [3, 5, 21, 53, 54]
5. **Change orientation** the ability to recognize the need for change and to adapt to the changes in the working environment. [21, 28, 55]
6. **Communication** is the ability to listen to others. Also it represents the ability to openly express one's feelings, ideas and opinions and to read non-verbal cues. [4, 11, 21, 28, 51, 56-58]
7. **Conceptual thinking** represents the ability to use models, theories or frameworks to interpret or to explain events. Additionally, conceptual thinking is the ability to identify patterns and to the see the "big-picture". [3, 5, 21, 53, 59, 60]
8. **Divergent thinking** is the ability or preference to generate many alternative solutions to a problem, also the valuation of new ideas and approaches. [11, 54, 57, 59, 61, 62]
9. **Flexibility** is the ability to manage multiple demands without losing focus and to handle the ambiguities of organisational life. Additionally flexibility is the ability to be open to new experiences and viewpoints. [4, 5, 21, 25, 27, 28, 50, 52, 53, 56, 57, 61, 63, 64]
10. **Imagination** is the ability to form ideas in the mind, especially of things never seen or experienced directly. It is also the natural tendency to find new ideas and viewpoints. [31, 65]
11. **Independence** represents the sense of autonomy and independence of work. Also it is a sense of ownership and control of one's own work and ideas. [2, 23, 55, 61, 63, 64, 66]
12. **Information seeking** is the curiosity to know more about things, people or issues. [5, 55, 67]
13. **Initiative** is the ability to see new possibilities and to seize opportunities and to do more than what is expected. [3, 4, 21, 50, 55]
14. **Intuitive thinking** represents the use of knowledge that emerges as a vision or images, or a clear sense of knowing, inner speech, gut feelings or physical sensations. [53, 59, 65, 68-71]
15. **Leveraging diversity** means having appreciative attitude towards others and respecting people from different backgrounds. [3, 4, 72]
16. **Professional and technical expertise** is the mastery of job-related knowledge and the readiness to give and receive help when needed. [4, 5, 9, 11, 21, 25, 57]
17. **Relationship building** is building or maintaining friendly relationships or networks of contacts with people who are or might be useful in achieving work-related goals. [5, 11, 21, 28]
18. **Risk orientation** is courage to take on challenges even when facing the risk of failure.[2, 11, 28, 52, 73, 74]
19. **Self-development** is the desire to continually grow, learn and develop. [5, 21]
20. **Stress tolerance** is ability to maintain performance when facing workload pressures and or organisational impediments. [2, 21, 55, 63, 64, 66]
21. **Teamwork and collaboration** represent interest in team members and in what they are doing, sharing plans and knowledge with others, recognition of possibilities to cooperate and act on them. [5, 9, 21, 28, 50, 55, 57, 75, 76]

Competence linked to the core capabilities of an organization

Christensen [77] has presented the link between individual competencies and organizational business capability, where vertically each organization acts in a business environment with opportunities, challenges and resources. The managers in organization find its vision and create the strategy, each demanding certain organizational competencies. Those competencies require certain individual competencies, thus forming the link between human beings in the organization and organization's business.

Suominen et al. [78] have combined some of those innovation competencies with their organizational counterparts presented in the table below (Table 5). However, this listing is not all-inclusive, but it has been the basis for the gathering of the empirical evidence for this paper. Also noticeable is that the relation of the counterparts is conceptual.

Table 5 Conceptual relations of features of innovation capability of two components: organizational and individual

Organizational innovation enablers	*Innovation competencies of an individual*
1. Absorptive capacity	1. Absorptive capacity
2. Constructive feedback	2. Accurate self-assessment
3. Challenge	3. Achievement orientation
4. Change-able	4. Change orientation
5. Communication	5. Communication
6. Flexibility	6. Flexibility
7. Freedom	7. Independence
8. Empowerment	8. Initiative
9. Stress management	9. Stress tolerance
10. Requisite variety	10. Leveraging diversity
11. Organization support learning	11. Professional and technical expertise
12. Networking	12. Relationship building
13. Risk tolerance	13. Risk orientation
14. Seeking information	14. Seeking information
15. Organization support development	15. Self-development
16. Team work and collaboration	16. Teamwork and cooperation
17. Trust and openness	17. Trustworthiness
18. Idea generation	18. Analytical thinking
	Conceptual thinking
	Divergent thinking
	Imagination
	Intuitive thinking

However, from this table, organizational innovation enabler "Trust and Openness" and innovation competence "Trustworthiness" are not included in this study due to the lack of empirical data.

3 Research Methodology

Self-evaluation, Data Mining and Correlation

Surveys or questionnaires are important tools for researching e.g. human actions, opinions, attitudes and values [79]. In self-evaluation a person is evaluating oneself, or a system that this individual evaluator is part of. The results from self-evaluation could be used for different purposes, such as motivation, identification of development needs, evaluation of potential or performance, career development purposes, etc. However, self-evaluation has its limitations too [80]: the results of a self-evaluation are less reliable in the evaluation of work performance [80], also people have the tendency to evaluate their own performance better than others' [81]. People are also limited in their ability to observe themselves and others accurately [82]. Still, there is no question that people are able to evaluate e.g. themselves if they are motivated to do so. Self-evaluation is more effective in evaluating the relation between different items, such as competencies, than comparing individuals' performance to others' performance [83]. The effectiveness of self-evaluation depends also on content of the evaluation, application method and the culture of an organization [83]. The results of self-evaluations conducted by an individual change to some extent: in the short term, due individuals' power of observation, intentions and motives change [84] and in the long term, due to mental growth, learning and changes in personality and health. Yet, data generated though self-evaluation does have certain characteristics: e.g. every single individual respondent apply their own, personal scale of degree. Therefore using traditional scientific statistical methods for such data should be applied with care and consideration.

Data mining is about "mining" or discovering unexpected, valuable, or interesting structures or patterns from large amounts of data [85, 86]. The metaphor of data mining illustrates how computers can be used to sift through mountains of data, in search for "nuggets" of knowledge, similar to mining for gold [85, 87] By using data mining methods, there are possibilities to cluster different sets of statements of the survey or even find potential correlations between different variables.

Correlation analysis attempts to measure the dependency [79, 88] or the strength of relationships between two variables [89], with the help of a correlation coefficient, which is a single number and often called briefly correlation [79]. Statistically it signifies only linear dependency. The nature of the dependency should be evaluated from figures that illustrate the deviations; solely the correlation itself does not portray anything.

The correlation coefficient measures the strength of the linear dependency between the two random variables X and Y. The value of correlation coefficient equal to +1 implies a perfect linear relationship with a positive slope, while a value of correlation coefficient -1 results from a perfect linear relationship with a negative slope. Sample estimates of correlation coefficient close to unity in magnitude imply good correlation or linear association between X and Y, whereas values near zero indicate little or no correlation. [89] In other words: in case the correlation coefficient is close to value 1, it represents a strong positive correlation between the two variables, on the other hand when the correlation coefficient is close to -1, it represents a strong negative correlation between those two variables [88]. In the case of a positive correlation an increase in a variable leads to increase on the other variable, whereas in the case of a negative correlation and increase in a variable leads to decrease on the other variable.

Regression lines can be placed in the illustrations that represent linear dependency, similarly to correlation.

Case study with survey

Based on a conceptual analysis, the concepts of 'innovation capability', 'innovation competencies' have been described in the conceptual part of this paper. Concepts are abstract notations or symbols by their nature [90] assisting the solidification, structuring and illustrating both phenomena and their characteristics at a quantitative level.

In the empirical part of the study, the case study method [90, 91] is applied to collect data; however the results obtained through this method are often new hypotheses or theories, explanations of change- or development processes, even normative instructions [90]. The material and its processing are empirical, although often the material is formed of a small number of cases. Thus the results obtained with case study method include the difficulty of generalization: (as) to what extent the results obtained in a limited number of cases can be generalized applicable to a larger group. In other words, the results have to be regarded (as) more or less directional.

The empirical data set includes data of five organizations: three knowledge-intensive business organizations from Spain and two universities - one from Finland and the other from Korea, including two student groups and one staff group presented in the table below (Table 6). The sample groups varied from five to 47 persons of their size. The entire case population of this study is, to some extent, technically oriented students or professionals. The age of the case population varied from 20 years to 64 years, the average age being 31.3 years and median being 28 years old. 30 % of the case population was women and 70 % men.

Table 6 The quantity of participants in Case organizations of the empirical data

Case organizations	*Quantity of participants*
1. **Company_A**	11 pcs (9 Men, 2 Women)
2. **Company_B**	12 pcs (7 Men, 5 Women)
3. **Company_C**	10 pcs (6 Men, 4 Women)
4. **Students_Finland**	47 pcs (29 Men, 18 Women)
5. **Students_Korea**	5 pcs (4 Men, 1 Woman)
6. **University_Staff Finland**	13 pcs (11 Men, 2 Women)

The study was conducted with two self-evaluation survey tools implemented to "Evolute" -web-based application platform designed for self-evaluation research purposes [92] one covering the individual and the other organizational side of innovation capability. Here, self-evaluation is considered as a method for a person to evaluate subjectively oneself and objectively the environment. In our approach, competencies and systems are evaluated indirectly through the statements related to individuals' every day work – therefore individuals are not evaluating their performance. In this context, we mean self-evaluation of innovation culture (the system) and innovator (human in the system). The self-evaluation survey tool of the individual's innovation competence comprised of 96 statements and the organizational innovation capability of 89 statements. All the respondents from the different organizations did both the evaluations. The Spaniards responded with their mother-tongue of Spanish and the Finns with their mother-tongue of Finnish, whereas the Korean respondents used an English version of

the survey sets. With the opportunity to do multiple evaluations, a total of 98 respondents completed both, including their demographic data.

The nature of the data is linguistic meaning that each respondent performed the evaluation by choosing the level of agreement or disagreement to a statement on a nominal scale from current state perspective. Altogether, the data set contains 186 current state evaluations of statements from each 98 respondent. In other words the dataset comprise 17150 numeric values. The 89 statements of the survey regarding organizational innovation capability perspective were gathered into 18 eighteen organizational innovation capability features each including the values of 3-4 statements. Similarly, those 96 statements of the survey regarding the individual innovation competencies were accumulated into 22 individual innovation competencies, equally each containing values of 3-5 statements. The value of the organizational innovation capability features and also individual innovation competencies were calculated as mean values of those statement values.

However, intrinsically this data does not reveal any insight or provide understanding of innovation capability components and their relationships, therefore the data mining methods, i.e. here calculating of the correlations with statistical application SPSS were used for further analysis. This study is based on the assumption that individual innovation capability, e.g. innovation competencies has a connection or relationship to the organizational innovation capability components. Hypothetically was assumed that there might be found correlations, either positive or negative between the innovation competencies and organizational innovation capability components.

The test was conducted in further mentioned way:

1. The respondents were given user names and passwords to the two web-based survey tools self-evaluation

2. The respondents self-evaluated the statements, either 96 pcs or 86 pcs for both of their current state.

3. They were able to have a break before completing the survey set.

The data was gathered in a period of approximately one year in those various organizations.

4 Results

In table (Table 7) the first column describes organizational innovation capability's organizational features together with those individual innovation competencies that they might have a conceptual connection that has already been described in the conceptual part of this paper.

The second column contains the actual correlations that were found between the perceived current states of organizational innovation capability's organizational features and individual innovation competencies. For example, the perceived current state of communication, an organizational innovation enabler, has statistically significant correlations with the following innovation competencies: divergent thinking (0,334), flexibility (0,333), initiative (0,402), seeking information (0,356) and self-development

(0,442). The stronger the correlation between organizational innovation enabler and innovation competence the more linear is the dependence between the two variables. This indicates that the level of communication in organization affects the level of creative thinking (divergent thinking) as well as other personal competencies (flexibility, initiative, seeking information and self-development).

Table 7 Correlations between Organizational Innovation capability component features or competencies

Organizational innovation enablers/ *Conceptual connections of individual innovation competencies to innovation enablers*	*Innovation competencies that Organizational innovation enabler has a correlation with statistically most significance*
1. **Communication**/ Communication	1. Self-development [0,442], Initiative [0,402], Seeking information [0,356], Divergent thinking [0,334], Flexibility [0,333]
2. **Empowerment**/ Initiative	2. Divergent thinking [0,431], Seeking information [0,352], Analytical thinking [0,344], **Initiative** [0,350]
3. **Freedom**/ Independence	3. Initiative [0,391], Seeking information [0,328]
4. **Constructive feedback/** Accurate self-assessment/	4. Initiative [0,386], Seeking information [0,346]
5. **Networking/** Relationship building	5. Initiative [0,363], Seeking information [0,352]
6. **Organizational Flexibility**/ Flexibility	6. Initiative [0,371],
7. **Change-able/** Change orientation/	7. Self-development [0,345]
8. **Seeking information/** Seeking information	8. Self-development [0,336]
9. **Idea generation/** Analytical thinking ,Conceptual thinking, Divergent thinking, Imagination, Intuitive thinking	9. Divergent thinking [0,366]

Statistically significant correlations from organizational point of view with Innovation competencies have **Communication** with five competencies: (Divergent thinking, Flexibility, Initiative, Seeking information and Self-development), **Empowerment** with four competencies (Analytical thinking, Divergent thinking, Initiative and Seeking information). Significant correlations with two innovation competencies has organizational innovation capability's organizational features **Freedom, Constructive Feedback** and **Networking** all having significant correlations with Initiative and Seeking information. One significant correlation with innovation competency has **Organizational Flexibility** (with Initiative) and both **Changeability** and **Seeking information** with Self-development and **Idea generation** (Divergent thinking).

When viewing these results from innovation competence point of view, the competence having most of the significant correlations with organizational innovation capability features is **Initiative** with six significant correlations (with Freedom, Organizational communication, Organizational flexibility, Empowerment, Constructive

feedback and Networking). Next highest amount of significant correlations of five pieces has competence **Seeking information** (with Freedom, Organizational communication, Empowerment, Constructive Feedback and Networking). **Divergent thinking** is the innovation competence that has the next amount of significant correlations (with Organizational Communication, Empowerment, and Idea Generation). Also **Self-development** has three significant (with Organizational communication, Changeability and Seeking information). One significant correlation has innovation competence **Flexibility** (with Organizational communication).

Additionally there was found both individual innovation competencies and organizational features that had less significant correlation with each other: there were six competencies of such Team work and collaboration, Relationship building, Leveraging diversity, Individual Absorptive capacity, Risk orientation, Change orientation and Independence together with one organizational feature with statistically not significant correlation of Risk tolerance.

In order to understand better the implications of these correlation results, two of these pairs were studied further. The first pair is Empowerment and Initiative, which conceptually can be seen having relationship with each other and also had significant correlation with the studied data set in this paper. The second is Risk tolerance and Risk orientation that conceptually would be seen having a relationship, yet with this study did not have statistically significant correlation.

Those individual responses were put into Figure (Figure 2) were Empowerment is one other axis and Initiative in the other. Each of these dots represents one respondent. The color signifies the group they are part of. In the figure, the linear correlation of those responses can be seen.

Figure 2. *The linear correlation of responses between Empowerment and Initiative, correlation coefficient 0,350.*
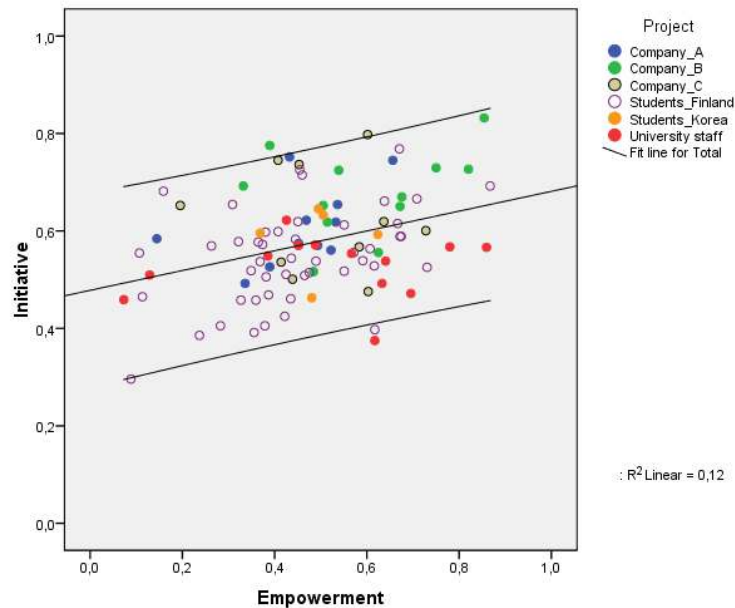
The interpretation to the correlation of these two features, one organizational and the other individual, can be explained with people's willingness to take initiative, while given a certain amount of empowerment. From other point of view, it can be concluded that people with initiative, which people in knowledge intensive organizations mostly are, appreciate, and have recognized currently a certain amount of empowerment in their work environment, which organization's leaders should consider. As this pair of Empowerment and Initiative has a linear correlation, the correlation works also vice versa: there are also people whose initiative is low; additionally the Empowerment level they have experienced in their work environment is also low. Viewed from other angle this signifies that people given a little Empowerment in their work environment, see themselves having currently a low level of Initiative.

In the figure below (Figure 3) the responses of Risk tolerance and Risk orientation are portrayed similarly, where Risk tolerance is in one axis and Risk orientation in the other. Each of these dots again represents one respondent. The color signifies the same group they are part of as in the previous figure above. In the figure, the reasons for the lacking statistically significant correlation of those responses can be seen.

Figure 3. *The illustration of responses between Risk tolerance and Risk orientation, correlation coefficient 0,161.*
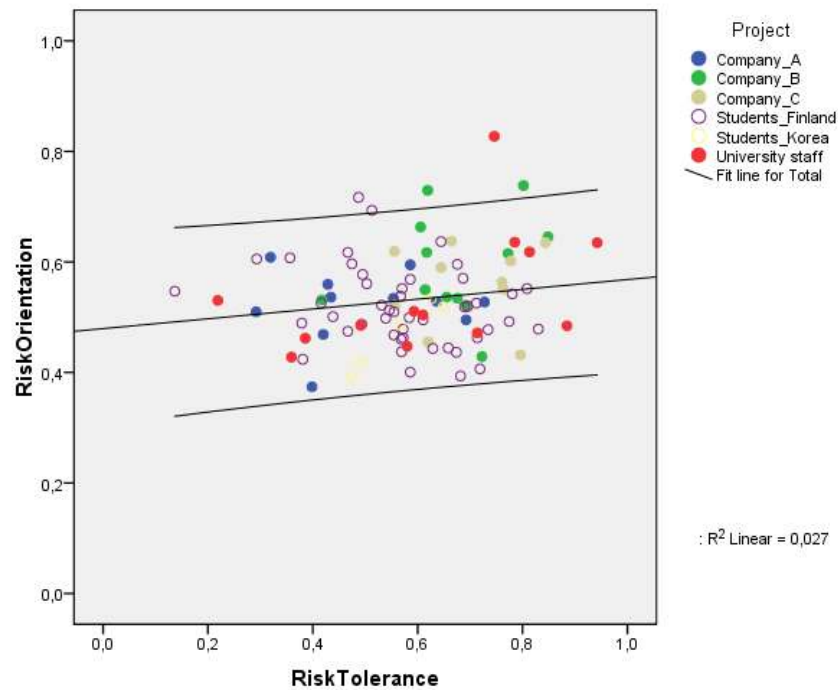
The interpretation to the lacking statistically significant correlation of these two features, one organizational and the other individual, can be explained with two kinds of people: others willing and others unwilling to orient towards risk, although organizations they work in have tolerance towards risk taking. From other point of view, it can be

interpreted that people with certain amount of risk orientation are either expecting low or high tolerance of risk from the organization in their work performance. Keeping in mind that Risk orientation and Risk tolerance are both frequently emphasized in the innovation literature makes this result of lacking correlation quite interesting.

Furthermore, it has to be pointed out that statistically significant correlation portray that people have given their evaluations to those two viewpoints in the similar manner (i.e. high evaluations compared to high evaluations or either high evaluations to low evaluations). Therefore, if two features lack a statistically significant correlation between them, in fact reveals nothing from the existing or non-existing potentiality that there would be a relationship that would come across with other statistical methods or with other set of data. Here for example, had the correlations between Risk orientation and Risk tolerance been calculated for each organization separately, the results might have revealed that this Risk orientation-Risk tolerance –pair would have correlated in a single organization data, even in each of these case-organizations separately.

Therefore, the results when studied with a survey where respondents self-evaluate their individual innovation capabilities and those organizational innovation features that enable innovation found in the literature can be summarized as follows:

Firstly, there was found correlations between Organizational innovation capability data components of organizational features and individual competencies. Some of the findings are quite interesting as most of the correlations did not correspond to those features and competencies that conceptually would be related as only Empowerment and Initiative had significant correlation between each other with this data.

Second finding was that most correlating organizational features with innovation competencies are Organizational communication and Empowerment when studied from the significant correlation point of view. Furthermore with significant correlations with innovation competencies have organizational features of Networking, Constructive feedback and Freedom together with Changeability and Seeking information with Self-development and Idea generation.

Third finding was the most correlating individual innovation competencies were Initiative and Seeking information, together with Divergent thinking and Self-development.

Fourth finding was there are both individual innovation competencies and organizational features that had no statistically significant correlation with each other: there were six competencies of such Team work and collaboration, Relationship building, Leveraging diversity, Individual Absorptive capacity, Risk orientation, Change orientation and Independence together with one organizational feature with no correlation of Risk tolerance.

5 Conclusions

Our claims in this article with a study carried out with a survey where respondents self-evaluate those individual innovation competencies and those organizational innovation features, have been as follows:

First, there was found correlations between the two components of Organizational innovation capability: organizational features and individual competencies that were found conceptually corresponding in the literature. Statistically significant correlations have only Empowerment and Initiative, which can be interpreted so that currently respondents evaluated those organizations under study to empower at high level those people with high impression of their own level of initiative. On the other hand people

with low view of their initiative were empowered at low level – similarly a mediocre evaluation for empowerment and mediocre for initiative. Basically this leads to wonder which comes first: the initiative when empowered or low initiative when not empowered. Or do organizations empower initiative people or do people with low initiative seek for non-empowering working environments? As this study was carried out with current state evaluations, very interesting would be to study how these people would see the target state, or tension for development, between this organizational feature and individual competence.

Second and third findings were that both some of the organizational innovation capability features and on the other hand individual innovation competencies have either significant correlation with each other. This can be interpreted so, that not only those relations between organizational features and individual competencies obvious in the literature correlate similarly as Empowerment and Initiative. Additionally there might be found certain organizational features that attract people with certain competencies, or that organizations mould its environment to fit better to particular competencies of people like enabling those with Initiative alongside Empowerment also Communication, Freedom, Constructive feedback and Networking or those with Self-development with Communication, Changeability and Information seeking.

In this study, the fourth finding was that there were some of the individual innovation competencies lacking correlation with organizational features and surprisingly also no correlation found between risk tolerance, widely recognized as an important innovation enabler, and individual innovation competencies. Again here the nature of the correlation has to be emphasized: the statistically significant correlation portray that people have given their responses to two viewpoints in the similar manner and thus those features lacking a statistically significant correlation between them, does not exclude or include, but in fact, reveals nothing of the potentiality of an existing relation. The explanations can be found for example in the divergence of the organizations or in the different roles people, such as professor versus student in a university organization. Also the fact that organizational features seem to correlate better than the individual competencies may be caused by the fact that there were only 6 organizations that people were evaluating, whereas there were 98 individuals to self-evaluate. Undoubtedly the individual attributes of 98 persons do differ and especially, when they are evaluating their impressions of themselves. Therefore, the nature of self-evaluation data brings interesting viewpoints, but also challenges into the interpretation of the results. However, in order to improve the validity of the results, more research is required. One consideration to the correlation calculation would be to take into account other correlation coefficients, such as Spearman or Kendal that are based on the order, not the distance of the data findings. Also other statistical methods or data mining methods such as tree-modelling or clustering could be considered alongside with more data gathering.

On the basis of the results, we suggest that organizational features of Organizational communication and Empowerment together with Freedom, Constructive feedback and Networking have significant correlations with individual innovation competencies that they should be really paid attention in the innovation management efforts of organizations. Moreover, we suggest that individual competencies such as Initiative and Seeking information, together with Self-development and Divergent thinking are taken into consideration and given more room in order to develop the innovation capabilities of organization's individuals.

Finally, we conclude that this study revealed correlations between the individual and organizational components of the innovation capability data that should be taken into account in innovation management procedures in organizations. Therefore, we suggest that both managers and researchers approach this subject of organizational innovation capability holistically, taking account both the organizational and individual component of organizational innovation capability.

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