Department of Business and Management

Project-Based Organization: Design and HRM

MANAGING KNOWLEDGE IN THE PROJECT-BASED ORGANIZATIONS

SUPERVISOR

Professor Luca Giustiniano

CANDIDATE

Margherita Casetta

681031

CO-SUPERVISOR

Professor Kerem Gurses

Index

1 Introduction

This thesis deals with the role of *knowledge management* in the *project-based organizations*. Both concepts are topical, since their importance is increasingly growing in our current economic paradigm.

Indeed, on the one hand, *knowledge management* is recognized to be extremely relevant in many fields, such as business organization, strategy and human resources, since it is recognized to be a mean to establish and sustain *competitive advantage*. On the other hand, project-based organizational structures are being progressively more adopted, since their flexibility makes PBOs the most suitable form of organization for many industries that have to deal with a fast-changing business environment.

Therefore, there is a need for a deep analysis of their relationship, with the aim to understand how they interact and especially how knowledge should be managed in project environment in order to be effectively lead to achieve a competitive advantage.

This work is divided in three chapters. The first one proposes a literature review about knowledge management. First of all, the concept of knowledge is explained in order to be acknowledged about the basic components and characteristics of this discipline. Then, it follows a focus on the knowledge management cycle, which describes the main stages of the process, from creation to improvement of knowledge, with a particular emphasis on knowledge sharing and its barriers. The following paragraphs describe the main knowledge strategies (personification and codification) and systems. Furthermore, it is proposed an exploration of the main roles involved in knowledge management: knowledge workers, knowledge managers and technologies. The last part of the chapter treats an investigation about the relationship of knowledge management with organizational culture, innovation and organizational learning.

The second paragraph provides an overview of the *project-based organization*. After a detailed description of this organizational structure, which is considered as *an organization in which core activities are performed by means of projects* (Bredin and Soderlund, 2013), it is highlighted its positioning in relation to the other forms of organization. Then, the chapter offers a description of the functioning of project teams and the governance of project-based organizations, with a focus on the roles of the brokers and the steward. The closing paragraphs offer an overview of the human resources management in project-based organizations. In particular, it describes the main HRM activities carried out in project-based organization, the *liminality* condition of project-workers and the main players involved: line manager, project manager, project worker and HR specialists.

The third chapter investigates how knowledge is managed in the project-based organizations. First of all, it describes the major mechanisms involved: knowledge sharing, knowledge integration and learning. Then, it provides an analysis of the role of the project management office and the knowledge governance strategies adopted in project environment. It closes with an exploration of the critical factor that enable an effective knowledge management in project-based organizations.

Chapter 1: Knowledge Management

1.1 Definition of knowledge

In the current economic environment, which is highly unstable and uncertain, knowledge becomes the only certainty and key factor of success.

Indeed, in this world of constant change, there is a shift away from the natural resources to an era of knowledge which is based on research and development, skills and education (Friedman, 2005; Gulbranson & Audretsch, 2008).

The concept of knowledge within managerial context has been defined as *a fluid mix of framed experience, contextual information, values and expert insight that provides a framework for evaluating and incorporating new experiences and information* (Davenport, 1998). As it is clear from the definition, this concept is quite wide and covers different notions.

Therefore, it is pivotal to clarify the boundaries between some basic points regarding knowledge theory, which are optimally explained in the DIKW (Data/Information/Knowledge/Wisdom) Pyramid Model by Ackoff. As Liew(2007) explained, data are considered as *recorded (captured and stored) symbols and signal readings. Symbols may include words (text and/or verbal), numbers, diagrams, and images (still &/or video), which are the building blocks of communication.* Data, indeed, aim at representing *unstructured facts or ideas*, which are not contextualized and do not provide any kind of human interpretation. Information are intended as data which have been *contextualized, categorized, calculated and condensed* (Davenport, 1998). Information, in fact, also provides a human interpretation of data (i.e. raw unorganized facts). The third pillar of the model is knowledge, which Liew (2007) defines as *cognition or recognition (know-what), capacity to act (know-how), and understanding (know-why) that resides or is contained within the mind or in the brain*. Knowledge is reached with the use and

experience. Lastly, the top of the pyramid is represented by wisdom. According to Ackoff (1999) it is an *extrapolative and non-deterministic, non-probabilistic process* and it deals with *values* and *involves the exercise of judgment*.

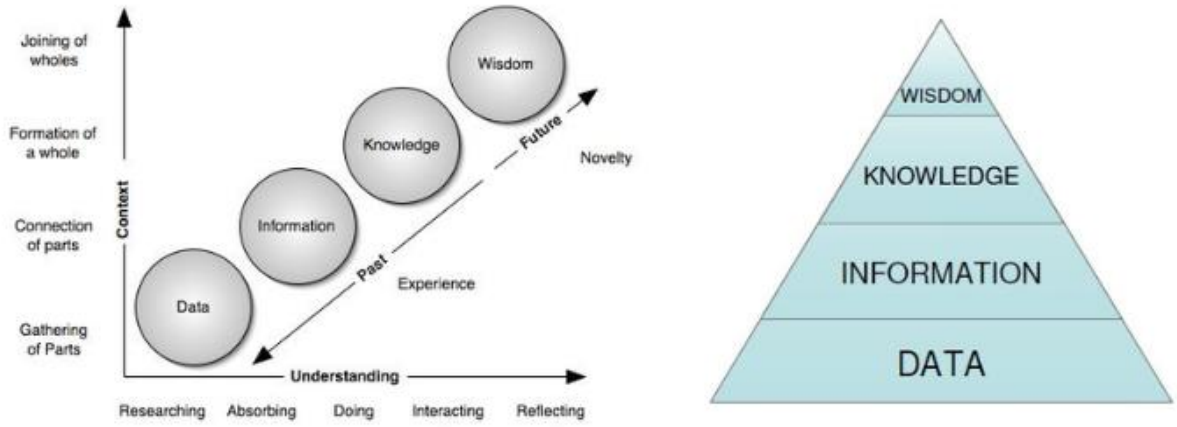

Figure 1.1: DIKW (Data/Information/Knowledge/Wisdom) Pyramid Model
Source: Ackoff (1999)

Even if the model has been criticized, it is helpful since it sets boundaries between concepts, which is crucial. Indeed, as Fahey and Prusak (1998) assumed, knowledge management would be meaningless if there was no difference between knowledge, data and information.

1.2 Tacit knowledge vs Explicit knowledge

Knowledge can be classified according to different variables. One of the most useful is between tacit and explicit knowledge, which has been broadly studied by many authors.

Tacit knowledge was first defined by Polanyi (1966) as *knowing more than we can tell* and as the *knowledge people carry in their minds* and consequently it is difficult to access and articulate. Tacit knowledge is composed by individual skills and *"know-how"* which are based on intuition, personal experience, perspectives, beliefs, and values and are, indeed, difficult to be shared (Ahmed, Lim and Zairi, 1999)).

Explicit knowledge, on the other hand, is regarded as a *formal and systematic* entity. Explicit knowledge can be expressed in words and numbers, and *easily communicated and shared* in the form of data, scientific formulas, or codified procedures It can be referred to as *know-what*. Thus it is can easily be processed, articulated, stored and shared within an organization. (Nonaka 1991).

The studies of Nonaka, which are mainly related to Japanese companies, provide a deep understanding in this field. They recognize that codified knowledge represents only the tip of the iceberg and they, therefore, give a great emphasis to it. It is, indeed, shown that knowledge is primarily tacit, which means it is difficult to be expressed and communicated because of its strong *cognitive dimension*.

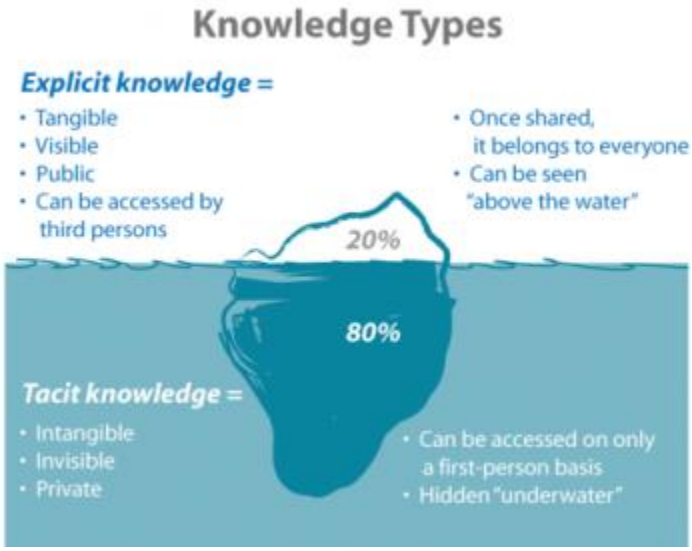

Figure 1.2: Knowledge types
Sorce: Nonaka (1994)

Therefore, sharing tacit knowledge is one of the biggest challenges for managers, since *making personal knowledge available to others is the central activity of the knowledge-creating company* (Nonaka, 1991). Thus, according to Takeuchi, the best way to spread it is through direct experience, which often also implies trials and errors.

However, as Nonaka (1991) explains, even if the dichotomy between tacit and explicit knowledge stands, it is possible to identify four basic patterns for knowledge-creation, which allow to generate transfer and recreate knowledge in any organization. This process is significantly explained through the spiral model, also known as SECI (socialization, externalization, combination, and internalization), that Nonaka himself proposed in 1991 and subsequently expanded by Nonaka and Takeuchi in 1995. There are four modes of knowledge conversion according to the model:

- Socialization (tacit to tacit): in this process it is possible to observe a social interaction that leads to share tacit knowledge between people within an organization. Since tacit knowledge has a strong personal dimension and it is difficult to be formalized and acquired, the only way to learn tacit skills is through direct experience, e.g. *observation, imitation and practise*. (Nonaka, 1991)

- Externalization (tacit to explicit): this pattern aims at articulating tacit into explicit knowledge. This goal is usually reached through *dialogue and reflection*. Nonaka suggests that the use of metaphors, not only intended as linguistic symbolisms but also as peculiar method of perception, can be significantly helpful at this point: it allows intuitive understanding without analysis and generalization. Given the specific features of tacit knowledge, this is one of the most challenging processes of the spiral model. Indeed, it

requires a process of *articulating one's vision of the world*. However, this step is pivotal as it prompts sharing of tacit concepts. (Nonaka, 1991)

- Combination (explicit to explicit): this process aims at *systematizing and applying explicit knowledge and information*. It usually happens when all the different sources of explicit concepts are gathered through *reports, meetings, telephone conversations or exchange of documents*. In this context Information Technology (IT) can be very helpful, as it supports both transfer and integration with other explicit concepts in order to generate new knowledge. Once all the explicit knowledge is combined, it is also clear that it can be easily shared. (Nonaka, 1991)

- Internalization (explicit to tacit): this pattern shows *embodying explicit knowledge*, which occurs when a new explicit concept is shared in any organization. As soon as other members begin to internalize the new explicit knowledge, *they use it to broaden, extend and reframe their own tacit knowledge*. This process can be linked to the concept of *learning by doing*, according to which, practice and experience are the key to create new tacit knowledge, that eventually become an asset for the organization. This step, as well as externalization, is very critical, since they both demand a strong *personal commitment*. (Nonaka, 1991)

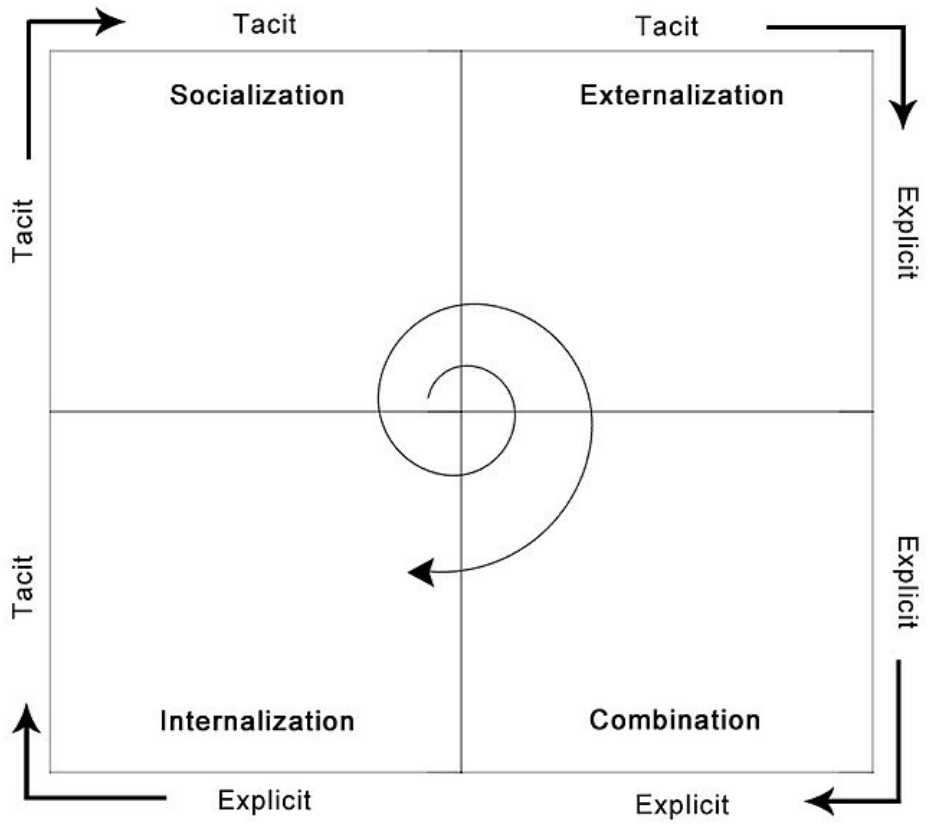

Figura 1.3: SECI Model
Source: Nonaka (1991)

Each pattern does not stand on its own and they should not be considered as distinct entities, indeed this model must be intended as a cycle, which always *starts the spiral of knowledge all over again*. (Nonaka, 1991)

Starting from tacit knowledge, after it is shared, articulated into explicit, combined with other already existing explicit concepts, it is eventually internalized and it is possible to obtain new tacit knowledge, which is different from the starting one, otherwise it would be a round and not spiral model. (Nonaka, 1991)

1.3 **Definition of knowledge management**

Knowledge management (KM) rose as managerial discipline starting from the early 90s, when knowledge emerged as a new effective competitive advantage for companies. The available literature offers numerous definitions, which are sometimes contrasting because of the interdisciplinary nature of the topic.

According to Peter Drucker (1999), knowledge management is the *coordination and exploitation of organizational knowledge resources, in order to create benefit and competitive advantage*. Bukowitz and Williams (1999) describe it as *fast-moving field* developed from the *collision of several others, including human resources, organizational development, change management, information technology, brand and reputation management, performance measurement, and evaluation*.

Another broad description is provided by Davenport & Prusak (1998), which states that KM consists in *managing the corporation's knowledge through a systemically and organizationally specific process for acquiring, organizing, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organizational performance and create value*.

As opposed to the previous definition, Wellman (2009) sets some boundaries. Indeed, he explains that the real goal of knowledge management is limited to *techniques employed for the management of what is already known*, and does not consider *knowledge creation* within the same discipline.

However, based on the common features of all the available definitions, KM can be defined as the process of *creating, sharing, using and managing the knowledge and information of an organization* (Girard, John P.; Girard, JoAnn L. (2015)).

Due to the lack of an unanimous definition of knowledge management, Earl (2001), based on a research conducted over the period of 10 years, proposed a new framework in which three main typology of *school of knowledge* are classified.

The first category is defined as *technocratic*, because it mainly focuses on *technologies, maps and processes*. This school of thought believes that knowledge workers should always be supported by technologies in order to complete their tasks, since technologies are considered as the best mean to enhance knowledge management performances.

The second category is labeled *economic*, given the orientation toward the commercial side. Indeed, according to this school of thought, knowledge and intellectual capital should be exploited in order to generate revenue streams.

The last category is *behavioral*, since it relies on the role of managers and management to create, share and use knowledge as a resource. It focuses on networks, mindset, communities and it mainly aims at knowledge pooling and exchange. (Earl, 2001)

1.4 **Core components of knowledge management**

Besides some contrasts regarding the definition, most literature agree that KM has three main core components (people, process, technology). The combination of the three elements can lead companies to create a *system* for knowledge management, therefore the focus of this discipline is to connect people, process and technologies for the purpose of taking advantage of knowledge (Liebowitz, 1999).

- *people/culture*: people in any organization are the entities who mostly own knowledge, in particular for what concerns tacit knowledge. People are regarded as a core component of KM, since *people are the source of knowledge*. People are both knowledge creators and

consumers, indeed, *KM begins, revolves around, and ends, with people*. People working in KM have increasing challenges and requirements, there management has to guarantee that individuals are able to influence each other with their knowledge. Hence, the organization should work toward a company's culture focused on the *sense of importance of people* (Omotayo, 2015).

- *process/structure*: processes can be described as the mechanical and logical guidelines about how work is managed in organizations. In essence, processes define the functioning of organization, therefore it is relevant in knowledge management. Processes can be conducted by machines or human, or both. Each organization follows different processes, therefore there is an unlimited number of possible processes. Management needs to develop a structure that allows the diffusion of information, by adopting flexible business processes. (Omotayo, 2015)

- Technology: this element supports sharing and transfer of knowledge management. It has to be wisely chosen according to the specific needs of company. For instance, its importance is particularly growing within those organization who decide to outsource their activities and, therefore, require an higher and better coordination of knowledge.

Thus, knowledge management does not only regard technologies, such as data bank and information system. Indeed, technology supports knowledge transfer but it is the not a solution itself, since an efficient KM system also requires an adequate company's culture and structure.

Thus, Jawadekar (2011) states that the knowledge management system lies at the intersection of the three core components, and that the interaction between the three components leads to the generation of knowledge.

1.5 **Knowledge-Based Economy: from Resource-based to Knowledge-based view**

The 21st century is often referred to as the *knowledge era* (Leana and Van Buren, 1999), since knowledge gained an increasing importance in management. According to OECD it is the element that is driving *productivity and economic growth*. As a result, it is possible to observe that the resource-based view of the firm has evolved into knowledge-based view.

According to the resource-based view theory, a firm is regarded as an aggregation of resources out of which the company can develop strengths or weaknesses. It means that all the resources and capabilities owned by a company are the strategic assets to reach higher performances and, therefore, they allow the company to gain and sustain a competitive advantage (Penrose, 1959). Indeed, sustainable competitive advantage only comes from strategic assets (Meso and Smith, 2000). Barney (1991) clarifies that there are four empirical indicators that allow to understand the potential of each resource:

- Value: resources are valuable when they enable the company to adopt and follow efficient and effective strategies.
- Rareness: if a large number of firms had the same valuable resources, they could be able to exploit them in the same way by adopting the same strategy. Hence, the resource should not be available to other competitors, otherwise no firm would gain any competitive advantage.
- Imitability: the resource should not be easily implemented by other companies.
- Substitutability: the resource should not have any *strategically equivalent valuable resource that are themselves either not rare or imitable*.

According to the RBV theory, firm resources may include all *assets, capabilities, organizational processes, firm attributes, information, knowledge, etc.* that generate competitive advantage (Daft, 1983). Thus, knowledge is perceived as only of the possible strategic assets for the firm (Barney 1991, Penrose, 1958).

By contrast, knowledge-based view theory recognizes knowledge the most important resource of the firm. This new approach is based on the idea that a sustainable competitive advantage comes from an effective knowledge management strategy. Hence, the organization has to focus on *knowledge application rather than knowledge creation* (Grant,1996).

The RBV focused on the idea of the *transferability* of knowledge between firms (Barney, 1986), while the KBV theory highlights the importance of the exchange of knowledge within the organization itself.

In the last years, the importance of knowledge management is no longer limited to knowledge intensive firms, but to all the industries (Teng and Song, 2011). Additionally, Zack (2003) states that even companies in the most traditional sectors of the economy can take advantage of KM. The role of KM is, indeed, crucial in all the industries, *be it educational, banking, telecommunications, production/manufacturing, and even the public sectors* (Omotayo, 2015).

In this context, a deep study of knowledge is pivotal, as it is the resource through which companies can achieve competitive advantage.

1.6 **The role of intellectual capital**

According to the KBV, knowledge is a very powerful tool, from which companies can gain great benefits. Hence, organizations do not only rely on tangible assets anymore, since intangible

information and knowledge became a major source of competitive advantage (Guthrie, 2001). Knowledge is considered as a commodity in the knowledge economy, therefore the intangible commodity is represented by *intellectual capital*. It is the sum of all knowledge resources possessed by an organization and that give a competitive advantage in the market. Dzinkowski (2000) regarded IC as the *total inventor of capital or knowledge-based resources* possessed by an company. Therefore, IC is the *intellectual properties or intellectual assets transferred by knowledge*. Indeed, knowledge should be able to generate wealth in order to be considered as intellectual capital (Stewart, 1997).

According to Bontis (1998), intellectual capital can be divided in three main components: *human, structural* and *customer*.

First, *human capital* is recognized to be main strategic resource for success and it lies in the tacit knowledge possessed by the members of an organization. It refers to the employees' capacity to generate tangible and intangible assets. It is the combination of different factors, such as *genetic inheritance, education, experience* and *attitude about life and business* (Hudson, 1993). It is a strategic value as it drives innovation and the renewal of knowledge (Bontis, 1998).

Structural capital refers to organizational routines and it deals with all the processes that can support employees in their attempt to optimize intellectual performances within the organization. It aims at creating a supportive culture where individuals are encouraged to produce and share knowledge (Bontis, 1998).

The last component is *customer capital* refers to market relationships. It mainly deals with marketing channels and customer relationship. It is a highly valuable resource for organization, as the ability of understanding what a customer want in a product or a service can be the key of success. It is an intangible asset that concerns the *knowledge embedded in customers, suppliers,*

the government or related industry associations. (Bontis, 1998) Thus, the objective of a company should be to maximize intellectual capital by linking to knowledge management. IC and KM are, indeed, two concepts highly correlated given since they both focus on individuals in the organization. This goal can only be reached if knowledge processes are managed efficiently and with intent. Intellectual capital can be maximized if the organization is able to manage knowledge in a effective way (Zhou and Fink, 2003).

1.7 **Knowledge management Cycle**

As knowledge is a strategic asset for organization and source of competitive advantage, it must be managed in a practical and coherent manner. However, even if the economic context supports a knowledge-based view and knowledge is worldly recognized as the most important asset, many admit that it is not clear how to manage it (Wiig,1993).

Starting from the early 90s, many authors started to individualize and conceptualize the phases of knowledge management. Indeed, a precise and concise framework is pivotal not only for the definition of good strategies for an efficient management of the resource, but also for enhancing the adoption of KM practices.

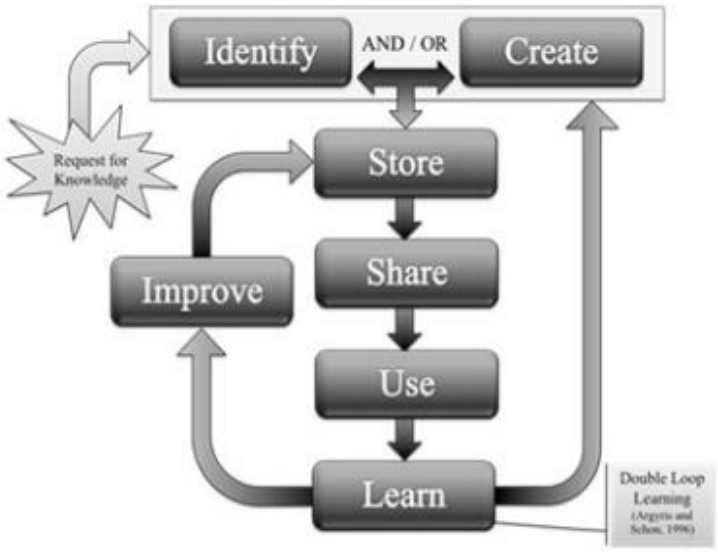

Figure 1.4: Knowledge management cycle
Source: Dalkir (2014)

Based on the major past theories about KM cycles of Meyer & Zack (1996), Bukowitz & Williams (2003), McElroy (1999), Wiig (1993), in 2005 Dalkir offers an integrated KM cycle

Later, in 2014, Evans, Dalkir and Bidian provided an extension of the theory an *holistic view* regarding this topic: *the knowledge management cycle (KMC) model*, which relies on an integration of major previous literature. They recognized seven non-sequential phases, described in order to provide a practical use.

1.7.1 Identify and/or create

Once there is an evident request for knowledge, which may rise from different factors - including *strategic and/or operational problem solving, decision making, knowledge gap analysis or innovation*, a good manager can have two opportunities.

On the one hand, he may observe that the requested knowledge is already held by the organization and, therefore, he has to *identify* it. This stage usually deals with exploring *codified and encapsulated knowledge assets (e.g., documents in electronic and print format stored in a knowledge repository and/or live demonstrations and observations of artifacts)*. Besides, this

phase may also involve other *methods such as network analysis or brainstorming sessions*, in order to identify tacit knowledge existing in-house. Hence, this step is closely related with *storing* knowledge and requires a deep analysis and assessment of the owned assets, in order to determine the *quality* (Meyer and Zack, 1999; Bukowitz and Williams, 1999) and the *relevance of the information extracted*.

On the other hand, when the required knowledge is not identified within the existing resources in-house, it arises the need for knowledge creation. In this stage there might be different processes involved. It may come from R&D project (e.g. *prototyping, information and workflow analysis, or competence and process mapping*) or knowledge can be *imported* through expertes interviewing, joint ventures aimed at technological innovation or people transfer between departments. Additionally, knowledge can also arise from the observation of the *real world*, such us during on-site visit or observing processes after the introduction of a change (Wiig, 1993).

Nonaka (1998) also gave a relevant contribution regarding knowledge creation when he introduced the concept of *ba*, which is the Japanese word for *place*. This concept aims at explaining the enabling context and conditions for knowledge creation. *Ba* refers to a *shared space* where relationships are created and it is considered as the *building foundation* for knowledge. This space can be *physical (e.g., office, dispersed business space), virtual (e.g., e-mail, teleconference), mental (e.g. shared experiences, ideas, ideals), or any combination of them*. The concept of *ba* unifies all these spaces and creates a world in which knowledge is embedded and, therefore, individuals are able to acquire it through *one's experience or the reflections on the experiences of others*. The importance of this *shared space* is pivotal since if knowledge is separated from ba, it evolves into information, which can be shared also outside of

ba. Indeed, information is tangible while knowledge is intangible and, therefore, only resides in *ba*, where information are interpreted and become knowledge. (Nonaka, 1998)

1.7.2 Store

This stage refers to the action of gathering and organizing the knowledge in order to generate an *organizational memory*. Undoubtedly, once the knowledge is created, it has to be adequately held within the organization for the purpose of allowing its sharing in the future. The process of storage can be both *physical* (file folders, printed information) or *digital* (database, online archives, knowledge management software (Meyer and Zack,1996)). It can differ according to the specific features of the information: more explicit forms of knowledge are usually stored into *corporate portals, encapsulating knowledge artifacts, prototypes, patents or intellectual properties*, while it can be more demanding to retain tacit knowledge and it requires the creation of *audits, maps, case studies, videotapes from experts, models or taxonomies*.
The inventory of knowledge has to be sustained in a highly structured and professional manner. Indeed, knowledge cannot be randomly stored, otherwise it would not allow a functional sharing of the resources. Furthermore, knowledge also needs to go through a continuous process of manipulation, retrieval, revision and optimization in order to guarantee an updated and efficient organizational memory.

1.7.3 Share

This phase concerns the processes through which stored knowledge is shared both *internally* and *externally*. It is, indeed, a process through which *knowledge held by an individual is converted into a form that can be understood, absorbed, and used by others* (Ipe, 2003). This step can *pre-established*, meaning that knowledge is shared immediately after it has been stored (much likely to a *"push" approach*), or it can be performed in an *ad-hoc fashion*, according to the specific need of the moment (similar to a *"pull" approach*).

This stage is pivotal and needs to be managed efficiently, since often employees are unaware of it and they end up looking for knowledge outside even if a certain resource is already existing in-house (Bukowitz and Williams, 1999). Hence, a high level of *coordination* and *collaboration* between teams, which allows the creation of a *"who knows what" network* and the direct consultation with *knowledgeable people about difficult problems,* fosters knowledge sharing (Wiig,1993). Knowledge can be accessed through repository of knowledge or *network of expertise*, while more tacit forms of knowledge require different processes, such as *coaching, mentoring, and apprenticeships programs as well as through storytelling, narratives, and anecdotes* (Swap et al, 2001; Peroune, 2007). Besides, it is important to highlight the role of the chosen *medium* or mix of medium through which knowledge is shared. It should not be selected only on the base to the function of the task but it should also be based on the knowledge management maturity of the organization, in order to allow a more timely sharing of knowledge (Dalkir, 2011).

The authors also explain that this phase can be considered as a *bridge between the upstream knowledge 'hunting and gathering' and the downstream putting knowledge into practice*.

1.7.4 Use

Once knowledge has been stored and shared, the organization is able to put in to use and apply it to perform its tasks. However, this step might be quite demanding since even *codified forms of knowledge may not, by themselves, translate into understanding* (Dalkir, 2011) and tacit knowledge is often required in order to extract the real value of the knowledge assets. Hence, there might be the need for the help of an expert, who supports the organization to use the knowledge correctly and efficiently through a process called *recontextualization of knowledge* (Dalkir, 2011).

1.7.5 Learn

The continuous application of existing knowledge can be a great opportunity for the organization as it can lead to the creation of new forms of knowledge. Employees gain experience and become more confident with the new knowledge assets, so that they are able to challenge them and are eventually create new assets. This step allows the company to be addressed toward a better management and growth of knowledge assets. The most common processes used in this phase are *benchmarking, best practices and lessons learned, and knowledge gap analyses*.

1.7.6 Improve

After *learn* phase, knowledge assets are *identified*, *created* or *updated*, so that they can be stored again and be available for the whole organization. According to the KMC model, in this moment the *improve* phase can begin and it deals with different actions aimed at knowledge archiving, retrieval, or transferring outside the organization for further use. Most common activities in this step are *after action reviews, reflection time, and adapting lessons learned*.

1.8 Knowledge sharing

The KMC model has shown the strategic importance of knowledge sharing (KS), which is *basically the act of making knowledge available to others within the organization* (Ipe, 2003). KS aims at the creation of network in organization, since this activity requires both a sender and a recipient of knowledge (Quigley, 2007). KS is considered as one of the most challenging activities for knowledge managers, since knowledge has a limited organizational value if it is not shared (Grant, 1996).

Even if technological evolution of the last years supports this activity, still it can be a quite

challenging because of numerous reasons, that Ipe (2003) tried to sum up in four main key points:

- Nature of knowledge

As it has been mentioned in the previous paragraphs, knowledge can be divided between *tacit* and *explicit*.

Tacit knowledge is extremely difficult to be captured and codified, because of its intrinsic nature that Szulanski (2000) started to refer to it with the term *stickiness*. He also explained that the transfer of tacit knowledge is both *costly* and *time-consuming*. Hence, the characteristics of this of this form of knowledge are a natural obstacle to its sharing within organizations. On the other hand, explicit knowledge, which is easily captured and codified, can be naturally and smoothly shared within an organization.

Furthermore, also the value of knowledge can be a critical factor. Since knowledge is now perceived as a profitable asset for the company and ownership is increasingly becoming important, employees might not be willing to share it as they are likely to claim *emotional ownership* of knowledge (Jones & Jordan, 1998). For instance, it is the case of organization focused on research and development, where knowledge has a critical commercial value, which creates a *dilemma* between knowledge sharing and its retention.

- Motivation to share

As Stenmark (2001) explains, people are not willing to share knowledge without a *strong personal motivation*. In this context, the influencing factors can be *internal* (power of knowledge and reciprocity) or *external* (relationship with the recipient and rewards for sharing).

When an individual consider the knowledge they possess as a source of *power*, they are quite unlikely to share it. In a competitive environment, indeed, knowledge can be perceived as a mean to reach personal goals, therefore, individuals tend to use knowledge for both *control* and *defense* (Brown and Woodland, 1999).

The other internal factor is *reciprocity*, which concerns the mutual exchange of knowledge between individuals. It fosters knowledge sharing if individuals perceive that their chance to gain value depends on what they share with others. On the other hand, reciprocity can have a negative aspect: the *fear of exploitation* (Empson, 2001), which rises when individuals perceive to be asked to share valuable knowledge in exchange of very little or no benefit.

The first relevant external factor is the relationship with the recipient, which concerns two threatening elements: trust and the power and status of the recipient himself.

The first can be a barrier since the sender may have doubts about the real contribution of the others or he may also assume that the recipient might exploit his willingness to share knowledge (Kramer, 1999). On the other hand, the latter is critical as studies show that individuals with low status and power tend to share knowledge with recipients with more status and power, while those with more power tend to share knowledge with their peers (Huber, 1982).

Lastly, the existence of rewards for sharing is highly influential, since O'Reilly and Pondy (1980) assess that individuals will be more likely to share knowledge with a system based on incentives while they will be more unlikely in presence of penalties related to bad performances.

- Opportunity to share

Opportunities to share knowledge in organization can be divided in formal and informal. Formal situations are those in which environment and tools for supporting knowledge sharing are provided. They include *training programs, structured work teams, and technology-based systems that facilitate the sharing of knowledge*. They are, in fact, also called *purposive learning channels* (Rulke and Zaheer, 2000). However, given the nature, they do have one main limitation, as it works effectively only with explicit knowledge (Nonaka & Takeuchi, 1995; Rulke & Zaheer, 2000).

On the other hand, there are informal situation, also known as *relational embeddedness* (Granovetter, 1992). They are characterised by personal relationships, which are developed over time and are based on values of *respect* and *friendship* (Nahapiet & Ghoshal, 1998). Thus, knowledge sharing usually develops naturally and informally. Studies show that it is the channel through which most knowledge is shared; indeed face-to-face communication facilitates the creation of trust.

- Culture of the work environment

It influences all the factors listed above. De Long and Fahey (2000) stated that organizational culture is one of the *major barriers to effective knowledge creation, sharing, and use*. They understood that there are numerous cultural factors that can affect the relationship between different levels of knowledge (*organizational, group,* and *individual*). For instance, corporate

vision is an important component as it both highlights the objectives of the company but also the *organizational values*.[1]

1.9 **Knowledge management strategies**

The choice regarding which strategy to adopt is one of the most challenging for organizations. According to Hansen (1999), there are two main strategy for knowledge management: *codification* or *personalization*. Those companies that follow a *codification strategy* put their focus on codified knowledge, which is stored in computers and databases. This strategy aims at converting knowledge into a more tacit form of knowledge, in order to store into repositories. Therefore, this strategy seems to decant the human capital into the structural capital of an organization. On the other hand, companies that pursue a *personalization strategy* base their KM strategies on human interaction. Indeed, in those organization knowledge cannot be found on computers or database, but it is closely linked to the individual who developed it and it is mostly shared through *direct face-to-face contacts.* This strategy is implemented by sharing knowledge amongst the members of an organization in a social environment *(*Hansen, 1999).

However, choosing the right strategy is not an arbitrary decision and it is not an easy task, since different groups and department of a company may have different requirements and expectations about the form of knowledge to be shared. The decision should be taken on the basis of the specific characteristics of the organization, such as *how it serves its clients, the economics of its business, and the people it hires* . Therefore, the knowledge management strategy should be the reflection of its competitive strategy. If a company creates value for customer through the reuse of reliable and high-quality knowledge, they should be likely to pursuit a codification strategy.

[1] The relationship between organizational culture and knowledge management will be better explored in the following paragraphs.

On the contrary, if a company has customers who have difficult and one of a kind issues, they will adopt a personalization strategy. As a consequence, in the first case profit will rise from the reuse of knowledge after high initial investments in a knowledge asset, while in the second case customers will be willing to pay an higher price for unique and customized solutions (Hansen, 1999).

Therefore, according to Hansen (1999) a wrong choice or the pursuit of both strategies at the same time could undermine the success of a company. Thus, a company should choose one main strategy and just pursue it.

By contrast, Choi (2002) suggests another theory. He distinguishes between a system strategy and a human strategy. The first one can be compared to a codification strategy. A system strategy, indeed, requires the creation of networks through information technology (IT), such as video conference, groupware and virtual reality when it comes to tacit knowledge, while it adopts traditional information processing technologies when it comes to explicit knowledge. Therefore, according to this strategy knowledge can be easily accessed and used by anyone in the organization, through an attempt to share knowledge formally (Choi, 2002). The latter reflects a personalization strategy. It relies on community of practice, discussion group and help task, through an emphasis of *person-to-person relationship* for tacit knowledge, while regarding explicit knowledge, personification strategy aims at the creation of an environment that enhances the transmit of newly created knowledge (Choi, 2002).

The main difference between the two authors regards the choice and adoption of the strategy. Indeed, if Hansen states that only one strategy at time should be pursued, Choi assesses that, according to empirical studies, there are three different option for the adoption of KM strategies: *focused, balanced* and *dynamic*. Focused view refers to the Hansen's idea, for which one main

strategy should be followed while the other should only be used in a supporting role. Balances view suggests that organization should find a correct combination between the two strategies. According to Bierly and Chakrabarti (1996), the right balance can lead companies to be more profitable. The last option is the dynamic view, which suggests that a company should align their strategies with the characteristics of knowledge.

1.10 **Knowledge management systems**

Companies that want to successfully pursue their strategies need to implement effective and adequate KM systems. Knowledge management systems (KMS) are described as a special class of information systems. Dalkir (2005) described KMS as *centralized databases in which employees enter information about their jobs and from which other employees can seek answers. This system often relies on groupware technologies, which facilitate the exchange of organizational information, but the emphasis is on identifying knowledge sources, knowledge analysis, and managing the flow of knowledge within an organization—all the while providing access to knowledge stores*. KMS aim at *supporting creation, transfer and application of knowledge in organizations*.

The concept of KMS has evolved, since they are not also regarded as a support for data transfer. On the one hand, they are now considered as a mean to codify, store, integrate and share knowledge, on the other hand they enhance interaction between individuals in organizations (Alavi, 2001)

Therefore, a company that pursue a *codification strategy* calls for an *information system* which is able to store knowledge and allows its sharing and reuse, while a company that follows a

personification strategy requires a network system that supports sharing of tacit knowledge between employees. Hence, KMS do not necessary imply the role of technology. Indeed, the use of IT depends on which KM strategy is pursued by the organization (Lee, 2002).

1.11 **Knowledge managers and knowledge workers**

Knowledge management requires the interaction of different actors within an organization, however there are two main roles: *knowledge managers* and *knowledge workers*.

The role of knowledge managers deals with the promotion and implementation of knowledge management principles and practices (Dalkin, 2005). The main activities of a knowledge manager include planning, organizing and coordinating knowledge, information, data and knowledge workers. However, since knowledge is different from traditional economic resources, the role of managers is pivotal, since only an effective knowledge management leads to achieve competitive advantage (Asllani, 2003).

Besides knowledge creation and organization, the main focus of knowledge managers lies in knowledge sharing. Therefore, they have to support the creation of an environment in which each member of the organization feels safe to share its knowledge. For instance, managers should arrange networking activities, where employees are encouraged to share knowledge. Moreover, they should also support the creation of *community of practice*[2], which draw attention to informal knowledge and knowledge practices among people who have similar specialization (Lindkvist, 2005).

[2] Communities of practice are groups of people who are *brought together by joining in common activities and by what they have learned through their mutual engagement in these activities* (Lave and Wenger, 1998)

Managers have to develop commitment among organization's members, in order to *motivate the sharing and creation of knowledge based on the knowledge vision* (Nonaka, 2001). Thus, motivation is the biggest challenge for knowledge managers. Liebowitz (1999) highlights that employees are reluctant to share not only for competitive edge reasons, but also because knowledge workers prefer not to use other people's knowledge for the fear of being unable to put their thumbprint on it. According to Tampoe (1993), it is possible to recognize four key motivators on which leaders should act: *personal growth, operational autonomy, task achievement* and *money*.

Lastly, their leadership role should be exploited in order to build *commitment* among employees, since commitment is recognized to be one of the most critical factors for knowledge creation (Thompson, 2005).

Knowledge worker are described as professionals whose main capital is knowledge and who *create, modify, and/or synthesize knowledge as a fundamental part of their jobs*. They are, indeed, *responsible for a contribution that materially affects the capacity of the organization to perform and to obtain results* (Ducker, 1964).

According to Moore and Rugullies (2005), there are three categories of knowledge workers: *dreamers*, whose work deal with the creation of marketing ideas or corporate strategies; *problem solvers*, who act in order to implement strategies built by dreamers and *doers*, who execute those strategies.

Geisler (2007) offers another categorization of workers, since he distinguishes them between *generators, transformers* and *users*. A deeper classification is offered by Reinhardt (2011), who identifies nine categories: *controller, helper, learner, linker, networker, organizer, retriever, sharer, solver, and tracker*.

Knowledge workers are different from traditional workers, since their main task is thinking. Their role became increasingly vital since knowledge economy is based on their job. Therefore, organizations need to retain knowledge workers, since they are a highly valuable resource. In this context, human resource management plays an important role, since HRM practices can support the retention of workers and encourage knowledge creation and sharing (Lee, 1997).

1.12 **The role of technologies**

The digital revolution of 21th century changed the way knowledge is managed. The rise of Information and Communication Technologies (ICTs) offered new solutions to KM process. These new technologies support organizational knowledge management in each stage of the KM cycle, in particular ITCs are highly useful for the creation of virtual community. Indeed, ICT offers the highest advantages when the organization has multiple location and therefore it is geographically separated, or the company is middle-big sized and it is characterized by an elevated level of complexity in its processes.

However, it is not always easy to implement an effective information technology system to communicate knowledge, as it requires the organization to share an *interpretive context*, intended in terms of *knowledge*, *background* and *experience*. The importance of a shared interpretive context specially relevant for more tacit forms of knowledge, which cannot be easily communicated (Zack, 1999).

Organization need to base their strategies according their objectives and, thus, they have to adopt the adequate technologies to reach their goal. According to the segmentation proposed by Zack (1999), technological applications can be divided between *integrative* and *interactive*.

Technologies used in *integrative applications* show a *sequential flow of explicit knowledge into*

and out of a repository, while technologies used in *interactive applications* are mainly focused on supporting interaction among people who hold tacit knowledge.

Integrative applications mostly rely on the interaction between producers and consumers through *repositories* rather than with each other directly. Therefore, the focus is on those repositories and the explicit knowledge they hold, rather than contributor, users and the tacit knowledge they possess. These applications can be divided in two categories labeled as *electronic publishing* and *integrated knowledge base*. The first one is a content that tends to be stable once it is produced and it is passively accepted by consumers. On the other hand, the *integrated knowledge base* relies on the best-practice principle, according to which content is developed through the interaction of member of the community. These applications, for instance, take advantage of the use of World Wide Web, data warehouse or document management systems (DMS).

Interactive applications refer to more tacit forms of knowledge and they vary according to the structure imposed on their interaction. Therefore, application can be referred as *distributed learning* (interaction is mainly between instructor and students) or *forums* (interaction is based on *ongoing, collaborative discussions among the producers and consumers as one group*). These applications, that mostly focus on tacit knowledge, rely on interactive forms of technologies such as videoconferencing or other forms of groupware. (Zack, 1999)

However, authors are still debating about the effective role that information technology can play for knowledge management. Even though IT is supporting the development of a better KM system, there is a worrying tendency to invest more in IT rather than in human capital. This attitude can be dangerous since it leads toward *objectifying and calcifying knowledge into static, inert information, thus disregarding altogether the role of tacit knowledge*. Therefore, managers are required to reach a good balance between the pivotal support of IT to KM objectives and the

limits of technology, which is not able to be effective without the interaction with human capital (Borghoff, 1997).

1.13 **Organizational culture**

1.13.1 Definition of organizational culture

Organisational culture, according to Schein (1985), can be defined as *a pattern of shared basic assumptions – invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration – that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems.* He also highlights a *growing interest in the cultures of small coherent units within organizations*. Those units are intended as a sort of subculture that are different from the main organization (Schein, 1985).

According to Deal and Kennedy (1982), organizational culture is regarded as the interaction of a connected set of cultural elements, which are *history, values and beliefs, rituals and ceremonies, stories, heroic figures and the cultural network*[3]. The authors believe that the above elements build the corporate cultural.

Even if most literature agree with this explanation, Schein (1985) tries to put some bounds in order to explain the structure of corporate culture, indeed he identifies three main levels of organizational culture: *artifacts, values* and *basic assumptions*. *Artifacts* are those elements at the surface, they are the visible elements of the culture. Thus, they are quite easy to observe, however they can be hard to decipher. The dress code, the inside jokes, the office layout and all

[3] The culture network is intended as the space where knowledge is exchanged. Deal and Kennedy recognize five main players in this network: *storytellers*, *gossipers*, *whisperers*, *spies* and *priests and priestesses*.

the elements that are easily noticed even by an outsider can be included in this category. *Values* are regarded as the *espoused justification*, they include the declared norms, ideologies, charters and philosophies. They do influence the behavior of the members of the organization and how they represent it. Last, the *basic underlying assumptions* are the essence of the culture. They are the least visible element of the organizational culture, but they are the most influential. Indeed, they include those beliefs and behaviors that are so embedded in an individual that they end up being unnoticed. (Schein, 1992)

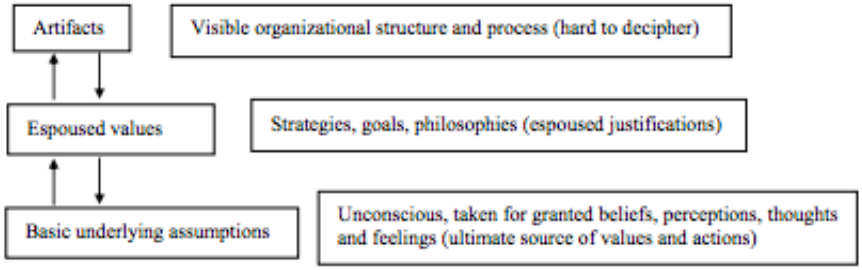

Figure 1.5: Structural model of culture indicating different levels of culture
Source: Schein, 1992

1.13.2 Organizational culture models

Different authors tried to define an organizational culture model, however different approaches were used. Below, two of the main organizational culture models will be described, the first one was proposed by Deal and Kennedy (1982), while the other one was developed by Quinn and Cameron (1985).

According to Deal and Kennedy, the corporate culture is determined by the outside influences. Therefore, this model has two key dimensions: the degree of risk of the company's activity and the rate of feedback on whether a decision or strategy is successful.

The *tough guy/macho culture* is characterized by high risk and fast feedbacks. It's the typical culture of sales-orientated organizations, such as constructions, management consulting and

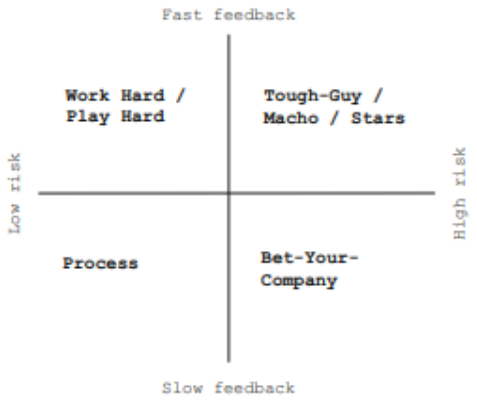

Figure 1.6: Deal and Kennedy's culture model
Source: Deal and Kennedy (2000)

venture capital, where managers are required to take quick and risky decisions. This culture is a *world of individualist* and it is based on the idea of a strong *internal competition*, since employees have to be resilient in order to survive.

The *work hard/play hard* culture is characterized by a low degree of risk and quick feedbacks. Therefore, everything is based on the constant activity and work, since *success comes with persistence*. This culture is typical of large organization, such as telecom, motor industry, IT and big retailer stores.

The *bet-your-company* culture is identified by *high risk, but slow feedbacks*. Long term projects in construction or aerospace industry are an example of organization holding this culture. The slow feedbacks are not related to a lack of pressure, instead the pressure is constant and persistent because projects are significantly risky.

The *process* culture is described as *a world of little or no feedback where employees find it hard to measure what they do; instead they concentrate on how it's done*. This environment can be dangerous, since employees can be very defensive and afraid to be attacked if they have done things improperly. This organizational culture is typical of banks and financial services. (Deal and Kennedy, 1982)

As the authors themselves have admitted, this model can be a bit simplistic, however it can be considered as a good starting point for further studies.

Few years later, Quinn and Cameron proposed a new framework in which they categorize four cultural types: *clan, hierarchy, market* and *adhocracy*.

The *clan culture* is characterized by a very friendly working environment, where members have a lot in common and they do share the same values, beliefs and goals. The clan organization recalls a family, where the leader is considered as a mentor or a father. The organization has a very high level of engagement, and *teamwork, participation or consensus* are considered very valuable.

The *hierarchy culture* is typical of an organization where there is a very structured and formalized working environment. All the pre-established procedures determine what people do, indeed this culture arises when the *environment is relatively stable*. Leaders coordinate and organize all the activities through *formal rules and policies*, which are pivotal for an efficient hierarchy culture.

The *market culture* assumes that the external environment is hostile, thus it is concentrated on competition. It mainly focuses on *productivity, results and profits*. Leaders are producers and

competitors, who are tough and demanding. Success is measured in terms of market penetration and share; therefore the workplace is *result-oriented*.

The *adhocracy culture* is characterized by a dynamic, entrepreneurial and creative working environment. It typical of temporary and specialized organizations. Leaders are visionaries and innovators, who call attention to *new knowledge, products and services*. (Quinn and Cameron, 1985)

1.13.3 Knowledge management and organizational culture

The role of organizational culture is pivotal as it influences values, norms and practices, but it also shapes how knowledge is created, shared and used in organizations. Culture, indeed, influences the behavior of individuals, that will determine the outcomes of organizational knowledge.

De Long and Fahey (2000) recognized four frameworks through which they explain how culture affects knowledge management. First of all, culture can influence which type of knowledge is recognized to be the most *useful, important or valid* for the organization. Thus, the employees of certain firms will perceive human knowledge as the most relevant, other will consider structured knowledge more valuable. Besides, there might arise these types of conflicts even within the same organization, if there are subcultures[4]. The presence of subcultures can lead their members to have different views of knowledge. This behavior is quite dangerous since it can induce

[4] Subcultures can be defined as a distinct group or unit within an organization, that exhibits a unique sets of value, norms and practices, which are different from the organizational culture to which it belongs. A subculture can be a specific department, such as R&D, sales, engineering, or groups at different levels of management, or teams in different geographical regions.

miscommunication and conflicts regarding strategies and goals in knowledge management. Thus, managers have to act in order to smooth out these differences in the evaluation of knowledge.

Secondly, culture defines the relationship between different levels of knowledge, by determining *what knowledge belongs to the organization and what knowledge remains in control of individuals or subunit*. This aspect is particularly relevant for knowledge sharing, when management tries to persuade employees to share their human knowledge, in order to have it stored into databases. Often, individuals are not willing to share since they fear to lose the ownership of the knowledge they previously controlled. Thus, cultural norms and practices affect the relationship between organizational and individual knowledge.

Thirdly, culture creates the organizational context for social interaction. Rules and practices define the working environment in which individuals communicate. Therefore, the interaction between employees also affects knowledge creation, sharing and use. The impact of culture on the context for social interaction is also relevant as it determines how all types of knowledge will be applied in a particular situation, by establishing the norms and *shaping people's perception of their range of options acceptable to the organization*.

Fourthly, culture shapes how new knowledge is *created, legitimated (or rejected), and distributed throughout the organization*. New knowledge can derive from an *external source*, in the form of structured knowledge, or it can be *created internally* by taking information from the outside and *interpreting it in the context of the firm's existing knowledge*. However, the ability of an organization to elaborate external inputs in order to create new knowledge is particularly relevant, since it can actually lead to strengthen the competitive position of the firm. Companies, which are specifically good at it, usually share four main characteristics related to their

organizational culture. They expect knowledge from external environment *to be the starting point, not the end of innovation*. Moreover, *intense debate, high levels of participation* and a continuous *challenge the existing assumptions and beliefs* are highly encouraged in order to be more efficient at generating new knowledge from external sources. (DeLong and Fahey, 2000)

1.14 **Knowledge management and innovation**

1.14.1 Definition of innovation

Even though innovation is a trending term in our society, there still is a debate regarding its definition. Chen (2004) refers to innovation as the *introduction of a new combination of essential factors of production into the production system.* According to Herkema (2003), innovation is a *process* which aims at creating new information to contribute to develop marketing and commercial solutions. Moreover, Gloet and Terziovski (2004) described innovation as the *implementation of discoveries and interventions and the process by which new outcomes, whether products, systems or processes, come into being*. Innovation can also be defined as *creation of new knowledge and ideas to facilitate new business outcomes, aimed at improving internal business processes and structures and to create market driven products and services* (Du Plessis, 2007). However, most of the strategic management literature agree that innovation is a *critical enabler* for organizations to create value and sustain competitive advantage (Subramaniam et al., 2005).

Hence, the development of an efficient innovation strategy is pivotal for the survival of the company. Innovation process can be quite complex and needs to be managed properly, still

Adamides (2004) tried to divide it into four phases in order to provide a better understanding. First, there is the *scanning phase*, which deals with an analysis of ideas on taking advantage of internal or external opportunities. The following phase is the *strategy development*, in which the organization decides what to do with the concepts they previously analyzed. The third phase deals with the evaluation of the *required resources* to implement the new strategy, this stage may require solving dilemmas such as make or buy. The last phase regards the *implementation* of the strategy itself and it is achieved through *actual development activities, such as design, prototyping and testing*. (Adamides, 2004)

Authors usually divide innovations in two categories: *radical* and *incremental*. The first type refers to those radically innovative and creative solutions, which are likely to be *competence-destroying*. Radical innovations often require a clear change in the managerial practices and they can represent a big risk for the company, however they are pivotal for the long-term success of the firm. On the other hand, incremental innovations are regarded as a *line extensions or modifications of existing products*, thus they can be labeled as *market-pull innovations*. They exploit and enhance existing internal knowledge; therefore they do not require significant structural changes in the company (Du Plessis, 2007).

1.14.2 The role of technologies in innovation

Additionally, it is relevant to underline the role of information technology for collaboration and knowledge management in the innovation process. On the one hand, IT supports the communication and collaborative process, which lead to innovation. On the other hand, IT ensures the creation of a corporate memory, which is the starting point of innovation. However, IT offers different solution to sustain innovation process through collaboration. These technologies can be categorized in three main groups: *idea-exchange systems, work-process*

oriented systems, and problem-solving oriented system. The first category includes *systems that implement forums for the exchange of messages and attached documents through an appropriate infrastructure*. These systems ensure both the communication through conferencing platform and the sharing data and documents.

In the second class belong *systems for the controlled execution of routine sequences of work tasks through a shared work space of available tools and associated artefacts*.

The third category *takes into account explicitly the intellectual processes of idea creation, decision-making, negotiation and argumentation*. These systems usually deal with the use of *modeling formalisms* to represent a problem. (Adamides, 2004)

However, technology itself is not enough to lead to innovation, it is also required a focus on human resources management which assists in creating a strong corporate culture. Thus, the studies of Gloet et al. (2004) show that there is a *significant and positive relationship between KM practices based on a combination of IT/HRM and innovation performance*. The best solution to achieve a long-lasting competitive advantage through innovation, indeed, follows an integrated approach.

1.14.3 Knowledge management and innovation

Knowledge management and innovation are two concepts closely linked, as KM contributes to create a favorable environment for innovation. According Du Plessis (2007), the existing literature presents three main drivers of the application of knowledge management in innovation. The first driver of applying knowledge management to the benefit of the innovation process concerns the creation and sustain of *competitive advantage*, which is increasingly challenging in

today's in business environment. Indeed, knowledge management plays an important role, since it facilitates internal *collaboration*, which eventually leads to innovation.

Secondly, knowledge helps to *reduce complexity in the innovation process*. Thus, knowledge becomes a resource from which innovation is dependant. According to Cavusgil et al. (2003), the most successful companies in innovating are, in fact, those that are able to create and use knowledge in a rapid and effective manner.

The third driver regards the *integration of knowledge both internal and external to the organization, thus making it more available and accessible*. Knowledge integration[5], supported by KM tools, should enhance *personal and organizational learning and innovation*. (Du Plessis, 2007)

Furthermore, knowledge management is crucial in the innovation process as it plays different vital roles, which Du Plessis (2007) tried to sum up in five major functions. First of all, knowledge management enables the *sharing and codification of tacit knowledge*, which is recognized to be a critical resource for the organization. Given its characteristics, tacit knowledge is particularly difficult to access, therefore it can represent a barrier to innovation. The importance of sharing tacit knowledge is particularly relevant in developing fields where there is a lack of available explicit knowledge. Here innovation is supported by *collaboration and learning-by-doing capabilities*, which enhance the access to more tacit forms of knowledge. (Du Plessis, 2007)

[5] Grant (1996) defines knowledge integration as a *process* through which the *specialized knowledge* of individuals is coordinated in the organization.

Secondly, knowledge management plays a role associated with explicit knowledge. Indeed, innovation is supported by the *conversion of tacit and explicit product and process knowledge into explicit models*. (Du Plessis, 2007)

The third major role that KM plays in innovation is related to the *enabling of collaboration.* Collaboration, which can be both internal and external to the organization, is particularly important for the transfer of *tacit knowledge and building collective know-how*. The availability of tacit knowledge helps innovation also in terms of risk, indeed it *shortens the development cycles and ensures effective innovation* (Cavusgil et al., 2003).

The fourth major role of knowledge management is managing various activities in the knowledge management lifecycle. It is considered vital since KM assures that *knowledge required in the innovation process is available and accessible*. (Du Plessis, 2007)

The fifth major role is related to the creation of an internal organizational culture that *supports creativity and fosters innovation* (Gloet and Terziovski, 2004).

1.14.4 Organizational ambidexterity: exploitation vs exploration

Innovation processes can induce organizational issues linked to a tension between *exploitation* and *exploration*. Exploratory innovation deals with the *experimentation of new alternatives* and involves the development of new knowledge through experiments that lead to more radical innovation. On the other hand, exploitative innovation concerns the *refinement and extension on existing competencies, technologies, and paradigms*. It aims at improving the existing knowledge and it tends to generate incremental innovations. The trade-off between exploitation and exploration represent a critical factor for the company, since studies show that the ability of a company *to exploit its current capabilities while simultaneously exploring fundamentally new*

competencies leads to sustain efficiency in the short term and innovation in the long term (March, 1991).

However, achieving the right balance between exploitation and exploration is quite complex and represent a demanding task for management. This tension can be managed in two way, indeed a firm can either decide to follow *temporarily alternating both learning modes* or *ambidexterity*, which is the concurrent pursuit of both exploration and exploitation. Indeed, *ambidextrous firms are able to both generate and manage familiar, mature, current or proximate knowledge (exploitation) and unfamiliar, distant and remote knowledge (exploration)* (Filippini, 2012).

Organizational ambidexterity is recognized to be the best mean to manage this innovation tension, but it is quite challenging. Literature suggests that it can be achieved in two different ways: *structural or contextual*. A *structural ambidextrous* firm tends to physically divide exploratory units (e.g. R&D) from exploitative units (e.g. production and sales) in order to develop the appropriate contexts for each learning mode (Filippini, 2012). On the other hand, *contextual ambidexterity* based on the creation of a *set of processes or systems that enable and encourage individuals to make their own judgments about how to divide their time between conflicting demands for alignment and adaptability* (Gibson and Birkinshaw, 2004). Contextual ambidexterity is more likely to use more behavioral and cultural rather than structural means to integrate both learning modes. Thus, according to Gibson and Birkinshaw (2004), this approach is the best one since it focuses on social and interpersonal relationships, which help actors to *think and act ambidextrously*.

The innovative tension between exploration and exploitation can represent a real *paradox* rather than a dilemma or trade-off. However, those innovation paradoxes should be tapped into its

energizing potential, as it is not essential to eliminate them. Managers should take advantage of *integration* or *differentiation* tactics in order to boots ambidexterity and foster innovation (Andriopoulos, 2008).

1.15 **Organizational learning**

Organizational learning (OL) is a concept strongly related to knowledge management, however, before exploring their interconnection, it is important to deeply understand the meaning of organizational learning.

1.15.1 Definition of Organizational Learning

Organizational learning is a debated term, thus there is no unequivocal definition. Simon (1991) even assesses we should *not to adopt too strict a definition of organizational learning, or we will define our topic out of existence*. It can be defined as the *collective phenomenon of the acquisition and development of cognitive and behavioral skills, knowledge and know-how, resulting in a more or less profound and durable modification of the way organizations are managed* (Koenig, 1994). Fiol and Lyles (1985) describe it as *the process of improving actions through better knowledge and understanding*. According to Cook & Yanow, 2001 OL refers to the *capacity of an organization to learn how to do what it does, where what it learns is possessed not by individual members of the organization but by the aggregate itself …the acquiring, sustaining and changing, through collective actions, of the meanings embedded in the organization's cultural artifacts (the means through which all organizational action is carried out).*

The discrepancy between definitions stems from the different approaches to OL adopted by authors.

On the one hand, part of the existing literature assumes that there only is mere individual learning and a company cannot learn as a whole as all learning only occurs inside *individual human heads*. According to Simon (1991), for instance, an organization can learn is only two ways: *by the learning of its members* or by exploiting new knowledge from new members. He believes that individual learning is a social phenomenon, since what an individual learns in an organization can be influenced not only by what he already knows but also by what other members know and the available knowledge in the environment.

On the other hand, Fiol and Lyles (1985) consider organizational learning as more complete than individual learning. According to the authors, individual learning cannot be considered as the simple *sum of each member's learning*. Even though organizational learning develops through individuals, only organizations are able to *maintain learning systems that not only influence their immediate members, but are then transmitted to others by way of organization histories and norms*. Moreover, Hedberg (1981) highlights that only organizations are able to preserve *certain behaviors, mental maps, norms, and values over time* through its *cognitive systems and memories*, while individuals are temporary entities.

Thus, according to Fiol and Lyles (1985), there are different levels of learning, which can be divided in: individual, group, organizational and inter-organizational. Individual knowledge is the first level at which learning occurs. Individual learning generates new knowledge that individual can choose to share or not. When it is shared it is amplified and it becomes organizational knowledge (Nonaka and Takeuchi, 1995).

Group learning is the next step in which learning can occur. A group can be a department, a project team or a social group. When individual learning is shared with all the members of the group, it is considered group learning.

Organizational learning refers to the result of the process during which individual learning is shaped with the culture and functions of the company.

Inter-organizational or network learning is a *process through which network actors learn how to collaborate and how to share and create knowledge*. The efforts toward the creation of a common knowledge is typical of organization such as joint ventures, alliances and strategic groups (Mariotti, 2012).

1.15.2 Learning organizations

The concept of organizational learning has evolved into learning organization. Even if both terms are similar and refer to the process of learning. Organizational learning regards the activities and processes through which a company can eventually become a learning organization.

Senge (1990) describes learning organizations as entities *where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together*. The author recognizes that learning organizations practise five main disciplines: , *personal mastery, mental models, shared vision, team learning* and *systems thinking*.

Personal mastery is the personal commitment of each individual towards learning. This discipline allows to clarify and better analyze the personal vision of each individual.

Mental models are *conceptual frameworks consisting of generalizations and assumptions* that enable individuals to understand the world and take action in it. It focuses on the *openness needed to unearth shortcomings in our present ways of seeing the world*.

Shared vision is seen as the final goal of the organization, toward which each individual take action in order to accomplish it as part of the organization. It is not usually imposed by few individuals, rather it derives from all the members of the organization through the creation of *common interests* and a *sense of shared purpose*.

System thinking is considered as the most important discipline, because it is the integration of the four other elements. This concept refers to the idea that organization is a *system* where each action does not only have consequences on the single individual, but it affects the whole organization. Hence, it is crucial to take into account this interrelationship and interconnectedness among the parts of the system. (Senge, 1990)

1.15.3 Types of organizational learning

Literature suggest that there are different categories of organizational learning. According to Argyris and Schon framework, learning can be divided in three types: *single-loop, double-loop* and *deutero learning*. In order to better understand the meaning of each concept, it is convenient to recall the definition of learning for the authors, they refer to OL as a *process of detecting and correcting error*. Thus, *single-loop learning* is the process that *enables the organization to carry on its present policies or achieve its objectives*. This type of learning requires a strong sense of organizational culture. All the members have to share the same *goals, values, frameworks and, to a significant extent, strategies are taken for granted*.

The *double-loop learning* usually takes one more step. Indeed, it occurs when an *error is detected and corrected in ways that involve the modification of an organization's underlying norms, policies and objectives*. It means that company's culture is being questioned. Thus, double-loop learning asks *questions not only about objective facts but also about the reasons and motives behind those facts.* (Argyris and Schon, 1996)

The last category is the deutero-learning, which is considered the highest form and can be considered as *learning to learn*. It deals with *the behavioral adaptation to patterns of conditioning at the level of relationships in organizational contexts*. Deutero-learning is quite different from the first two types of learning, since it is mostly unconscious and continuous (Visser, 2007).

1.15.4 Organizational learning framework

The *4I framework* is a model developed by Crossan, Lane and White in 1999 as a dynamic process of strategy renewal. It identifies four related process, which are *intuiting, interpreting, integrating, and institutionalizing*, that occurs over three different levels: individual, group, and organization. Intuiting and interpreting occur at the individual level, interpreting and integrating happen at the group level, and integrating and institutionalizing occur at the organizational level. These processes keep the structure of the organization together, indeed the model is based on *feed-forward and feedback processes* across each company's levels.

The first process is labeled *intuiting*, which is defined as the *preconscious recognition of the pattern and/or possibilities inherent in a personal stream of experience*. It is a *pattern of recognition* with a subconscious and pre-verbal nature, therefore it is critical as it allow to

understand how people learn something new. Intuition can be divided in *expert* and *entrepreneurial*, the first one supports exploitation while other one supports exploration.

Interpreting is the process in which there is an *explaining, through words and/or actions, of an insight or idea to one's self and to others.* This step acts as a bridge between individual and group levels, indeed it enables the shift from preverbal to the verbal and requires the development of a common language.

The following process is *integration* and it deals with the development of a shared *understanding amongst individuals and the taking of coordinated action through mutual adjustment*. This process requires interactive systems such as dialogue and joint action, in order to mediate the transformation from informal to institutionalized.

The last process, which is *institutionalizing*, deals with *ensuring that routinized actions occur*. This process sets *learning that has occurred by individuals and groups into the institutions of the organization including systems, structures, procedures, and strategy*.

The model shows that organizational learning has a highly dynamic nature. Thus, the framework involves a *tension between assimilating new learning (feed forward) and using what has already*

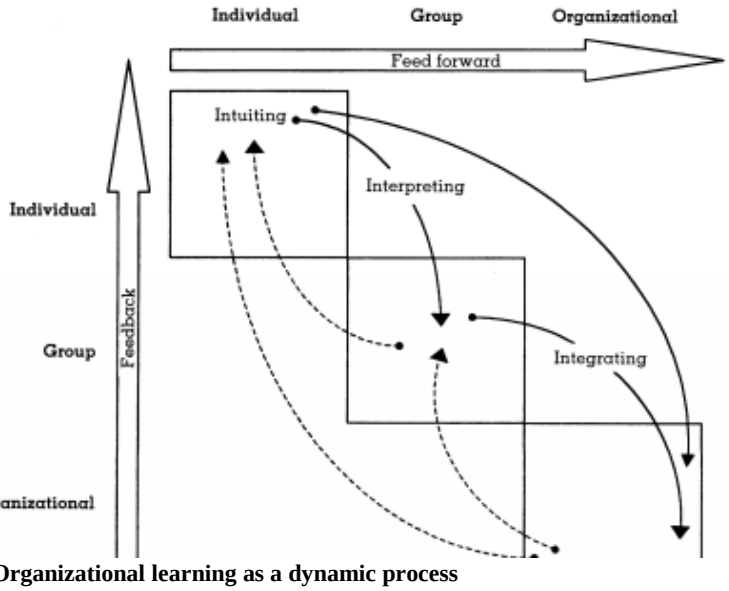

Figure 1.7: Organizational learning as a dynamic process
Soruce: Crossan (1999)

been learned (feedback). The cells in the upper right area include the feedforward learning processes that move from individual to group to organization, while the cells in the lower left area represent feedback—the impact of organization learning on individual and group learning (Crossan et al., 1999).

1.15.5 Influencing factors of organizational learning

Fiol et al. (1985) tried to recognize the main *contextual factors* that can affect the success of the organizational learning process. They grouped four main factors: *corporate culture, strategy, organizational structure* and *environment*.

Organizational *culture* deals with beliefs, ideologies and norms that shape the strategic choices of the firm. Thus, these norms have an impact on the *behavioral and cognitive development* that a company can undergo. Therefore, *change and/or learning in organizations often involves a restructuring of those broad norms and belief systems*. (Fiol et al., 1985)

The strategy, by defining goals and objectives of the company, allows flexibility. It can influence learning since it sets a *boundary to decision making and a context for the perception and interpretation of the environment*. Moreover, strategy creates and sustains a *momentum* to organizational learning. (Fiol et al., 1985)

The *structure* of the company has a strong impact on OL, even if it is often perceived as an outcome of learning. Indeed, *formalized and complex structures retard learning but that learning is enhanced by structures that diffuse decision influence* (Meyer, 1982). Hence, decentralized structures tend to support organizational learning, as opposed to more centralized structures.

The last contextual factor is the *environment*. Hedberg (1981) highlights that *learning requires the both change and stability... between learners and their environments*. Indeed, too much

stability can lead to the absence of a real growth and learning, while too much change can create difficulties for learners to map their environment.

1.15.6 Knowledge management and organizational learning

The relationship between knowledge management and organizational learning is highly debated, since this field of study is continuously developing, rich of diversity which generates discussions about it. Hence, literature offers a rich variety of theories. On the one hand, some researchers assess that knowledge management is a subset of organizational learning, while others consider knowledge management as a concept beyond organizational learning boundaries (Ponzi, 2002).

King (2009) perceived organizational learning as the goal of knowledge management. Indeed, *organizational learning is one of the important ways in which the organization can sustainably improve its utilization of knowledge*.

Easterby-Smith and Lyles (2003) highlights that there is one main dichotomy between the two concepts, since knowledge is more focused on *content* rather than organization possesses, while learning deals with the *process* through which content is acquired. Thus, learning is more about taking action. It relies on the information that are gathered to sustain the knowledge management system, and then on the use of that knowledge to improve the organization.

McElroy (2004) considers the concept of KM and OL tightly connected as both fields are mostly the same. He states that *KM and OL should join forces and develop a unified discipline. KM needs OL and its expanding body of good research work. OL needs the practitioner base of KM and its abiding interest in problems and practice*.

2 Chapter 2: Project-based Organization

The shift towards a knowledge-based economy led to a diversification of knowledge and competences, which became a key element for the creation of new products, services and new business models. Many companies shifted from a mass production to the *current situation where every product or service may be supplied against a bespoke design, and technology changes continuously and rapidly* (Turner, 2001). Hence, the new challenge is to be able to organize and manage this new form of innovation in fast growing industries. In this context, where knowledge leads to success, there is a need for open organizational systems, in which management is able to integrate knowledge, competences and internal resources with those coming from the outside (Hobday, 2000).

This new environment required a change in the organizational and managerial models, which has been found in the *project-based organization*.

In the following chapter, the deep literature review will allow to have a better understanding of the concept and mechanisms of the PBOs.

2.1 **Definition of project**

Projects have been adopted since ancient times, in order to achieve objectives that led to important results to society and culture. This form of organization is typical of a variety of different industries; indeed, it is often used in private manufacturing enterprise, but also in other organisations (public and private) including the legal profession, consultancy firms, marketing, the film industry, and advertising. Projects are adopted in order to perform *any activity with a defined set of resources, goals, and time limit* (Hobday, 2000).

Moreover, literature about organizational studies is showing an emerging interest regarding the process of *projectification*. It should not be intended as a mere managerial fad, but also as a multifaceted phenomenon that can influence project work. Projectification can be described as a *series of restructurings whereby traditional functional structures are gradually transformed into heavyweight project forms and projects become increasingly autonomous and customer-focused*. It is highlighted that it can have negative consequences, such as the *danger of re-bureaucratisation, neglecting the need for integration of projects into programmes or portfolios, limited time for knowledge development, overwhelming deadline stress, and lack of trust and social continuity*. However, above all, projectification allows to identify the *basic structural tenets of project-based organisational forms and the conditions associated with the gradual restructuring of former functional organisations* (Packendorff, 2014).
Hence, it is a crucial process that make be taken into account in the current environment, which is increasingly characterized by projects.

A project was first defined by Turner as *an endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives* (Turner, 1990). Later he provided an revised definition of project. He stated that a project is a *temporary organization to which resources are assigned to undertake a unique, novel and transient endeavor managing the inherent uncertainty and need for integration in order to deliver beneficial objectives of change* (Turner, 2003).

Both definitions allow to understand that a project has four main features: *they represent a unique, once-in-a-lifetime task; with a predetermined date of delivery; being subject to one or*

several performance goals (such as resource usage and quality); consisting of a number of complex and/or interdependent activities. (Packendorff, 1995)

The temporary nature of project creates huge challenges for this type of organization, since achieving the goal of the project requires a high level of coordination among all the actors involved.

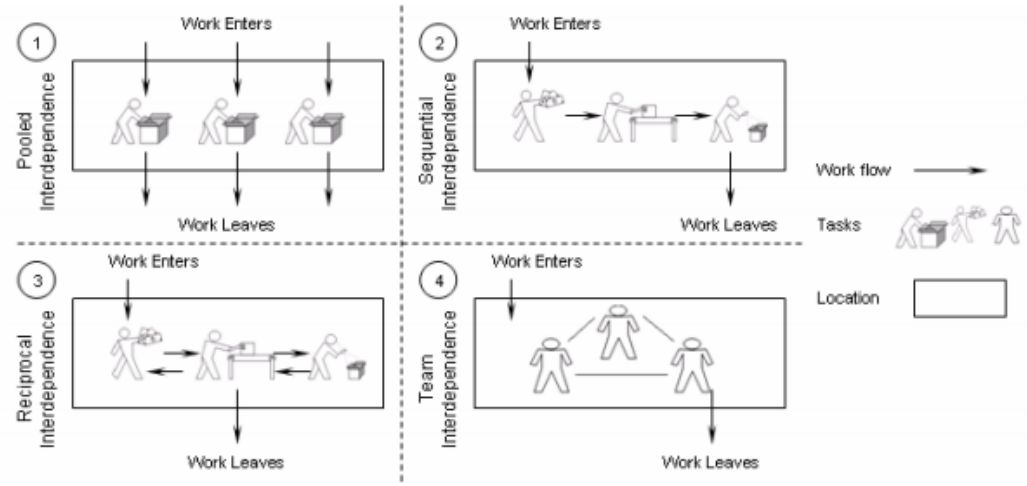

Figure 2.1: Types of task interdependence
Source: Thompson, 1967; Van de Ven, 1976

The importance of coordination in project environment is also emphasized through Thompson's model of *interdependence*. His studies concern how a project can be delivered and how all its activities need to be effectively coordinated, since each unit of the organization affects the performances of the others. He distinguishes three types of interdependence: *pooled, sequential* and *reciprocal*. The first category, *pooled interdependence*, has the lowest level of relationship intensity, since each unit works independently in performing its *task*. There is no interaction between the different departments, however the task of each unit contributes to complete the project. Hence, it can be seen as an *indirect dependence*, since it does not require a high level of coordination. (Thompson, 1967)

Sequential interdependence involves a higher level of planning and scheduling. Indeed, it takes place when one the *output* produced by one unit is absolutely necessary for the performance of the next unit. Therefore, the project is developed through the sequential execution of each *task.* An example of sequential interdependence would be an assembly line. (Thompson, 1967)

Reciprocal interdependence is the most complex and challenging because it requires very high level of coordination. It involves a cyclical network, since the product of first unit is the output of the following one, and at the same time the output of the second unit is the input for the first unit. This tight interaction between workers calls for an effective internal communication. Moreover, the adequate coordination can be achieved with constant information sharing, feedback system and progressive adjustments. (Thompson, 1967)

Additionally, Van de Ven (1976) extended Thompson's model by adding team interdependence. It occurs when *the work is undertaken jointly by unit personnel who diagnose, problem-solve and collaborate in order to complete the work* (Van de Ven, 1976).

Thus, the complexity of projects and its specific features call for a specific type of management.

Therefore, *project management* is the growing discipline, which regards *the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements* (PMBOK, 2004).

The activities of project management usually include: *initiating, planning, executing, monitoring and controlling and closing*. Each activity corresponds to a step of a project. (PMBOK, 2004)

2.2 **The project-based organizations**

Literature offers numerous definitions of the term project-based organization, but they mostly agree that it is an organizational form where the project is pivotal, and the functional structure is almost absent. Indeed, Hobday (2000) assess that the PBO is a structure *in which the project is the primary unit for production organisation, innovation, and competition* and there is a lack of *formal functional coordination across project lines*. However, this definition has some limitation, since it focuses too much on the core activity of the organization by ruling out the possibility for other activities. Therefore, Lindkvist (2004), who believes that functional coordination might also exist in PBOs, described them as companies that *privilege strongly the project dimension and carry out most of their activities in projects*. On a similar note, Whitley (2006) suggests that a PBO is a firm that *organize work around relatively discrete projects that bring particular groups of skilled staff together to work on complex, innovative tasks for a variety of clients and purposes*.

However, these definitions still seemed too vague. Therefore, in order to shed light on it, Söderlund (2000) categorized *four ideal types of organisations depending on the one hand on the permanency/temporality of the structure, and on the other hand on the permanency/temporality of the employment contracts*. Thus, according to his typology, project organisation refers to a *situation where people have permanent employment contracts in an organisation that is characterised by work in temporary project constellations*. Eventually, in his further studies, he provided the ultimate definition of PBO, which he describes as *an organization in which core activities – that is, the activities that are primarily directed toward the creation of products or services, which constitute the base for the organization's rationale and revenue stream – are performed by means of projects*. (Bredin and Söderlund, 2013)

Bredin (2008) recognized a set of common features that better allows to define and understand the nature of project-based organizations.

- *Knowledge intensity*

  Since a PBO performs most of its core activities in projects, the project form is the most effective for carrying out its operations. Studies show that this organizational form stems from the rising of the *knowledge economy* and *need to integrate knowledge resources in a fast and flexible way in order to reach a defined goal in a certain time*. Therefore, project-based organizations are characterized by an high level of knowledge intensity, since *competence and skills of employees have more importance than other inputs*, and *the majority of employees are highly qualified*, and *the work involves complex problem-solving*. (Bredin, 2008)

- *Cross-functionality*

  The specific nature of projects implies the creation of cross-functional teams, which *integrate competencies across functional lines*, indeed they include members that have different specialities and different competence bases. Therefore, a project-based work system requires a *focus on cross-functional work in projects instead of functional departments for carrying out core activities*. Cross-functionality can lead to the creation of *decentralised team working and relatively autonomous project managers* - thus, it is indispensable a high level of coordination. (Bredin, 2008)

- *Temporality*

  In a project-based organization, *project work is routine rather than the exception*, even if each project is unique and operations are not standardized. Thus, members carry out most of their tasks in time-limited temporary projects. According to Packendorff (2002), *individuals working by projects experience a long-term trajectory consisting of a long series of projects*. The temporary nature of projects involves the encounter of high variety of new different people and the creation of new relationships whenever a new project started. Hence, it requires coordination and adaptability in order to manage the resources, which are always changing. (Bredin, 2008)

- *Tension between permanent and temporary systems and logics*

  A project-based organization is considered as *a permanent organisational framework in which temporary projects are embedded*. In this regard, according to Sydow (2004), it is pivotal to recognize *the contextual embeddedness of temporary systems in the more permanent and - above all - the related inherent tension between permanent and temporary systems and logics in such organisations*. Indeed, on the one hand, projects can lead to the integration of different competencies across functional lines. Moreover, they enable the organization to concentrate its activities towards achieving the goal of the project within the set amount of time and to sustain a high level of *organizational flexibility* required to face the changing needs of the external environment. Instead, on the other hand, as it is shown in the study of Hobday (2000), if a PBO does not master functional coordination, it is *inherently weak in coordinating processes, resources and*

capabilities across the organisation as a whole. Therefore, project-based organization have to deal with the *dilemma of the conflicting needs of the temporary projects and the permanent organisational setting that defends long-term development as well as routines and interorganizational coordination* (Bredin, 2008).

- *Heterogeneity in employment relations*

  In PBOs, the relationship between employees and the organization is quite peculiar, since *people are employed by the organisation and not by individual projects*. Thus, their relationship is supposed to go beyond the single project. Still, *being 'employed' does not necessarily equals having a permanent employment contract in the PBO*. Indeed, as Whitley (2006) assesses, sometimes PBOs may rely on external individuals for performing a specific task, while all the other activities are carried out by a permanent team of workers. Therefore, the workforce in project-based organization is usually divided in two categories: *'permanent' employees* and *'temporary' employees such as consultants, self-employed professionals and others with temporary contracts*.

Conclusively, the specific features of project-based organization demonstrate the importance of managerial skills for handling the project and an excellent system of human resources management (Bredin and Söderlund, 2013).

2.3 **Positioning framework for the project-based organization**

The growing importance of project-based organization required the creation of an adequate structure. It is the newest form of organizational structure, which evolved following the new era of management. However, there a variety of form of organization, each structure has its own set

of advantage and disadvantage, therefore it is pivotal to choose the one that better reflects the characteristics of the business.

In order to better understand the specific features of the project-based organizations, Hobday (2000) offers a framework in which he distinguishes *six ideal-type organisational forms*, on the base of Galbraith (1971) and Larson and Gobeli (1987) works. In his study, Hobday (2000) uses a scale of extremes, which ranges from the pure functional form (Type A) to pure project form (Type F).

The first form is the *functional* organization, which better suits situations in which it is required to complete repetitive tasks and the environment is stable. This structure entails the division into small units based on specialized functional areas. It enables an higher level of organizational coordination and supervision over the firm's activities, since the decision-making power is centralized.

Next, three types of matrix organization are described: functional, balanced and project matrix. The matrix organization was introduce to offer more advantages in a competitive environment characterised by quick changes both internal and external to the firm. *Matrix management is a "mixed" organizational form in which normal hierarchy is "overlayed" by some form of lateral authority, influence, or communication*. Functional matrix *occurs when the project manager's role is limited to coordinating the efforts of the functional groups involved* and the functional managers keep their authority over their resources and project areas (Larson and Gobeli, 1987).

Balanced matrix is a situation in *which the project manager is responsible for defining what needs to be accomplished while the functional managers are concerned with how it will be accomplished*. Therefore, they share authority (Larson and Gobeli, 1987).

Project matrix occurs when *the project manager has direct authority to make decisions about personnel and workflow activities* and functional managers only provide a technical support (Larson and Gobeli, 1987).

The project-led organization occurs when t*he needs of projects outweigh the functional influence on decision-making and representation to senior management*, however there still is a need for coordination between the temporary project lines and the functional departments. (Hobday, 2000)

The project-based organization refers to a structure in which there is *no formal coordination across project lines*. The organization only focuses on projects and business processes are managed within the projects. This type of organizational structure is useful *for meeting innovative needs, responding to uncertainty, coping with emerging properties, responding to changing client requirements and learning in real time. By contrast, the PBO is weak where the functional matrix is strong: in coordinating resources and capabilities across projects, in executing routine production and engineering tasks, achieving economies of scale and meeting the needs of mass markets.* (Hobday, 2000)

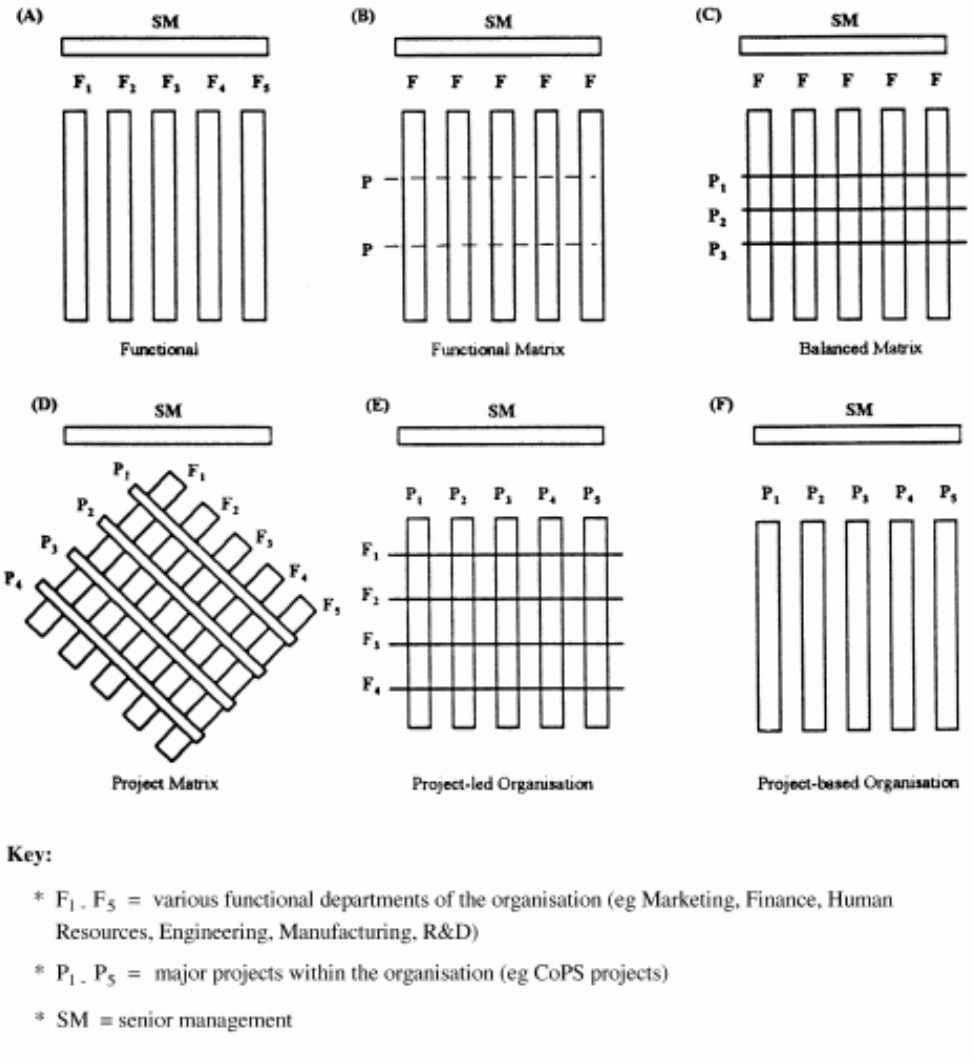

Figura 2.2: Types of organizational structure
Source: Hobday (2000)

2.4 Teams in the project-based organization

The PBOs are increasingly becoming more complex and unstable. Thus, their success depends on the ability to interact and react to a dynamic external environment. In this context, organizations started to progressively rely on *teams*, whose complexity is growing *in terms of team composition, skills required, and degree of risk involved*. Teams are defined as units of *two or more individuals, who have specific roles, perform interdependent tasks, are adaptable, and share a common goal* (Baker and Salas, 1997).

The composition of the teams and internal dynamics are a sensitive issue, since they turn out to be crucial for the success of the project. Therefore, it is important to deeply analyze their role in order to guarantee a higher level of coordination, which leads to achieve the project goal.

2.4.1 Team staffing

The first challenge in team-based organization regards the composition of the team. Different authors questioned if it is more convenient to rely on teams built selecting each individual or if it is more efficient to use consolidated team, which engage into a new project when they conclude the previous one. In this regard, Munyon (2011) distinguished between two different *employment modes*: *individual staffing* and *cluster staffing*.

According to the *individual staffing* method, a team should be built on the base of the competences and knowledge that the single individual can provide to the group, specifically created for the project. Thus, once the project is completed, the characteristics of the team might be not functional to another project, therefore it would be necessary to staff a new team.

Instead, *cluster hiring* is more challenging since it refers to the *organizational efforts to acquire and fit a pre-existing team with a new role*. Indeed, cluster staffing aims at building a team, which must be able to easily shift from one project to another one. (Munyon, 2011)

The choice between individual and cluster hiring is quite similar to the *make or buy* strategic decision. Indeed, *the use of individuals to staff teams, in development or acquisition employment modes, is similar to build actions of the firm, which transforms the productivity of existing or new resources (e.g., individual human capital) into a new unit (i.e., a team). Conversely, team staffing using cluster hiring would be similar to buy actions of the firm, where readily productive teams are acquired and used from outside of the firm*. (Munyon, 2011)

This dilemma can be overcome through the help of the *resource-based theory*, which illustrates advantages and disadvantages of each employment mode. As it is shown in the following table, in order to determine the best staffing method, three different parameters are taken into consideration: *pre-employment*, *employment* and *separation costs*.

Even if the reduction of pre-employment costs (i.e. expenses that the organization incurs in attracting and selecting needed human capital) is considered to be an advantage of individual staffing, however cluster hiring results to offer more advantages in regard of employment and separation costs. Employment cost represent a benefit in cluster hiring since a consolidated and unified team is able to work faster and it does not need to define the internal dynamics as would be required in a newly born team. Likewise, in individual staffing separation costs rise because of the strong exit barriers of this model.

Therefore, although individual hiring fosters innovation since team members bring their different background to the new group, cluster hiring results to provide more benefits when *exploiting markets opportunities* since team formation and development process is much faster. Moreover, hiring staffing is beneficial at neutralize environmental threats since the team is able to promptly respond and readapt thank to their *shared experience*. (Munyon, 2011)

Team staffing outcomes	Team staffing approach		Theoretical mechanism(s)
Contribution to competitive advantage	Individual	Cluster hiring	
Reduce costs			
Pre-employment costs	Advantage		Satisficing; signaling
Employment costs		Advantage	Socialization; shared mental models; role theory; structural adaptation
Separation costs		Advantage	Embeddedness; Person–team fit
Exploit market opportunities			
Innovation	Advantage		Shared mental models and knowledge structures
Diversity — initiatives		Advantage	Identity theory
New market entrance		Advantage	Competitive dynamics; knowledge based view
Neutralize environmental threats			
Competition for human capital		Advantage	Competitive dynamics; resource-based theory
Gaining competitor knowledge		Advantage	Competitive dynamics; resource-based theory
Team performance contribution	Individual	Cluster Hiring	
Motivation		Advantage	Galatea effect
Value creation		Advantage	Galatea effect

Figura 2.3: Advantages and disadvantages of team staffing approach
Source: Munyon (2011)

Thus, if an organization decides to build a team with its internal human resources, the project manager should choose team member after a deep evaluation of the competences of each candidate. In this regard, Tronca (2011) suggests to take advantage of preliminary meetings, where *some people shows, very probably more interested than others of the activities involved in the project*. This interest may stem from *the connection between those activities and current activities undertaken by that individual, or that person just wish to broaden their business horizons, covering a different area in that has not activated before*. Project managers should select those people with higher interest, since interest *manifests itself closely to motivation*.

2.4.2 The size of teams

Studies show that the size of the team is extremely relevant variable. Hackman (1987) demonstrates that the size affects team processes and performances. Also, Sethi e Nicholson (2001) clarified that the productivity of a team does not depend only on *task-related elements* (i.e. *cooperation and integration*), but it also closely linked to *social elements* (i.e. *enthusiasm, drive, and commitment* of the group members).

Therefore, the size of the team has a pivotal importance in project environment, since it has an influence over the degree of interaction and collaboration among members, from which productivity and information sharing are dependant. Furthermore, team size also has an impact on *social loafing*, which is the tendency of individuals to exert less effort to achieve a goal when they are part of a group.

According to Hoegl (2005), teams composed by a greater number of members will have to deal with greater issues at information sharing and at managing *social loafing*, since *individuals decrease their effort as the number of people in the group increases*. Thus, as it is shown in the following figure, large teams generate more interaction, eventually leading to slow down decision-making capabilities and adaptability to external changes. Indeed, *as team size increases, it becomes more difficult for team members to contribute their knowledge, skills, and experience to their full potential, thus hindering an essential element of teamwork quality, i.e., the balance of member contributions.*

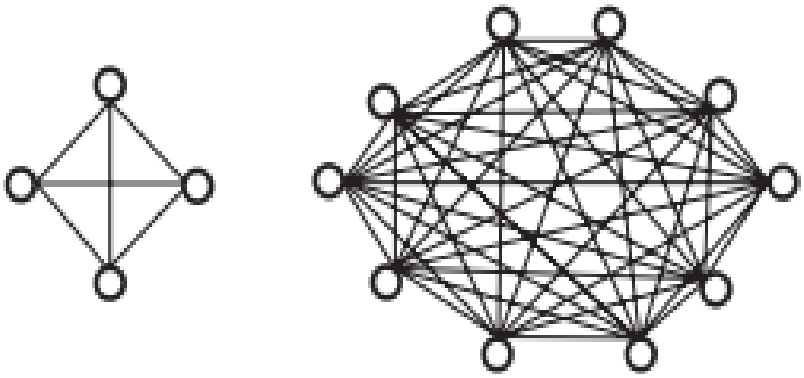

Figura 2.4: full communication structure with 4 and 10 members
Source: Hoegl (2005)

Although it is not possible to define the absolute optimal team size in terms of a specific number, researches show that the size of a team should be as small as possible. In this regard, Hoegl (2005) suggests four ways to keep project teams small: the creation of *multi-team project*, the development of *core team* and *extended teams*, the definition of *team-external contributions* and *phase-specific members*. The first method involves splitting up the main larger project into *multiple subprojects assigned to smaller teams*. Similarly, given the complexity of cross-functional teams, project managers should build *core team* for performing the most relevant tasks and a extended team with roles of consulting and advisory. The third method involves the decision to rely on an external team for the completion of a specific task. According to the last method, it is possible to keep teams small, by identifying project phases with different task requirements, so that each member joins and leaves the team when needed.

However, even if researches clearly demonstrate that small teams are better, organization still prefer to use larger teams.

2.4.3 Team functioning

The analysis of project teams sheds light on the importance of this organizational structure as it allows to facilitate horizontal cooperation in variety of industries. In this regard, Schweiger (2003) states that *there are a number of areas of team functioning that are vital to effective performance*. Among the dynamics described in Schweiger's research, the most relevant are the role of *culture*, the *diversity of team composition*, team member *motivation* and *information technology*.

The role of culture in the formation and functioning of the teams is quite complex. On the one hand, it can represent a strong *barrier to communication and understanding* if team members do not share the same cultural values. On the other hand, if it is wisely managed, it can enable

innovation by taking advantage of the diversity of the backgrounds of each team member and lead to the generation of new and innovative ideas.

Similarly, the diversity of team composition *can result in cognitive conflict, a constructive integration of diverse ideas*, if they are managed correctly. Otherwise, it can lead to *social conflict* and *interpersonal problems that mitigate effective communication and interaction among team members*.

Furthermore, in a team-based environment, it is pivotal to keep very high the interest and motivation of all the individuals and not only the leaders. Indeed, it turns out that motivation does not only stem from economical reward, but mainly when a project offers *the opportunity to learn and develop new skills, be associated with high priority and visible international projects, and expand their personal network*.

In conclusion, the role of information technology is strategic since it underlies many industrial and organizational processes and it is also involved in team dynamics. On the one hand, technology can *complement face-to-face relationships*, however it cannot substitute it. Indeed, IT can cause interpretational issues and limit the possibility to create relationships based on trust. This weakness of IT is due to the fact that technology allows communication through only two human senses: sound and sight. Clearly, this is not enough since touch, smell and taste are important for building a well-structured and cohesive team. Therefore, technology can be an effective tool for project teams, but only when relationships among team members are already well-established. (Schweiger , 2003)

2.4.4 Team composition

After the analysis of internal team dynamics, it is important to shed light on the team composition and the specific roles of each member. The role of the individual does not only stem from the capabilities and knowledge required from the project, but also from personal attitudes and tendencies.

Thus, Belbin studied for over 20 years team dynamics and he found out that the individual abilities of members do not necessarily lead to great team results, rather the effectiveness of a team depends on the behavior of the single individual. He highlights that a smart balance between technical abilities and personal behaviors allows to achieve project success. To better illustrate team dynamics he proposes a model, in which he categorizes nine team roles.

The *coordinator* has the role to clarify goal and guides the team towards it by managing resources and creating unity in the team.

The *completer* ensures that all the tasks are completed thorough and on time. His role is mostly relevant at the end of the task, since he foresees potential errors and controls quality in order to guarantees the highest standards.

The *implementer* puts ideas into a workable strategy, therefore he can be considered as the real practical organizer in the team.

The *monitor* has an analytical role, since he provides a rational and impartial judgements regarding the team's options.

The *plant* has a creative personality and is particularly good at problem-solving, therefore he is always able to present new ideas and approaches.

The *resource investigator* has an inquisitive nature and numerous external contacts, which allow him to find outside opportunities to bring back to the team.

The *sharper* has the role to always challenge the team to improve, therefore the team does not lose focus or momentum.

The *specialist* provides expertise and specialized knowledge in a key area to the team.

The *team worker* has a relationship-oriented personality, therefore he contributes to achieve the project goal by enhancing unity and encouraging cooperation. (Belbin.com, 2014)

Team Role	Contribution	Allowable Weaknesses
Plant	Creative, imaginative, free-thinking. Generates ideas and solves difficult problems.	Ignores incidentals. Too preoccupied to communicate effectively.
Resource Investigator	Outgoing, enthusiastic, communicative. Explores opportunities and develops contacts.	Over-optimistic. Loses interest once initial enthusiasm has passed.
Co-ordinator	Mature, confident, identifies talent. Clarifies goals. Delegates effectively.	Can be seen as manipulative. Offloads own share of the work.
Shaper	Challenging, dynamic, thrives on pressure. Has the drive and courage to overcome obstacles.	Prone to provocation. Offends people's feelings.
Monitor Evaluator	Sober, strategic and discerning. Sees all options and judges accurately.	Lacks drive and ability to inspire others. Can be overly critical.
Teamworker	Co-operative, perceptive and diplomatic. Listens and averts friction.	Indecisive in crunch situations. Avoids confrontation.
Implementer	Practical, reliable, efficient. Turns ideas into actions and organises work that needs to be done.	Somewhat inflexible. Slow to respond to new possibilities.
Completer Finisher	Painstaking, conscientious, anxious. Searches out errors. Polishes and perfects.	Inclined to worry unduly. Reluctant to delegate.
Specialist	Single-minded, self-starting, dedicated. Provides knowledge and skills in rare supply.	Contributes only on a narrow front. Dwells on technicalities.

Figura 2.5: Team roles
Source: Belbin.com (2014)

However, although team roles are important, the most influential factor for team performances is *leadership*. Chemers (1997) defines leadership as *a process of social influence in which one person is able to enlist the aid and support of others in the accomplishment of a common task*. The position of the leader is created through a process of social influence in which *one person is able to enlist the aid of others in reaching a goal*. Thus, leaders have a strong personality and innate skills, that allow him to gain a higher position in the hierarchy of power relations. Furthermore, the author recognizes that leaders has three main responsibilities, regarding *internal maintenance*, *external adaptability* and *the balance of contradictory demands*.

2.5 **Governance in the Project-based organizations**

In the second half of the 20th century, we observed a transition from a bureaucratic and functional management towards a project-based approach. This shift is linked to the changes in the nature of work: from mass production, with stable demand and slow technological evolution, to a situation in which products and services are highly bespoken and technological evolution is unstoppable. Therefore, those companies, which are managed according to the norms of classical theory, work well if markets, technologies and products respond slowly to changes; while a project-based approach is pivotal for managing temporary organizations.

The development of this type of business environment led to the creation of many project team, used to manage all the *unique*, *novel* and *transient* projects. Therefore, the specific features of PBOs require a shift toward a new governance model. In this context, classical management is not efficient anymore since *the functions are linked (bilaterally dependent), the work cannot be predicted with absolute certainty, operational control is aligned with the project*. If classical management used to adopt a market or hierarchical governance, now project-based organization

should follow a hybrid form of governance, which mixes elements of both market and hierarchical governance. (Turner, 2000)

The governance of PBOs represent a challenging task. Indeed, on the one hand each project unit requires a high degree of autonomy, which can cause disconnection between different levels of the organization. On the other hand, the *mix of individuals with highly specialized competences* can be a barrier for the creation of *shared understandings, a common knowledge base, etc* (Lindkvist, 2004).

Turner (1999) suggests that project-based organization require a different governance mode for each project. Thus, this is most likely to lead a *decentralization of decision-making on operational issues, with empowering governance*. The author also states that governance in PBOs should *set high-level strategic direction and performance parameters, but, under a principle of subsidiarity, delegate day-to-day decision-making on operational issues to local management, management at a level where the decision has an effect*.

Similarly, Lindkvist (2004) agrees that PBOs should rely on a renovated model of governance. Thus, he introduces the concept of a new *rules-of-the-game*, which created a new institutional framework by *promoting new individual responsibilities and enabling lower level market-like processes of self-organizing discovery*. According to the author, the new project-based structure should include new responsibilities and a *new reward structure, mirroring a strong incentives approach*. The increasing reliance on prices and incentives has an impact both in shaping incentives themselves and conducting *knowledge work*. In conclusion, he believes that a combination of different economic theories can guarantee the best governance model for PBOs,

moreover he suggests that top managers can decide to *engage in the design of a market-promoting mode of governance for their project-based firms*.

2.5.1 The roles of Broker and Steward in PBOs

Turner (2001) highlights that in PBOs operational control process vary according to the characteristics of the project they are about to undertake. Therefore, there are ad-hoc mechanism of governance for each possible scenario, which is usually dependant on the relationship between the members of the organization and clients. Hence, based on the following variables: *a few, large projects or many, small projects* and *a few, large clients or many, small clients*, the author defines four possible scenarios:

- Few large projects realized for few large clients. This situation requires the creation of a large and dedicated team, with its own command and control structure. This team recalls the features of traditional large projects and they are considered as *isomorphic teams*, since their composition is adapted in order to effectively suit each stage of the project life cycle.

- Many small projects for few large clients. This context is managed as *programs of projects*, since they rely on the construction of homogeneous teams and each one responsible for each project *from concept to completion*. Each team is able to work independently, under the guidance of the *programme manager* who is responsible for the whole project.

- Large project realized for many small clients. Thus, this scenario is usually typical of *start-ups*, since the firm and its innovative products or services constitutes the project

itself. The managing direct usually has the role to manage all the teams involved in the creation of different versions of the product. On the other hand, the marketing manager works closely with the potential clients, in order to identify their specific needs and be able to offer a product that satisfies their desires.

- Many small projects realized for many small clients. This situation is managed as a *portfolio of multi-projects,* since they all *share a common resource pool, but have independent outputs*. This scenario demonstrates the need for the roles of broker and steward, who are both pivotal in order to manage the relationship between client and project team.

The broker is responsible for the relationship with the client, while the role of the steward deals with the relationship with the team project. Thus, when they work together, they build a single interface. The client explains its needs to a broker, who has to identify the most suitable steward and address him towards those resource that can better satisfy the requests of the client. The steward should build the project team, including the designation of a project manager. Broker, steward and project manager collaborate with the client in order to ensure that the final results of the project coincide with the desires. The creation of the broker/steward interface is crucial for reaching project *efficiency* and *effectiveness*, since it would be *inefficient for all the project teams to deal with all the customers*. Thus, it is much more convenient when each team deals with one steward directly and when each customer interacts with one broker, and *the brokers and stewards manage the interrelationships*.

Therefore, the role of the broker deals with managing and improving the relationship with customers. Indeed, he has to find new clients, keep in touch with them throughout the whole duration of the project, make sure that they are satisfied with the results and guarantee that the new business will be able to survive in the long term.

On the other hand, the steward has to put together a *network* of resource needed for the completion of the project. Besides, he also has to ensure that the right person is at the right place in the right moment.

Brokers usually work outside the organization, while stewards works closely with it, therefore each role has to be carried out by two different entities. The broker/steward interface is mostly, but not only, recurrent in scenarios in which there are numerous clients and project.

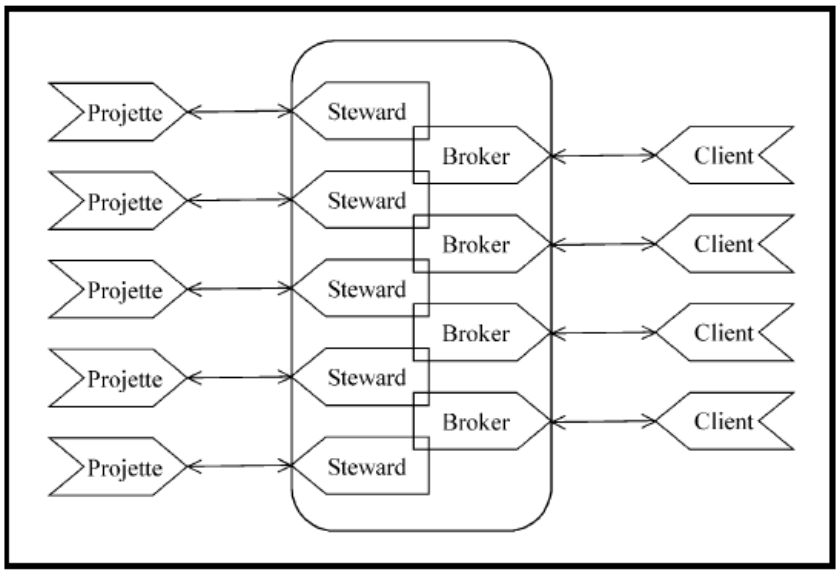

Figura 2.6: Multi-projects with the broker/steward interface
Source: Turner (2001)

2.6 **Project-based organization and human resources management**

In his research, Huemann (2006) highlights that the specific features of PBOs require that human resources are managed in a different way compared to other organization.

In project-based organizations tasks are carried out on the base of the specific project and it is required to satisfy the requests of each customer for bespoken goods or services. The environment is highly dynamic, indeed human resources is highly critical. It needs to be handled very carefully, in order to guarantee the well-being of the employees and the success of the project.

However, it is possible to recognize some specific features of PBOs that are particularly relevant for human resources management:

- *Temporary nature of projects*. Project-based organizations adopt temporary structure to carry out their tasks: when one project starts, or one is completed, also the human resource configuration changes. It creates pressures that affect the work organization. Moreover, it generates specific needs new processes, such as *assigning personnel onto projects, dispersement from projects, and processes for linking project assignments to careers*.

- *Dynamism*. The temporary nature of project work creates *dynamic boundaries and contexts*. The degree of dynamism also depends on the number and the size of the project, since they can always change and, thus, it becomes harder to forecast the exact demand for new resources. This environment has an impact on motivation of employees, but it can also generate stress for project workers. Hence, HR managers are required to develop strategies to better face and manage this situation.

- *Project-portfolio resource and role demands.* Project-oriented company are always involved in multiple projects at any time. Thus, an individual can work in different projects at the same time, *even in different project roles* (e.g. a person can be a project manager in one project, while he is a project worker in another one). It generates issues related to *multi resource allocation* and *role conflict at an individual level*.

- *Specific management paradigm*. The management culture of PBOs is quite peculiar and it is characterized by *empowerment of employees, process orientation and teamwork, continuous and discontinuous organizational change, customer orientation, and networking with clients and suppliers*. Therefore, employees are required to possess specific competencies and skills, in order to effectively carry out project activities. Thus, *HRM policies, practices and processes need to be designed to meet the specific needs of the project-oriented company*.

Clearly, organizations need to take care of the *workload, time pressure and conflicts to minimize the risks inherent in project organization* (Hovmark, 1996). In this context, HRM plays a pivotal role, especially it is important to understand HRM activities and practices and how HRM is structured.

2.6.1 HRM activities in PBOs

In their researches, Bredin and Soderlund (2013) identified four different areas in which HR activities are focused: *flows, performance, involvement* and *development*.

- *Flow*. This category deals with all the actions required to manage the *flow of people* involved in the organization. On the one hand, this function regards the internal HR

flows, such as *assignment to project, employment on project and dispersement from project*. On the other hand, instead, it concerns the external HR flows, such as *selection, recruitment and deployment of human resources*.

- *Performance*. This core activity deals with a continuous attempt to improve the performances of employees. HR managers can adopt different tools to fulfill this task: feedbacks, rewards and motivation systems.

- *Involvement*. It regards all those activities aimed at enhancing the relationship between the organization and its members, by making the employees more involved in the organization. Thus, managers have to focus on two main activities: on the one hand, the participation of individuals in the decision-making process should be more relevant, on the other hand, employees should be able to influence their own working environment.

Table 1.3 HRM Practice Areas

HRM practice area	Focus
Flows	In- and out-flows of human resources across organizational boundaries. Internal flows: job rotation, mobility in line as well as in project dimensions.
Performance	Design of work settings that allow for high performance and enhancement of proper and motivating work conditions. Appraisal, feedback, and reward systems.
Involvement	Involvement in decision-making processes. Individual influence on work and work conditions.
Development	Competence development. Career systems and development.

Figura 2.7: HRM Practice Areas
Source: Bredin and Soderlund (2013)

- *Development*. This practice area considers the development of employees on either individual and aggregate level (i.e. for a specific unit or the whole organization). In order to handle this activity, the organization should enable a long-term development of competence and career paths advantageous for both employees and organization. The development is a pivotal activity, since it does not only benefit the organization, but it also represents a motivational factor that allows to retain them in the organization.

2.6.2 Liminality and project workers

As a consequence of the specific features of projects described in the previous paragraph, project workers might have to face several negative outcomes of flexible work conditions, including *high levels of stress, limited opportunities for reflection, reduced job satisfaction, and lack of in-depth learning*. Therefore, employees find themselves in situations in which they do not have a long-term ongoing relationship with the organization for which they work. In organizational studies those situations are referred to with the concept of *liminality*. It is, indeed, described as a *work position for which boundaries are not always clear cut but can be graduated and dynamic in the sense of moving between seemingly bounded states of, say, organizational insider and outsider* (Borg and Soderlund, 2014).

Liminality highly affects the working experience for individuals. It results that, on the one hand, some workers perceive it as a useful tool for *coordination, integration and to make change happen*. On the other hand, instead, liminality can cause issues related to *frustration and irritation*. Hence, tensions can arise, and they need to be carefully managed (Gustavsson, 2018).

2.6.3 The HR quadriad

In the previous paragraphs, the specific features of the project-based organization were explained. Researches show that it is necessary to further develop the relationship between

human resources management and PBOs. In this context, Bredin and Soderlund (2013) proposed the *HR quadriad framework*, with the aim to offer a new model to apply in the project-based organizations.

This is a pivotal tool that allows to carry out *the analysis of HRM as a collective, configurational, and complementary system of roles and practices*. Indeed, the main challenge of HRM in PBOs deals with an effective management of the interplay between the organization and its employees.

According to the authors, in any project-based organization there are four key actors involved: *HR specialists, line managers, project managers, and project workers*.

- *HR specialists*. Although general rhetoric agrees that HR specialists are required to become more strategic and that HRM should be delegated to line managers, however many researches demonstrate that HR competence in basic operational setting is highly valuable. Indeed, Francis and Keegan (2006) assess that *the neglect of people-centered roles is shown to have a negative effect on the sustainability of high firm performance, as employees feel increasingly estranged from the HR department*. Therefore, it might be convenient to reduce the *HR specialists* and increase HR centers and other more strategic HR roles.
- *Line managers*. Their role particularly relevant since they are able to deliver the HR value to the company. Literature suggests the role of line managers in PBOs is shifting toward new forms of management. Indeed, when employees are involved in variety of projects, the line managers serve as a *competence manager*, who takes care of many HR issues, such as competence development, project staffing, and career counseling (Clark and Wheelwright 1992).

- *Project managers*. Project management literature demonstrate that project managers have a pivotal role in delivering human resource value in PBOs. It does not only involve direct feedbacks to employees, but it also requires a close contact with line managers, who have to start the evaluation and review processes.

  Project managers, who work very closely to the project managers for protracted periods, may end up increasing their HR responsibilities. However, *the long-term career development and other long-term people issues cannot reside with the project manager, because project members are not assigned to a project team on a permanent basis*, since the project is, by nature, a temporary organization (Clark and Wheelwright 1992).
- *Project workers*. Recent researches suggest that the individual employees are evidently growing their responsibility in order to stay employable, develop skills and give their career a boost. Therefore, project workers should be considered as pivotal and potentially active members of HRM, rather than passive entities. However, the growth of their responsibilities can lead to difficulties and uncertainties for the project work himself. Indeed, the vagueness and ambiguity of his responsibilities makes very critical the role of project workers, thus it is necessary to deeply analyze and clarify it.

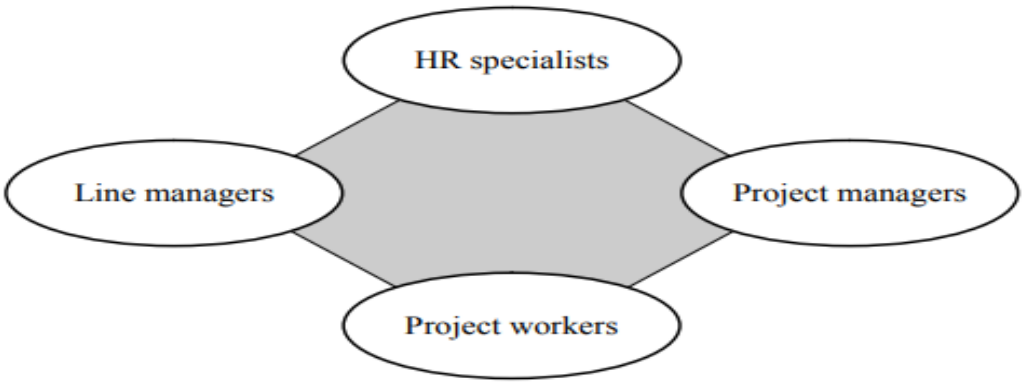

Figura 2.8: The HR quadriad in project-based organization
Source: Bredin and Soderlund (2013)

Bredin and Soderlund (2011) identify *two organizational factors* that can influence the design of the HR quadriad: on the one hand, *the type of project work* and, on the other hand, *the type of project participation*. Both dimensions are mainly related to the operational level of work and, if combined, they provide *four ideal types of project-based work setting*.

The first dimension deals with a distinction between two types of work in the project-based organization, that can require a different design of the HR quadriad. The first type, which is known as *intra-functional project work*, refers to a situation when project workers carry out most of their task at their line units. Thus, in this context, project workers *remain co-located in their line function* throughout the duration of the whole project, even if a *project core team from different functions may be dedicated and co-located*. Therefore, line managers, rather than project managers, gain a lot of importance since they have to be reliable for problem-solving activities and they also have the control over the key resources. However, it does not imply that project managers and the project dimension are less important, since most of the *activities carried out in the line units are essentially project activities*. (Bredin and Soderlund, 2011)
The second type is referred to as *inter-functional project work* and it can be compared to the work carried out in the *project-led organization* (Hobday 2000). In this situation, project workers perform their work primarily in project teams. They still have a *long-term affiliation* to their line unit, but *they are normally dedicated to and co-located with the rest of the members in their project team during the project assignmen*t. Therefore, in this setting, managers undertake more responsibilities regarding problem-solving activities, instead, line managers are involved in *staffing the projects with the right resources as well as for long-term career development and*

competence development.

The second dimension deals with the *project participation as either focused or fragmented*. *Focused project participation* refers to a situation in which project workers may be *assigned full time to one project at time*. This specific setting allows the worker to better focus on his tasks, create a closer relationship with the team. However, on the other hand, it might lead to shade the connection with the line managers and, therefore, *create certain frustration concerning the HR responsibilities*.

Fragmented project participation is typical of intra-functional project work, since project workers are involved in several projects at the same time. This type of project participation enables a close relationship between workers and HR managers, but it can also create issues related to the well-being of employees because of risk of excessive *workload*. (Bredin and Soderlund, 2011)

Therefore, by combining *the type of project work* and *the type of project participation* dimensions, it is possible to recognize four types of project-based work settings:

- *Intra-functional, fragmented*. In this setting, project work is carried out in lines organization, while project workers are involved in more projects at the same time, and are co-located with colleagues with similar expertise. (*Limited coordination across line units*.)
- *Intra-functional, focused*. In this situation, project work is carried out in lines organization, while project workers are focused on one project at a time, are co-located with colleagues with different expertise. (*Limited coordination across line units*.)

- *Inter-functional, fragmented*. In this context, project work is carried out in co-located projects, while project workers are involved in more projects at the same time and *physical mobility* turns out to be pivotal. (*Augmented coordination across expertise boundaries.*)
- *Inter-functional, focused*. In this setting, project work is carried out in co-located projects, while project workers are focused on one project at a time. (*Augmented coordination across expertise boundaries.*) (Bredin and Soderlund, 2013)

3 Chapter 3: Knowledge management in the project-based organization

The management of knowledge has a critical importance for the success of projects. The increasing complexity of project work is leading to a growing number of social and technical relationships, that project managers must carefully consider in order to effectively adapt knowledge and experiences from previous projects. Indeed, the members of a project team need to learn things which are already know in the context, and even in the same company. (Ajmal, 2008)

In particular, the projects undertaken by project-based organization are characterized by uniqueness, uncertainty, and complexity, therefore PBOs can be considered different from other types of organizations in many aspects. Thus, these differences also affect how knowledge is managed in this type of organization.

However, even if in the current economical context, knowledge is regarded as a source of *competitive advantage* and the project-based organization is a increasingly spreading in different industries, researches demonstrated that there still are issues involved *in attempting to capture, share and diffuse knowledge and learning across projects* (Bresnen, 2004).

Hence, in project environment, one of the biggest challenge concerns the ability to coordinate a various knowledge base and expertise. The temporary nature of projects does not allow to create a strong organizational memory, and even when memories are generated in form of routine, they end up not being reused. Thus, it is hard to integrate knowledge from one project to another context.

The specific features of project environment (e.g. strict deadlines, novelty and uncertainty) require a high degree of flexibility, which fosters the generation of creative and innovative solutions. Thus, projects are apparently able to encourage organizational learning and to develop better knowledge capabilities, instead the project-centric nature of PBOs makes knowledge management task even more difficult. Moreover, the *discontinuity* of project work in terms of personal, research, information and data, and the *fragmentation of project teams* creates even greater issues for the development of an effective knowledge management strategy. (Serrat, 2012)

Clearly, both knowledge management and project management are increasingly important concept, thus it is pivotal to understand they relationship and how they influence each other. Therefore, in the following paragraph, it will be proposed an investigation into the mechanisms, processes and practices of knowledge management in the project-based organization, in order to understand the state of art and the main future challenges.

3.1 **Knowledge sharing**

In project-based organizations, knowledge sharing represents one of major challenges. The temporary nature of project makes it very tough for the organization itself to learn and develop their knowledge capabilities. Moreover, employees are not usually motivated enough to share what they learnt .

However, the same issues might be faced in different projects, therefore knowledge sharing would a great tool.

In order to solve this problem it is possible to adopt certain *knowledge-sharing mechanism,* which are defined as *formal and informal mechanisms for sharing, integrating, interpreting and applying know-what, know-how, and know-why embedded in individuals and groups that will aid in the performance of project tasks* (Boh, 2007).

In his research, Boh (2007) offers a framework in which he identifies a configuration of knowledge-sharing mechanisms based on the specific features of the organization.

First of all, the author recognizes that there are two main mechanisms to share knowledge: *codification* and *personalization*[6], but he also decides to take into account another distinction of knowledge-sharing mechanisms: *individualized* or *institutionalized*. This second dimension is used to describe the patterns of socialization within the organization. Boh (2007) explains that *the institutionalization dimension describes socialization tactics that are collective and formal in terms of the contexts in which organizations provide information to newcomers, while the individualization dimension describes socialization tactics that are individual and informal*.

Then, the author combines the two dimension - *codification versus personalization* and *individualization versus institutionalized* - in order to create a framework that classifies the

[6] A deep explanation of the concepts of codification and *personalization* mechanism is provided at paragraph 1.9

different types of knowledge-sharing mechanisms.

	Individualized	Institutionalized
Personalization	*Quadrant 1:* individualized-personalization mechanisms	*Quadrant 4:* institutionalized-personalization mechanisms
Codification	*Quadrant 2:* individualized-codification mechanisms	*Quadrant 3:* institutionalized-codification mechanisms

Figure 3.1: Framework of knowledge-sharing mechanisms for managing distributed knowledge and expertise in project-based organizations
Source: Boh (2007)

- *Individualized-personalization mechanisms*. This mechanism regards a situation in which individuals can share knowledge *at the individual level in an ad hoc and informal manner*. In this context, social network can be very helpful, since they enable person-to-person interaction, even across distant geographical areas.
- *Individualized-codification mechanisms*. This mechanism relies on documents and other project artifacts that are *shared at the individual level, in an informal and ad hoc manner*. It involves the reuse of intellectual capital, but this mechanism requires an adequate structure of storing.
- *Institutionalized-codification mechanisms*. This mechanism concerns the acquisition of *individual or group-held knowledge* and to make it available for the whole organization. This situation requires a strong use of information technology in order to create knowledge repositories.
- *Institutionalized-personalization mechanisms*. This mechanism refers to a situation where the routines and the structure of the organization are institutionalized. It means that

knowledge sharing is based on direct interaction between people, but those mechanisms that foster person-to-person knowledge-sharing are institutionalized. (Boh, 2007)

3.1.1 Knowledge sharing within projects vs between projects

In this context, it is relevant to take into account the distinction between *knowledge sharing within projects* and *knowledge sharing between projects*. The first concept regards the process through which knowledge is shared within the boundaries of a certain project. It can concern sharing both tacit and explicit knowledge. Indeed, in this situation, sharing tacit knowledge results easier since individuals work side-by-side, while explicit knowledge is shared *through different explicit information channels such as project documents*. (Pemsel, 2013)

On the other hand, knowledge sharing between projects concerns a situation in which information are shared with individuals who are not working toward the same project. It means that knowledge goes beyond the boundaries of the project. Sharing knowledge between projects is pivotal for developing the long-term success of the organization. It can prevent individuals to make a mistake twice. Moreover, when knowledge is accumulated during a project, it can be *irretrievably lost*, if it not *effectively shared with other projects and the parent organisation*. Knowledge loss is a serious issue for project-based organizations, since it limits organizational learning and the possibility to foster innovation. (Pemsel, 2013)

3.2 Knowledge integration

Beside knowledge sharing, in project environment, knowledge integration dynamics are particularly relevant. Knowledge integration is defined as *an ongoing collective process of constructing, articulating and redefining shared beliefs through the social interaction of*

organizational members (Huang, 2003). The definition shows that the knowledge integration process is quite complex since it requires more than pure information transfer between individuals. Indeed, individuals are required to *transform their own existing knowledge into new knowledge that complements and stimulates the knowledge transformation of others, in a process of mutual influence and collaborative emergence* (Majchrzak, 2012).

Therefore, it is important to explore the dynamics of knowledge integration in *cross-functional projects teams*[7], since there is an increasingly reliance on project-oriented organizational structure, but also because *knowledge integration within the context of a project team is not limited to a focus on the dynamics occurring within the team boundary*. Indeed, it is pivotal to take into account how knowledge integration work *beyond the team boundaries* (Huang, 2003). However, literature demonstrates that knowledge integration is fostered *through minimizing differences and distinctions between the specialty areas*. Indeed, it allows to *avoid interpersonal conflict*, but also to encourage the quick *cocreation of intermediate scaffolds*, the continuous creative *engagement and flexibility to repeatedly modify solution ideas*, and the *personal responsibility for translating personal knowledge to a collective knowledge* (Majchrzak, 2012). Therefore, one of the biggest issue regarding knowledge integration in cross-functional project teams stems from the fact that team members usually have *little shared experience*. Hence, it is important to challenge knowledge differences between team members. In this context, Majchrzak (2012) proposes two different approaches to overcome the difficulties related to the

[7] According to Zoerman (2008), *a cross-functional team is a group of members from more than one functional area within an organization working together toward a common goal or project*. The team could include people from any department or division; thus, cross-functional team require *experts to execute tasks and solve the issues that arise during the project lifecycle* (Zoerman, 2008). Therefore, cross-functional team are typical of project-based organizations. Indeed, such teams are pivotal in organizations with a strong focus on *creativity and innovation*, they are *used to generate consensus through collective input, investigation and negotiation*. Lastly, they *are used for managing strategic change initiatives* (Huang, 2003).

cross-functional knowledge integration in teams from different streams: the *traverse* and the *transcend* approaches.

The traverse approach relies on significant efforts in terms of *time and resources* in order to ensure a *deep dialogue*, which allows individuals to be aware of the knowledge of the other members. Indeed, this approach emphasizes on the importance *for team members to identify, elaborate, and then explicitly confront the differences and dependencies across the knowledge boundaries* (Majchrzak, 2012).

According to this view, first of all, there is a dialogic process through which team members share with each other their deep knowledge (e.g. *disciplinary principles, causal models, and implicit assumptions*). The previously owned knowledge must be shared and understood by all the individuals in the team. Team members should also be able to acknowledge *task dependencies and differences between perspectives*, since it likewise pivotal in order to overcome boundaries between knowledge specialty areas. Then, after a *deep dialogue* and a phase of *understanding*, team members are able to recombine their knowledge and *traverse those boundaries through negotiation*. (Majchrzak, 2012)

In this regard, there is very useful tool: the *boundary objects*. They are described as *pragmatic representations that simultaneously satisfy the information requirements of multiple communities*. Indeed, they can be seen as *tangible definitions, physical products, components, prototypes, sketches, notes, drawings*, or even *metaphors*. These boundary objects are able to show the key differences in work context, and therefore, it enables discussions and negotiations that transform *each other's own knowledge to accommodate the knowledge of others* (Majchrzak, 2012). However, since this concept is a very broad concept, Ewenstein and Whyte

(2009) divided boundary objects in two major categories: *concrete* and *epistemic*. The first one is regarded as stable and static objects, *used in direct, cross boundary interactions between multiple actors*. On the other hand, epistemic boundary objects can be either concrete or represent abstract things. Indeed, they are plural and evolving; thus, they are characterised by *their openness, their lack in completeness of being and their capacity to unfold indefinitely* (Ewenstein and Whyte, 2009).

Nevertheless, some authors criticized the traverse approach, it has been blamed to *waste precious time and erode team relationships* (Edmondson and Nembhard, 2009).

In his research about a possible alternative to the *transcendent* view, Majchrzak (2012) individualized a new pattern to integrate knowledge, the *transcend approach*, which is composed of five main practices.

The first practice is labeled as *voicing fragments* and it involves a *high-energy voicing* between team members regarding a *broad range of uttered fragments of observations without discussing, critiquing, or querying each other for more details*. This behavior allows to create an environment characterised by *psychological safety*, where individuals do not feel judged. Indeed, *voicing fragments* relies on sharing problem definition and potential solutions, rather than focusing on *interpersonal differences*. Moreover, it *depersonalizes the shared knowledge*, enabling an easier collection of diverse ideas and observations. (Majchrzak, 2012)

The second practice is *co-creating the scaffold* and it consists of a rapid development and elaboration of *a visual or verbal representation that encompasses many voiced fragments*. This practice allows to increase *collaborative communication* and *members' felt responsibility for translating their own knowledge into the abstract language of the scaffold*, but also to decrease

time spent learning each other's language. Moreover, *co-creating the scaffold* has a great impact on knowledge co-creation, since team members are enabled to *reduce interpersonal confrontation, depersonalize their knowledge,* share their experience to quickly create new ideas with others, and *reduce the need to explain their deep knowledge so other members can quickly begin to elaborate*. (Majchrzak, 2012)

The third practice, named *dialoguing around the scaffold*, concerns a quick dialogue about the scaffold, through which team members can raise *questions about possible alternative solutions suggested by the scaffold, leading to reframing the scaffold to foster more creative solutions*. It is important to always keep the focus on the scaffold, so that the dialogue does not degenerates into an *interpersonal conflict* or *learning about each other's knowledge*. (Majchrzak, 2012)

The fourth practice, labeled *moving the scaffold aside*, aims at the *team's reconnection with their external stakeholders early after they had an initial solution but before the solution was well developed and thus harder to change*. At this stage, it is necessary to move the scaffold aside, and it turns out to be very helpful. Indeed, on the one hand it allows to *reenergize the team* and foster a continued *cogeneration* of solution. Furthermore, it guarantees a *smooth transition of the dialogue from a collectively created scaffold to an external stakeholder*. (Majchrzak, 2012)

The fifth practice is *sustaining engagement* and it deals with *activities for sustaining and monitoring engagement,* which *are created in a manner that minimizes interpersonal differences and sustains cogeneration*. Indeed, the relationship between team members with different background may degenerate into interpersonal conflicts, but there are three major sets of activities to contrast the issue: *repeated summarizations* (activity that implies a continuous *reviewing and summarizing the team's progress*), *sharing the unexpected* (a member proposes a different point of view, even if it is beyond his organizational role responsibilities), and *using*

enthusiasm to drive the process (activities that are induced by *enthusiasm rather than explicit criteria, technical analysis, or agreed-upon steps that might have differentiated members from each other*). (Majchrzak, 2012)

It is interesting to highlight that both approaches rely on the use of *dialogue*. However, its role is very different: in the traverse approach it is very deep, while in the transcendent approach is quick. Indeed, in the first case, dialogue aimed at emphasizing the differences among the knowledge background of each member. Instead, according to the transcendent approach, dialogue is used in order to obtain a collective perspective on the problem. Thus, dialogue results to be a crucial tool for reaching knowledge integration in cross-functional project teams.

3.3 **Learning in Project-based organizations**

The concept of *organizational learning*, which has been broadly explored in the paragraph 1.15, is very important in project environment since it is a *means to retaining and improving competitiveness*. Moreover, learning capabilities are regarded as one of the greatest requirements for project-based organizations. Thus, it is necessary to identify learning processes for project-based organizations, since they are directly aimed at growing knowledge within the organization, both through knowledge acquisition and knowledge creation. (Chroneer, 2015)

Learning in project-based organizations refers to the *practice of utilizing real-world work assignments on time-limited projects to achieve mandated performance objectives and to facilitate individual and collective learning* (DeFilippi, 2001).

Literature recognizes that, in PBOs, learning can be classified as *intra-project learning*, that occurs throughout the same project, and *inter-project learning*, that occurs beyond the

boundaries of the project. Hence, it is pivotal to be able to manage learning at both levels, by adopting *a broader approach capable of identifying the links between intra-project learning and the transfer of learning to the wider organization*. (Kotnour, 2000)

Intra-project learning, which can occur at individual or group level, refers to the creation and sharing of knowledge within a project. It mainly focuses on *tasks within a single project and supports the delivery of a successful project by identifying problems and solving them during the project* (Kotnour, 2000). The most successful method to achieve intra-project learning is *sharing of information, such as experience feedback during formal project meetings and follow-ups of deviations during evaluations in the project closure phase*. Although experience feedbacks are considered to be the most effective tool for learning, it appears that there might be some issues in project-based organizations. This is due to the uncertain and temporary nature of projects, indeed when a project is completed, there is a pressure to immediately start a new one, thus there is no time to analyse mistakes and learn from them. (Chroneer, 2015)

Therefore, it is pivotal to encourage discussion between project team members by defining *routines reporting cycle such as weekly or monthly status and review meetings, project deliverables, or major occurrences in the project* (Kotnour, 2000).

To conclude, it is relevant to underline that external partners can have an impact on project-level impact, since it creates a *population-to-project learning* process (Bartsch, 2013).

Inter-project learning concerns *combining and sharing of lessons learned across projects to apply and develop new knowledge* (Kotnour, 2000), *by making project-level knowledge available*

to the organization as a whole (project-to-organization learning), or to *other projects (project-to-project learning)* (Bartsch, 2013).

Inter-project learning can be achieved through *ITC-systems* as well as *face-to-face techniques*. Even if information technology is very helpful, it often lacks *user friendliness*, therefore in-person relationships result to be the most efficient tool (Chroneer, 2015).

Studies demonstrate that inter-project learning is a pivotal mechanism in project-based organizations, since it is a *key driver affecting various aspects of organizational performance: higher innovativeness and performance in particular, yet also market share, organizational capabilities and productivity* (Bartsch, 2013).

Moreover, Prencipe and Tell (2001) provided an interesting analysis regarding the project-to-project learning mechanism. They, indeed, introduced the concept of *learning landscape*, which is described as the *mix of project-to-project learning mechanisms adopted and implemented*. In this *learning landscape*, the authors recognize three major types of learning landscape: *the explorer landscape (or L-shaped), the navigator landscape (or T-shaped), and the exploiter landscape (or staircase)*. (Prencipe and Tell, 2001)

The *explorer landscape* is typical of organizations that follow a personalization strategy and focus on knowledge possessed by individuals. It mostly relies on *experience accumulation processes and knowledge transfer through people-to-people communication* (Prencipe and Tell, 2001).

The *navigator landscape* involves the implementation of *mechanisms for project-to-project learning based on a knowledge articulation process*. On the base of this approach, *the entire project is divided into phases (from bidding, to delivery to customer) and at the end of each phase a lessons-learnt meeting is held* (Prencipe and Tell, 2001).

The exploiter landscape focuses on *deliberate attempts to codify and store knowledge developed during the execution of a project and document it so that it becomes more easily accessible and exploitable for the rest of the organisation's members*. This approach is mostly used in companies that highly relies on an *advanced development of ICT-based tools to support their project-to-project learning* (Prencipe and Tell, 2001).

3.3.1 Barriers and remedies to learning in project-based organizations

The discontinuous and temporary nature of project work makes it very challenging to enable learning across project boundaries, since prevents the functioning of three major mechanisms of knowledge management, which are *opportunity, motivation, and ability* (Bartsch, 2013). However, literature offers remedies used to overcome barriers to organizational learning, such as *memory objects, post-project reviews* and the role of *social context* (Bartsch, 2013).

The role of *memory objects* is pivotal, since a *relatively simple artifacts, such as Excel workbooks, represent knowledge enables them to act as boundary objects across occupations and as memory devices across projects*. Hence, they because objects in which knowledge is stored, but from which it is always possible to retrieve knowledge overtime (Cacciatori, 2008). In this regard, it is important to underline that IT-based memory objects are more effective since available technologies are highly reliable. However, the use of memory objects is only effective if knowledge is codified, otherwise, their use is irrelevant with tacit forms of knowledge (Cacciatori, 2008).

The *post-project reviews*, described as *a formal review of the project which examines the lessons which may be learnt and used to the benefit of future projects*, are a powerful tool used to guarantee learning within an organization. However, few companies actually adopt this technique, and those that do use them often are not able to do it effectively. Indeed, there are many factors that can negatively affect the utility of post-project review. For instance, if the review occurs too late, the key learning points might have been already forgotten (Koners, 2007).

The last remedy is the social context, which has critical role in organizational learning. Indeed, it has an influence over the following aspects: *communities of practice, partnering flexibility, culture and leadership, knowledge sharing networks and social capital*. It is particularly relevant to highlight the relationship with the social capital, which is described as the *intra-organizational social ties of project teams with their colleagues outside the project*. Indeed, social capital encourages the *exchange and combination of resources, especially knowledge resources, among organizational units including local subsidiaries, business units, and projects* by improving the quality human relationships between actors involved in the learning process (Bartsch, 2013).

3.4 **The role of the Project Management Office**

The specific features of project-based organization require an organizational entity that must be able to take on *responsibilities related to the centralization and coordination of projects under its domain*. This is, indeed, the role of the *project management office* (PMO), that performs many different roles and functions in different organizations. Indeed, PMO can be defined as a *management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques* (Cunha, 2014).

Generally, in project-based organization, PMO is regarded as an entity that has control responsibility between top management and project management. However, the role of the PMO deeply varies on the base of the specific context. Therefore, the high degree of complexity regarding PMOs leads to numerous interpretations of what a PMO actually is and should do (Pemsel, 2013).

According to Eriksson (2015), PMOs can exert seven major functions: *lessons-learnt database, PM standards and methods, consulting and education, strategic management, project resource management, monitoring and controlling, and discussion of synergies among functions*. According to the authors, the interaction of these functions can *serve as knowledge governance mechanisms that facilitate explorative and exploitative learning in PBOs* (Eriksson, 2015).

Alternatively, Muller (2013) distinguishes three basic PMO roles: *serving, controlling,* and *partnering*.

PMOs performs a *serving* role when they act as a *service unit to internal and external units, project managers, and project workers*. This supportive functions to project are exerted in order to boost *resource efficiency* and *outcome effectiveness*. The *controlling* role is performed when a PMOs *operate as management units for projects under their domain,* by controlling the compliance with pre-established standard and evaluating both project and employees' performances. Lastly, PMOs can assume a *partnering* role, which refers to a *relationship that is characterized by reciprocity, mutuality, and equality* between a PMO and other PMOs, project workers or project managers. Moreover, the partnering role of a PMO involves activities such as *equal knowledge sharing, exchange of expertise, lateral advice giving, and joint learning with equal level stakeholders* (Muller, 2013).

From knowledge perspective, the partnering role is the most relevant. Indeed, Pemsel (2013) refers to PMO as *an organisational unit facilitating coordination of knowledge and other resources between the PBO and its projects, and can therefore act as a bridge over organisational and knowledge boundaries*. Hence, a PMO can be seen as a *knowledge broker* between projects, and between project and top management. Indeed, a PMO manages the coordination mechanisms, required by a PBO in order to support knowledge management. In particular, a PMO should encourage individual, group and organizational learning, by fostering knowledge sharing. In the role of knowledge broker, a PMO should perform project administration and consulting activities, develop a set of standards and methods, as well as give support to networks, in order to *bridge boundaries*. Furthermore, for the purpose of fostering knowledge sharing and learning, a PMO must be able to manage *retrospective learning, which refers to generating knowledge from past projects, as well as prospective learning that refers to transferring knowledge from past experience to future projects* (Pemsel, 2013).

3.5 **Knowledge governance strategy in project-based organizations**

Project-based organization are increasingly required to develop effective knowledge management strategies. Thus, knowledge governance is pivotal, since it aims at *strategically influencing knowledge processes by implementing governance mechanisms* (Pemsel, 2016). The main activities of knowledge governance regard the choice of *organizational structures and mechanisms that can influence the process of using, sharing, integrating, and creating knowledge in preferred directions and toward preferred levels* (Foss, 2010). Thus, knowledge governance strategies may differ broadly among organizations.

Therefore, Pemsel (2016) proposes a framework in which six strategies are identified: *Protector, Deliverer, Polisher, Explorer, Supporter, and Analyzer*.

The *protector strategy* is mostly *undeveloped, reactive, and procedural*. It is typical of companies where employees have a lot of freedom in terms of knowledge management and dislike interference from executives. Therefore, *the outcome is often that managers who want to encourage knowledge-creating activities feel helpless because of a prevailing culture that discourages knowledge sharing* (Pemsel, 2016).

The *deliverer strategy* is typical of project-based organizations that rely on *routines and procedures for projects and business processes and tend to focus on documentation and control, favoring procedures over an integrative strategy*. Even if, likewise to *protector strategy*, employees are independent in regard of their knowledge-sharing and learning behaviors, however, the *employees of deliverer firms tend to resent interference from executives, though not to same degree as protector employees* (Pemsel, 2016).

The *polisher strategy* is usually adopted by organizations that have already developed *processes, procedures, and control systems as well as a greater dependence and focus on the sharing and integration of knowledge than do protectors and deliverers*. According to this strategy, employees are required to be very open-minded and are not allowed to have superior attitudes. Thus, there is a great focus on innovation and learning, since employees are endowed with *combinatorial, entrepreneurial, evaluative, and project management competences* (Pemsel, 2016).

The *explorer strategy* is typical of *stand-alone PBOs* that are able to excel in any type of project management services they are offering. These organizations focus more on gaining more customers through reputation rather than building long-term relationships with them, in fact,

their main goal is *striving for professional excellence in all operations*. According to this strategy, employees are very *passionate* and excel in their work and the organization puts a lot of efforts on *building relationships both internally and with external experts is a core competence established through various communities of practices* (Pemsel, 2016).

The *supporter strategy* is usually adopted by PBOs that include subsidiary organizations conducting projects. These organizations are customer-focused; indeed, they aim at building long-term relationships with their customers through the use of *interactivity (in its various forms) than on formal documents*. However, the main goal is *more on the accumulation and articulation of knowledge and much less on its codification* (Pemsel, 2016).

The analyzer strategy is typical of PBOs with a business model quite similar to the one of a *franchise company*. The focus of this strategy is on the client, but, unlike *support strategy*, it mainly relies on *formal meetings and on codified and mainly decontextualized knowledge*. Organizations that adopt this strategy are not likely to implement new information into their knowledge system, since they are *poorly suited to act on collected information or to integrate conceptual knowledge (derived from their survey respondents) internally* (Pemsel, 2016).

3.6 **Critical factors for KM in project-based organization**

The implementation of an effective knowledge management strategy is pivotal for PBOs, since it represents a strong tool to establishing and sustaining a competitive advantage. Therefore, it is important to understand what are the factors that affect knowledge management initiatives in project environment. Ajmal (2010) identifies six major aspect that can determine the success or failure of those initiatives in PBOs.

- *Familiarity with KM*. All the team members are required to be familiar with KM and to *have a clear strategy for contributing to specific KM initiatives*, otherwise any KM strategy is destined to fail. (Ajmal, 2010)
- *Coordination among employees and departments*. Knowledge sharing is crucial in any KM initiative; thus team members should be encouraged to *communicate and share their knowledge with others*. In this regard, coordination is pivotal in order to *bring together team members to share their best practices with each other*. (Ajmal, 2010)
- *Incentive for knowledge efforts*. The use of incentives, which are intended as *any factor (financial or non-financial) that motivates people to adopt a particular action or to prefer one alternative to another*, can be a great tool to enhance KM performances of project workers. Indeed, if employees are not intrinsically motivated, incentives turn out to be essential. It is possible to distinguish three types of incentives: *remuneration, moral* or *coercive*. (Ajmal, 2010)
- *Authority to perform knowledge activities*. In this regard it is important to make a distinction between the term "power" and the term "authority". The first refers to the *ability to achieve certain ends*, while the latter concerns the *legitimacy of exercising that power*. Therefore, employees should not only feel *motivated to create and share knowledge, but also authorised to share and utilise it within the organisation*. (Ajmal, 2010)
- *System for handling knowledge*. Since knowledge should be regarded as a *process rather than an asset*, organizations need to implement an effective *system to support the flow of knowledge in KM initiatives*. Indeed, an appropriate system of IT can support

communication, collection, and re-use of knowledge in project-based organizations. (Ajmal, 2010)

- *Cultural support*. As, it has already been mentioned in the previous chapters, culture plays a crucial role in the success of KM initiatives. It is even more relevant in project-based organizations, since *project teams frequently involve professionals from different cultural backgrounds*. (Ajmal, 2010)

4 Conclusion

Throughout this thesis, the theme of knowledge management and project-based organization have been deeply analyzed with the aim to understand how knowledge can be effectively managed in project environment.

The research showed that, in the current economic context, knowledge is becoming the main asset for many firms, as it regarded as a tool through which companies can establish and sustain a durable competitive advantage. Indeed, business is increasingly shifting towards a knowledge-intensive orientation.

It has been highlighted that the unique and dynamic nature of projects, that involves the continuous development of new products and services, could generate an environment aimed at creativity and innovation, where learning and, therefore, knowledge could be fostered. However, at the same time the nature of projects creates many barriers to knowledge management. Indeed, it has been found out that one of the biggest issues is related to the temporary nature of projects, since at the end of a project team members are divided, and, thus knowledge is fragmented or disintegrated, unlike in permanent organizations. Moreover, routines and organizational memory rarely emerge. In fact, project environment there is a lack of mechanisms for knowledge capturing, storing and disseminating.

Therefore, it appears a need for a re-conceptualization of projects as a vehicle for fostering knowledge creating, capturing and storing. Indeed, the use of knowledge management in project-based organizations can increase the chances of a project success, which depends on the ability and willingness of project team members to create and share knowledge within the organization. Hence, it is important to encourage familiarity with knowledge management processes, improve coordination among employees and departments, create incentives for knowledge efforts,

establish an authority that carries out knowledge activities and a system for handling knowledge tasks, and build an organizational culture that supports knowledge management.

This thesis highlighted that the available literature offers many researches about knowledge management, together with increasingly number of publications about the theme of project-based organizations. Hence, given that knowledge is a strategic asset for project success, it is expected and necessary to keep on exploring their interaction in order to develop systems and strategies that enable to improve the challenging management of knowledge in project-based organizations.

5 References

Ackoff, R. L. (1999). *Re-creating the corporation: A design of organizations for the 21st century. New York: Oxford University Press.*

Adamides, E. and Karacapilidis, N. (2004). *Information technology support for the knowledge and social processes of innovation management.* Technovation.

Ajmal, M., Helo, P. and Kekäle, T. (2010). *Critical factors for knowledge management in project business.* Journal of Knowledge Management. (Vol. 14, No. 1, pp.156-168).

Ajmal, M.M. and Koskinen, K.U. (2008). *Knowledge Transfer in Project-Based Organizations: An Organizational Culture Perspective*. Project Management Journal. (Vol. 39, No. 1, pp. 7-15).

Akerkar, R. (2010). *Knowledge-Based Systems. Technomathematics Research Foundation.*

Alavi, M., and Leidner, E. (2001). *Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues.* MIS Quarterly (Vol. 1, No. 10, pp. 107—136).

Andriopoulos, C. and Lewis, M. (2008). *Exploitation-Exploration Tensions and Organizational Ambidexterity.* Organization Science. (Vol. 20 No. 4, pp. 696–717).

Argyris, C. and Schön, D. (1996). *Organizational learning II: Theory, method and practice.* Addison-Wesley.

Asllani, A. and Luthans, F. (2003). *What knowledge managers really do: an empirical and comparative analysis. Journal of Knowledge Management* (Vol. 7, No. 3, pp. 53-66).

Baker, D. P., and Salas, E. (1997). *Principles and measuring teamwork: A summary and look toward the future*. In M. T. Brannick, E. Salas, & C. Prince (Eds.), *Team performance assessment and measurement: Theory, methods, and applications* (pp. 331–355). Mahwah, NJ: Lawrence Erlbaum.

Barney, J. B. (1986). *Organizational culture: Can it be a source of sustained competitive advantage? The Academy of Management Review.* (Vol. 11, No. 3, pp. 656-665).

Barney, J. B. (1991). *Firm Resources and Sustained Competitive Advantage. Journal of Management.* (Vol. 17, pp. 99–120).

Bartsch, V., Ebers, M. and Maurer, I. (2013). *Learning in project-based organizations: the role of project teams' social capital for overcoming barriers to learning*. International Journal of Project Management. (Vol. 31, No. 2, pp. 239–251)

Belbin.com. (2014). *Team Role Theory - Belbin Team Roles.* [online] Available at: http://www.belbin.com/rte.asp?id=8 [Accessed 1 Sep. 2018].

Bierly, P., and Chakrabarti, A. (1996). *Generic knowledge strategies in the U.S. pharmaceutical industry.* Strategic Management Journal. (Vol. 17).

Boh, W. F. (2007). *Mechanisms for sharing knowledge in project-based organizations*. Information and Organization. (Vol. 17, No. 1, pp. 27-58).

Bontis, N. (1998). *Intellectual capital: an exploratory study that develops measures and models.* Management Decision.

Borg, E. and Söderlund, J. (2015). *Liminality competence: an interpretative study of mobile project worker's conception of liminality at work*. Management learning. (Vol. 46, No. 3, pp. 260–279).

Borghoff, U. M. (1997). *Information Technology for Knowledge Management. Journal of Universal Computer Science.* (Vol. 3, No. 8, p. 83).

Bredin, K. (2008). *Human Resource Management in Project-Based Organisations - Challenges, Changes, and Capabilities*. Linköping Studies in Arts and Science (No. 431).

Bredin, K. and Söderlund, J. (2011). *The HR quadriad: a framework for the analysis of HRM in project-based organizations*. The International Journal of Human Resource Management.. (Vol. 22, No. 10, pp. 2202-2221).

Bredin, K. and Söderlund, J. (2013). *Human Resource Management in Project-Based Organizations - The HR Quadriad Framework.* PALGRAVE MACMILLAN, 3rd Edition.

Bresnen, M., Goussevskaia, A., and Swan, J. (2004). *Embedding new management knowledge in project-based organizations*. Organization Studies. (Vol. 25, No. 9, pp. 1535-1555).

Brown, R. B., & Woodland, M. J. (1999). *Managing knowledge wisely: A case study in organizational behavior.* Journal of Applied Management Studies.

Bukowitz, W. R., and Williams, R. L. (1999). *The Knowledge Management Fieldbook.* Upper Saddle River, N.J.: Financial Times, Prentice Hall.

Burkus, D. (2014). *How to Tell if Your Company Has a Creative Culture.* Harvard Business Review.

Cacciatori, E. (2008). *Memory objects in project environments: Storing, retrieving and adapting learning in project-based firms*. Research Policy (Vol. 37, No. 9, pp. 1591–1601).

Caldwell, F. (2001). *Layoffs? Intellectual capital walking out the door*. Gartner Group report.

Cameron, K. (1985). *Cultural Congruence, Strength, and Type: Relationships to Effectiveness*. National Inst. of Education (.ED), Washington, DC.

Cameron, K. and Quinn, R. (2011). *Diagnosing and Changing Organizational Culture.* John Wiley & Sons.

Cavusgil, S.T., Calantone, R.J. and Zhao, Y. (2003). *Tacit knowledge transfer and firm innovation capability. Journal of Business & Industrial Marketing.* (Vol. 18 No. 1, pp. 6-21)
Chemers M. , (1997). *An integrative theory of leadership.* Lawrence Erlbaum Associates.

Chen, J., Zhaohui, Z. and Xie, H.Y. (2004), *Measuring intellectual capital*. *Journal of Intellectual Capital* (Vol. 5 No. 1, pp. 195-212).

Choi, B. and Lee, H. (2002). *Knowledge management strategy and its link to knowledge creation process.* Expert Systems with Applications. (Vol. 23, pp.173–187).

Chronéer, D. and Backlund, F. (2015). *A Holistic View on Learning in Project-Based Organizations*. Project Management Journal. (Vol. 46, No. 3, pp. 61–74).

Clark, K.B., and Wheelwright, S.C. (1992), *Organizing and Leading 'Heavyweight' Development Teams.* California Management Review (Vol. 34, No. 3, pp. 9–28).

Cook, S. and Yanow, D. (2011). *Culture and Organizational Learning.* Journal of Management Inquiry.

Crisan, E., Ilies, L. and Muresan, I. (2010). *Best Practices in Project Management*. Review of International Comparative Management. (Vol. 11, pp. 43-51).

Crossan, M., Lane, H., & White, R. (1999). *An organizational learning framework: From intuition to institution. Academy of Management Review.* (Vol. 24, No. 3 pp. 522-53).

Cunha, A., Figueiredo, J., Matos, F. and Fernandes Thomaz, J. (2014). *Knowledge Management on PMO's Perspective: A Systematic Review*. 15th European Conference on Knowledge Management, At Santarém, Portugal.

Daft, R. L. (1983). *Organization theory and design.* St. Paul: West Pub. Co.

Daft, R.L. and Weick, K.E. (1984). *Toward a Model of Organizations as Interpretation Systems. Academy of Management Review* (Vol. 9, pp. 284-295).

Dalkir, K., Evans, M. and Bidian, C. (2014). *A Holistic View of the Knowledge Life Cycle: The Knowledge Management Cycle (KMC) Model. The Electronic Journal of Knowledge Management* (Volume 12 Issue 2 - 2014, pp. 85-97).

Dalkir, K. (2005). *Knowledge Management in Theory and Practice. Burlington.* Oxford: Elsevier/Butterworth Heinemann.

Dalkir, K. (2011). *Knowledge management in theory and practice.* 2nd edition, Cambridge, MA: Massachusetts Institute of Technology.

Davenport, T., De Long, D. and Michael C Beers (1998). *Successful Knowledge Management Projects.* Sloan Management Review.

Davenport, T. and Prusak L. (1998). *Working Knowledge: How Organizations Manage What They Know. Harvard Business School Press.*

Deal, T. and Kennedy, A. (2000). *Corporate Cultures: The Rites and Rituals of Corporate Life*. Perseus Books Group.

DeFillippi, R. J.(2001). *Introduction: project-based learning, reflective practices and learning outcome*s. Management Learning. (Vol .32, pp. 5–10).

DeLong, D.W., and Fahey, L. (2000). *Diagnosing cultural barriers to knowledge management. Academy of Management Executive.* (Vol. 14, No. 4, pp. 113–127).

Drucker, P. (1964). *Knowledge worker: new target for management*. Christian Science Monitor.

Drucker, P. F. (1999), *Management Challenges for the 21 Century. New York Harper Collins.*

Du Plessis, M. (2007). *The role of knowledge management in innovation. Journal of Knowledge Management.* (Vol. 11, No. 4, pp. 20-29).

Dzinkowski, R. (2000). *The measurement and management of intellectual capital: an introduction.* Management Accounting. (Vol. 78).

Earl, M. (2001). *Knowledge management strategies: toward a taxonomy. Journal of Management Information System.* (Vol. 18 No. 1, pp. 215- 233).

Easterby-Smith, M. and Lyles, M. (2003). *The Blackwell handbook of organizational learning and knowledge management.* Oxford: Blackwell.

Edmondson, A. C. and Nembhard, I. M. (2009). *Product development and learning in project teams: The challenges are the benefits*. J. Product Innovation Management (Vol. 26, No. 2, pp. 123–138).

Empson, L. (2001). *Fear of exploitation and fear of contamination: Impediments to knowledge transfer in mergers between professional service firms.* Human Relations.

Eriksson, P.E. and Leiringer, R. (2015). *Explorative and exploitative learning in project-based organizations: improving knowledge governance through a project management office?*. Engineering Project Organization Journal.

Ewenstein, B. and Whyte, J. (2009). *Knowledge practices in design: The role of visual representations as "epistemic objects".* Organization Studies. (Vol. 30, No. 1, pp. 7–30).

Fahey, L. and L. Prusak. (1998). *The Eleven Deadliest Sins of Knowledge Management. California Management Review.* (Vol. 40, No.3, pp. 265-276).

Filippini, R., Güttel, W. and Nosella, A. (2012). *Ambidexterity and the evolution of KM initiatives.* Journal of Business Research.

Fiol, C.M. and Lyles, M. (1985). *Organizational Learning.* Academy of Management Review.

Firestone, J. and McElroy, M. (2004) *Organizational learning and knowledge management: the relationship. The Learning Organization.* (Vol. 11, No. 2, pp.177-184).

Foss, N.J., Husted, K. and Michailova, S. (2010). *Governing knowledge sharing in organizations: levels of analysis, governance mechanisms, and research directions*. Journal of Management Studies. (Vol. 47, No. 3, pp. 455-482).

Francis, H., and Keegan, A. (2006). *The Changing Face of HRM: In Search for Balance*. Human Resource Management Journal. (Vol. 16, No. 3, pp. 231–249).

Friedman, T. (2005). *The World is Flat: A Brief History of the Twenty-First Century. 1st ed. London: Farrar, Straus and Giroux.*

Galbraith, J.R. (1971). *Matrix organization designs: how to combine functional and project forms*. Journal: Business Horizons. (Vol. 14, No. 1, pp. 29-40).

Geisler, E. (2007). *A typology of knowledge management: strategic groups and role behavior in organizations. Journal of Knowledge Management* (Vol. 11, No. 1, pp. 84–96).

Gibson, C.B. and Birkinshaw, J. (2004). *The antecedents, consequences, and mediating role of organizational ambidexterity. Academy of Management Journal* (Vol. 47, pp.209–26).

Girard, J. P. and Girard, J. L. (2015). *Defining knowledge management: Toward an applied compendium. Online Journal of Applied Knowledge Management*.

Gloet, M. and Terziovski, M. (2004). *Exploring the relationship between knowledge management practices and innovation performance. Journal of Manufacturing Technology Management.* (Vol. 15, No. 5, pp. 402-409).

Gourlay, S. (2004). *The SECI model of knowledge creation: some empirical shortcomings-Kingston: Kingston Business School.*

Granovetter, M. S. (1992). *Problems of explanation in economic sociology.* In N. Nohria & R. Eccles (Eds.), Networks and organizations: Structure, form and action (pp. 25-56). Boston: Harvard Business School Press.

Grant, R. M. (1996). *Toward a knowledge-based theory of the firm. Strategic Management Journal* (Vol. 17, (Winter Special Issue), pp. 109-122).

Gulbranson, C. and Audretsch, D. (2008). *Proof of Concept Centers: Accelerating the Commercialization of University Innovation. The Journal of Technology Transfer.* (Vol. 33, No. 3, pp. 249-258).

Gustavsson, T.K. (2018). *Liminal roles in construction project practice: exploring change through the roles of partnering manager, building logistic specialist and BIM coordinator.* Construction Management and Economics

Guthrie, J. (2001). *The management, measurement and reporting of intellectual capital. Journal of Intellectual Capital.*

Hackman, J. R. (1987). *The design of work teams*. In J. W. Lorsch (Ed.), Handbook of organizational behavior (pp. 315-342). Englewood Cliffs, NJ7 Prentice-Hall.

Halawi, L.; Aronson, J. and McCarthy, R. (2005). *Resource-Based View of Knowledge Management for Competitive Advantage. The Electronic Journal of Knowledge Management* (Vol. 3, No. 2, pp 75-86).

Hansen, M., Nohria, N. and Tierney, T. (1999). *What's your strategy for managing knowledge?* Harvard Business Review, March–April.

Hedberg, B. (1981). *How organizations learn and unlearn?* In P. C. Nystrom & W. H. Starbuck (Eds.), Handbook of organizational design (pp. 8-27). London: Oxford University Press.

Herkema, S. (2003). *A complex adaptive perspective on learning within innovation projects. The Learning Organization.* (Vol. 10, No. 6, pp. 340-6).

Hobday, M. (2000). *The project based organization: an ideal form for managing complex product and systems*. Research Policy.

Hoegl, M. (2005). *Smaller teams - better teamwork: How to keep project teams small*. Business Horizons. (Vol. 48, No. 3, pp. 209-214).

Huangc, J. C. and Newell, S. (2003). *Knowledge integration processes and dynamics within the context of cross-functional projects*. International Journal of Project Management. (Vol. 21, No. 1, pp. 167–176).

Huber, G. (1982). *Organizational information systems: Determinants of their performance and behavior.* Management Science (Vol. 28, No. 2).

Hudson, W. (1993). *Intellectual Capital: How to Build it, Enhance it, Use it.* John Wiley & Sons, New York, NY.

Huemann M., Keegan A. and Turner J.R. (2006). *Human resource management in the project-oriented company: a review.* International Journal of Project Management.

Ipe, M. (2003). *Knowledge Sharing in Organizations: A Conceptual Framework. Human Resource Development Review.*

Jawadekar, W. (2011). *Knowledge Management: Text & Cases.Tata McGraw-Hill*.

Jones, P., & Jordan, J. (1998). *Knowledge orientations and team effectiveness.* International Journal of Technology Management.

King, W.R., (2009). *Knowledge Management and Organizational Learning. Annals of Information Systems.* (Vol. 4).

Koenig, G. (1994), *L'apprentissage organizationnel: repérage des lieux.* Revue Française de Gestion. (Vol. 97, pp. 76-83).

Koners, U. and Goffin, K. (2007). *Learning from post-project reviews: A cross-case analysis*. Journal of Product Innovation Management. (Vol. 24, No. 3, pp. 242–258).

Kotnour, T. (2000). "*Organizational learning practices in the project management environment*. International Journal of Quality & Reliability Management. (Vol. 17, No. 4/5, pp. 393-406).

Kramer, R. M. (1999). *Social uncertainty and collective paranoia in knowledge communities: Thinking and acting in the shadow of doubt.* In L. L. Thompson, J. M. Levine, & D. M. Messick (Eds.), Shared cognition in organizations: The management of knowledge (pp. 163-194). Mahwah, NJ: Lawrence Erlbaum.

Larson, E. W. and Gobeli, D. H. (1987). *Matrix Management: Contradictions and Insights*. California Management Review. (Vol. 29, No. 4, pp. 126-138).

Lave, J. and Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

Leana, C.R. and Van Buren, H.J. (1999) *Organizational Social Capital and Employment Practices. Academy of Management Review* (Vol. 24, pp. 538-555).

Lee, S. and Hong, S. (2002). *An enterprise-wide knowledge management system infrastructure.* Industrial Management & Data Systems.

Lee, T. and Maurer, S. (1997). *The retention of knowledge workers with the unfolding model of voluntary turnover. Human Resource Management Review.*

Liebowitz, J. (1999). *Key Ingredients to the Success of an Organization's Knowledge Management Strategy. Knowledge and Process Management.* (Vol. 6, No. 1).

Liew, A. (2007). *Understanding Data, Information, Knowledge And Their Inter-Relationships. Journal of Knowledge Management Practice.* (Vol. 8, No. 2).

Lim, K.; Ahmed, P. and Zairi, M. (1999). *Management for quality through knowledge management- Total Quality Management journal.* (Vol. 10, No. 4 and 5, pp. 615-621).

Lindkvist, L. (2004). *Governing Project-based Firms: Promoting Market-like Processes within Hierarchies.* Journal of Management and Governance. (Vol. 1, No.8, pp. 3-25).

Lindkvist, L. (2005). *Knowledge Communities and Knowledge Collectivities: A Typology of Knowledge Work in Groups.* Journal of Management Studies (Vol. 42 no. 6, pp. 1189-1210).

Majchrzak, A., More, P. H. B., and Faraj, S. (2012). *Transcending Knowledge Differences in Cross Functional Teams*. Organization Science. (Vol. 23, No. 4, pp. 951–70).

March, J.G. (1991). *Exploration and exploitation in organizational learning.* Organizational Science. (Vol. 2, pp. 71–87).

Mariotti, F. (2012). *Exploring Interorganizational Learning: a Review of the Literature and Future Directions.* Knowledge and Process Management. (Vol. 19, No. 4).

McElroy, M. (1999). *The second generation of knowledge management.* Knowledge Management (Vol. October, pp. 86-88).

Meso, P. and Smith, R. (2000). *A Resource-Based View of Organizational Knowledge Management Systems. Journal of Knowledge Management.* (Vol. 4, pp. 224-234).

Meyer, A. (1982). *Adapting to environmental jolts.* Administrative Science Quarterly. (Vol. 27, pp. 515-537).

Meyer, M. H. and Zack, M. H. (1999). *The design and development of information products.* Sloan Management Review. (Vol. 37).

Moore, C. and Rugullies, E. (2005). *The Information Workplace Will Redefine The World Of Work At Last.* Forrester Research, Inc.

Müller, R, Glückler, J. and Aubry, M. (2013). *A Relational Typology of Project Management Offices*. Project Management Journal. (Vol. 44, No. 1, pp. 59-76).

Nahapiet, J. and Ghoshal, S. (1998). *Social capital, intellectual capital and the organizational advantage.* Academy of Management Review.

Nonaka, I., Toyama, R. and Byosiere, P. (2001). *A theory of organizational knowledge creation: understanding the dynamic process of creating knowledge*. Oxford University Press, Oxford.

Nonaka, I.; Takeuchi, H. (1995). *The Knowledge-Creating Company - How Japanese Companies Create the Dynamics of Innovation.*

Nonaka, I. (1991). *The knowledge creating company. Harvard Business Review.*

Nonaka, I. and Konno, N. (1998). *The Concept of 'Ba': Building a Foundation for Knowledge Creation*. *California Management Review.* (Vol 40, No.3 Spring 1998).

OECD. (1996). *The knowledge-based economy. Paris.*

Omotayo, F. (2015). *Knowledge Management as an important tool in Organisational Management: A Review of Literature. Library Philosophy and Practice*.

O'Reilly, C., & Pondy, L. (1980). *Organizational communication.* In S. Kerr (Ed.), Organizational behavior.

Packendorff, J. (1995). *Inquiring into the temporary organization: New directions for project management research*. Scandinavian Journal of Management. (Vol 11, No. 4, pp. 319–333).

Packendorff, J. (2002). *The temporary society and its enemies: Projects from an individual perspective*. In K. Sahlin-Andersson & A. Söderholm (Eds.), *Beyond project management: new perspectives on the temporary - permanent dilemma* (pp. 39-58). Malmö; Oslo; Copenhagen: Liber ekonomi; Abstrakt; Copenhagen Business School Press.

Packendorff, J. and Lindgren, M. (2014). *Projectification and its consequences: narrow and broad conceptualisations*. South African Journal of Economic and Management Sciences. (Vol. 17, No. 1, pp. 7-21).

Pemsel, S., Mueller, R., and Söderlund, J. (2016). *Knowledge Governance Strategies in Project-based Organizations*. Long Range Planning. (Vol. 49, No. 6, pp. 648-660).

Pemsel, S. and Wiewiora, A. (2013). *Project management office a knowledge broker in project-based organisations*. International Journal of Project Management (Vol. 31, No. 1, pp. 31–42).

Penrose, E. (1959). *The Theory of the Growth of the Firm. Oxford University Press: Oxford.*

Peroune, D. (2007). *Tacit knowledge in the workplace: The facilitating role of peer relationships. Journal of European Industrial Training* (Vol. 31, no. 4, pp. 244-258).

Polanyi, M. (1966). *The Tacit Dimension. Routledge & Kegan Paul, London.*

Ponzi, L. (2002). *The intellectual structure and interdisciplinary breadth of knowledge management: A bibliometric study of its early stage of development.* Sciento Metrics. (Vol. 55, No. 2, pp. 259–272).

Prencipe, A. and Tell, F. (2001). *Inter-project learning: processes and outcomes of knowledge codification in project-based firms*. Research Policy. (Vol. 30, pp. 1373–1394).

Project Management Institute. (2004). *A guide to the project management body of knowledge (PMBOK guide)*. Newtown Square, Pa: Project Management Institute.

Quigley, N. R., Tekleab, A. G., & Tesluk, P. E. (2007). *A Multilevel Investigation of the Motivational Mechanisms Underlying Knowledge Sharing and Performance.* Organization Science.

Reinhardt, W., Schmidt, B., Sloep, P. and Drachsler, H. (2011). *Knowledge Worker Roles and Actions – Results of Two Empirical Studies*. Knowledge and Process Management.

Rulke, D. L., & Zaheer, S. (2000). *Shared and unshared transactive knowledge in complex organizations: An exploratory study.* In Z. Shapira & T. Lant (Eds.), Organizational cognition: Computation and interpretation.

Schein, E. H. (1985). *Organizational Culture and Leadership* (1st ed.). San Francisco: Jossey-Bass.

Schweiger D. M.,. Atamer T. and Calori R. (2003). *Transnational project teams and networks: making the multinational organization more effective*. Journal of World Business. (Vol.38, No. 2, pp. 127-140).

Senge, P.M. (1990). *The Fifth Discipline.* London: Century Business.

Serrat, O. (2012). *Managing knowledge in project environments.* Manila, Philippines: Asian Development Bank.

Sethi, R. and Nicholson, C. Y. (2001). *Structural and contextual correlates of charged behavior in product development teams.* Journal of Product Innovation Management. (Vol. 18, No. 3, pp. 54-168).

Simon, H. A. (1991). *Bounded rationality and organizational learning.* Organization science. (Vol. 2, pp. 125-134).

Söderlund, J. (2000). *Temporary organizing: consequences and control forms*. In R. A. Lundin & Hartman (Eds.), *Projects as business constituents and guiding motives*. Boston: Kluwer Academic Publishers.

Stenmark, D. (2001). *Leveraging tacit organizational knowledge.* Journal of Management Information Systems.

Stewart, T. (1997). *Intellectual Capital: The New Wealth of Organizations*. New York: Doubleday.

Subramaniam, M. and Youndt, M. A. (2005). *The influence of intellectual capital on the types of innovative capabilities. Academy of Management Journal.* (Vol. 48, No. 3, pp. 450–463).

Swap, W., Leonard, D., Shields, M. and Abrams, L. (2001). *Using mentoring and storytelling to transfer knowledge in the workplace. Journal of Management Information Systems* (Vol. 18, No. 1, pp. 95-114).

Sydow, J., Lindkvist, L., and DeFillippi, R. (2004). *Project-Based Organizations, Embeddedness and Repositories of Knowledge: Editorial*. Organization Studies. (Vol. 25, No. 9, pp. 1475-1489).

Szulanski, G., (1995). *Unpacking Stickiness: An Empirical Investigation of the barriers to Transfer of Best Practice Inside the Firm.* Academy of Management Best Papers Proceedings.

Szulanski, G., (2000). *The Process of Knowledge Transfer: A Diachronic Analysis of Stickiness.* Organizational Behavior & Human Decision Processes. (Vol. 82, No. 1).

Takeuchi, H.; Shibata, T. (2006). *Japan, Moving Toward a More Advanced Knowledge Economy Volume 2: Advanced Knowledge-Creating Companies. The World Bank Washington, D.C.*

Tampoe, M. (1993). *Motivating Knowledge Workers The Challenge for the 1990s*. Long Range Planning. (Vol. 26, No. 3).

Teng, J. and Song, S. (2011). *An exploratory examination of knowledge- sharing behaviors: solicited and voluntary. Journal of Knowledge Management*. (Vol. 15, No. 1, pp.104-117).

Thompson, J. D., (1967). *Organizations in action: Social science bases of administrative theory*. s.l.:Transaction publishers.

Thompson, M. and Heron, P. (2005). *The difference a manager can make: organizational justice and knowledge worker commitment. The International Journal of Human Resource Management.*

Troanca D. (2011). *Building the project team and project organization – challenges and obstacles*. Studies in Business and Economics. (Vol. 6, No. 3, pp. 186-195).

Turner, J.R. (1990). *What are projects and project management* [Henley Working Paper 9002]. Henley-on-Thames: Henley Management College.

Turner, J.R. and Keegan, A. (2001). *Mechanisms of Governance in the Project-Based Organization; Roles of the Broker and Steward*. European Management Journal Vol.19, Pergamon.

Turner, J.R. and Müller, R. (2003). *On the nature of the project as a temporary organization*. International Journal of Project Management. (Vol. 21 No.1, p. 1–8).

Turner R., Keegan A. (2001). *Mechanisms of Governance in the Project-based Organization: Roles of the Broker and Steward*. European Management Journal. (Vol. 19, No. 1, pp. 254-267).

Turner R. and Keegan A. (1999). *The versatile project-based organization: governance and operational control*. European Management Journal, Vol. 17.

Van de Ven, A. H., Delbecq, A. L., & Koenig, R. Jr. (1976). *Determinants of Coordination Modes within Organizations*. American Sociological Review (Vol. 41, no. 2, pp. 322-338).

Visser, M. (2007). *Deutero-learning in organizations: A review and a reformulation.* The Academy of Management review. (Vol. 32, No. 2).

Wellman, J. L. (2009). *Organizational Learning. Palgrave Macmillian.*

Whitley, R. (2006): *Project-based firms: new organizational form or variations on a theme*. Industrial and Corporate Change. (Vol. 15, No. 1, pp. 77-99).

Wiig, K. M. (1993). *Knowledge management foundations: Thinking about thinking: How people and organizations create, represent, and use knowledge*. Arlington, TX: Schema Press.

Zack, M. H. (1999). *Developing a Knowledge Strategy. California Management Review*. (Vol. 41, No. 3, pp. 125-14).

Zack, M. H. (1999) *Managing codified knowledge*. Sloan Management Review.

Zack, M. H. (2003). *Rethinking the knowledge-based organization*. Sloan Management Review, (Vol. 44 No. 4, pp. 67-71).

Zhou, A. and Fink, D. (2003). *The intellectual capital web: A systematic linking of intellectual capital and knowledge management. Journal of Intellectual Capital.* (Vol. 4 No. 1, pp.34-48).

Zoerman, K.W. (2008). *Cross-Functional Efficiency*. Retrieved 5 September 2018 from http://www.zoerman.com/cfe.pdf

Abstract

Knowledge management (KM) is currently recognized to be extremely relevant discipline in many fields, such as business organization, strategy and human resources. Given the interdisciplinary nature of the subject, literature offers a variety of definitions. Drucker (1999) defines knowledge management as the *coordination and exploitation of organizational knowledge resources, in order to create benefit and competitive advantage*. While Davenport & Prusak (1998) states that KM consists in *managing the corporation's knowledge through a systemically and organizationally specific process for acquiring, organizing, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organizational performance and create value*.

In order to have a better understanding of the discipline, it is pivotal to explore the meaning of the concept of knowledge, which is defined as *a fluid mix of framed experience, contextual information, values and expert insight that provides a framework for evaluating and incorporating new experiences and information* (Davenport, 1998). Knowledge is considered as a development of mere data and information, indeed knowledge is reached through use and experience. Knowledge can be divided between tacit and explicit. The first one is highly personal and it is, therefore, hard to codify and communicate, while the latter is formal and systematic, thus easily communicated and shared.

However, most literature agree that KM has three main core components (people, process, technology), whose combination creates a system for knowledge management for the purpose of taking advantage of this resource. Indeed, the growing importance of knowledge can be

explained through the knowledge-based theory, according which a sustainable competitive advantage comes

from an effective knowledge management strategy. Thus, knowledge is considered as a commodity, therefore the intangible commodity is represented by *intellectual capital,* described as total *inventor of capital or knowledge-based resources* possessed by an company (Dzinkowski, 2000).

Managing knowledge requires to develop practical and coherent practices. In this regard, Dalkir (2014) identifies seven phases of the knowledge management cycle: identify and/or create, store, share, use, learn improve. One of the most relevant phase of the cycle is knowledge sharing, which can be described as *knowledge held by an individual is converted into a form that can be understood, absorbed, and used by others* (Ipe, 2003). It is regarded as a very challenging activity in KM, indeed it can be strongly affected by many factors: nature of knowledge, motivation to share, opportunity to share and the culture of work environment.

Knowledge managers can decided to pursue different strategies to reach their KM goals. On the one hand, it is possible to adopt a *codification* strategy, which aims at converting knowledge into a more tacit form of knowledge, in order to store into repositories. On the other hand, companies that pursue a *personalization* strategy base their KM strategies on human interaction, since it involves sharing knowledge through human interaction. The success of a certain strategy also also requires to implement an effective KM system, which is a special class of information system, that aims at *supporting creation, transfer and application of knowledge in organization* (Dalkir, 2005). Thus, a company that pursue a codification strategy calls for an information system which is able to store knowledge and allows its sharing and reuse, while a company that

follows a personification strategy requires a network system that supports sharing of tacit knowledge between employees.

The two main actors in knowledge management are *knowledge managers*, whose tasks deal with the promotion and implementation of knowledge management principles and practices, and *knowledge workers*, who create, modify, and/or synthesize knowledge as a fundamental part of their jobs. Managers mainly have to develop an environment where workers are motivated and committed to pursue KM objectives. Furthermore, technologies also play an important role as it provides new solutions, however IT themselves are not enough since it is not effective without interaction with the human capital.

It is pivotal to analyze the relationship between knowledge management and other relevant subjects, such as organizational culture, innovation and organizational learning.

Organisational culture, according to Schein (1985), can be defined as a *pattern of shared basic assumptions – invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration – that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems*. Culture represent, at the same time, the greatest enabler and barrier for knowledge management. Culture affects KM as it defines what is the *most useful, important or valid* for the organization, the relationship between different levels of knowledge, the organizational context for social interaction and, lastly it shapes how *new knowledge is created, legitimated (or rejected), and distributed throughout the organization* (DeLong and Fahey, 2000).

Then regarding innovation, KM should manage available, or potentially achievable, knowledge with the purpose to enable and improve innovation processes. Indeed, KM can create a favorable

environment for innovation, in particular knowledge can reduce complexity in the processes and enables the *integration of knowledge both internal and external to the organization, thus making it more available and accessible* (Du Plessis, 2007). However, innovation processes can induce organizational issues linked to a tension between exploitation and exploration. Exploratory innovation deals with the *experimentation of new alternatives* and involves the development of new knowledge through experiments that lead to more radical innovation. On the other hand, exploitative innovation concerns the *refinement and extension on existing competencies, technologies, and paradigms*. Thus, this tension should be carefully managed through *organizational ambidexterity*, that allows to *both generate and manage familiar, mature, current or proximate knowledge (exploitation) and unfamiliar, distant and remote knowledge (exploration)* (Filippini, 2012).

Organizational learning (OL), which can be defined as *collective phenomenon of the acquisition and development of cognitive and behavioral skills, knowledge and know-how, resulting in a more or less profound and durable modification of the way organizations are managed* (Koenig, 1994), and knowledge management are strongly linked, but their relationship is highly debated. Indeed on the one hand, some researchers assess that knowledge management is a subset of organizational learning, while others consider knowledge management as a concept beyond organizational learning boundaries (Ponzi, 2002).

The shift towards a knowledge-based economy also required in the organizational and managerial models, which has been found in the *project-based organization*, indeed more and more companies hang on projects in their everyday procedures. A project is a *temporary organization to which resources are assigned to undertake a unique, novel and transient endeavor managing the inherent uncertainty and need for integration in order to deliver*

beneficial objectives of change (Turner, 2003) and they are adopted in order to perform *any activity with a defined set of resources, goals, and time limit* (Hobday, 2000). Indeed, the growing reliance on the use of projects led to the so-called projectification, which is regarded as the use of temporary projects and the passage between repetitive production and non-routinized work procedures.

Thus, a project-based organization (PBO) is a structure *in which the project is the primary unit for production organisation, innovation, and competition and there is a lack of formal functional coordination across project lines* (Hobday, 2000). PBOs are characterized by a high knowledge intensity, cross-functionality, temporality and a tension between permanent and temporary system and logics (Bredin, 2008) . This organizational structure is considered as the opposite of functional structure, and is useful for *meeting innovative needs, responding to uncertainty, coping with emerging properties, responding to changing client requirements and learning in real time* (Hobday, 2000).

Project workers are usually organized in team, which are defined as units of *two or more individuals, who have specific roles, perform interdependent tasks, are adaptable, and share a common goal* (Baker and Salas, 1997). Therefore, it is important to build teams who are able to provide high performances. Teams can be staffed through *individual* (built on the base of the competences and knowledge that the single individual can provide to the group, specifically created for the project) or *cluster hiring* method (team built with the purpose of enabling it to easily shift from one project to another one). Researches show that the size of the team matter, in particular it is more convenient to rely on smaller team, since as team size increases, it results more challenging to coordinate all the activities. Team work generates a variety of dynamics that can highly affect the results, most influential factors are: the role of culture, the diversity of team

composition, team member motivation and information technology. Each team member has a specific role, which does not only stem from the capabilities and knowledge required from the project, but also from personal attitudes and tendencies. In particular, Belbin (2014) recognizes nine major roles: the *coordinator* that acts as a chairperson, the *completer* who ensures thorough and timely completion, the *implementer* who puts ideas into action, the *monitor* that analysis options, the *plant* who presents new ideas and approaches, the *resource investigator* that explores outside opportunities, the *sharper* that challenges the team to improve, the *specialist* who provides specialized skills, and the *team worker* who encourages cooperation. However, the most influential role in team working is the leader, indeed his position involves a strong social influence that can determine the success of the project.

The governance of project-based organization is another critical practice, since on the one hand each project unit requires a high degree of autonomy, which can cause disconnection between different levels of the organization. On the other hand, the *mix of individuals with highly specialized competences* can be a barrier for the creation of *shared understandings, a common knowledge base, etc* (Lindkvist, 2004). Thus, each project requires a different governance mode and this is most likely to lead a decentralization of decision-making on operational issues, with empowering governance. In this regard, it is interesting to highlight roles of *broker* and *steward*, who are both pivotal in order to manage the relationship between client and project team. The broker is responsible for the relationship with the client, while the role of the steward deals with the relationship with the team project. The client explains its needs to a broker, who has to identify the most suitable steward and address him towards those resource that can better satisfy the requests of the client. The steward should build the project team,

including the designation of a project manager. Thus, when they work together they in project, they ensure the success of the project itself.

The specific nature of PBOs is reflected in the unique way human resources are managed in projects. The role of HRM is critical since it affects project in different areas: the flow of people, the performances, the personal involvement of workers into the organization and the development of employees on either individual and aggregate level. In this regard, there is a need for clarity, therefore Bredin and Soderlund (2013) provided a framework to offer a new model to apply in the project-based organizations. Indeed, HRM has to be considered as managing the interplay between the employer and the employees. In particular, there are four key players in project-based organization and they constitute the HR quadriad: the HR specialist, the project manager, the project worker and the line manager. Besides, these roles are significantly influenced by project-based work settings in relation to project work and project participation types, and they are the result of the deep collaboration among the HRM and the four roles. In particular, the line manager is responsible for functional line unit and he is usually specialized a in a specific function or area of expertise in an organization. Project workers have a crucial role in HRM since they are highly interested in developing skills, stay employable and run their careers. HR specialist are pivotal as they enable a continuous improving interplay among the HR quadriad. Lastly, in the framework, the role of project managers refers to the direct feedbacks to employees, to foster a continuous personal development.

In this context, it results that knowledge management is pivotal for the success of a project, as knowledge is recognized to be a crucial source of competitive advantage, even if researches demonstrated that there still are issues involved *in attempting to capture, share and diffuse knowledge and learning across projects* (Bresnen, 2004).

Therefore, it is important to deeply analyze the mechanisms involved into knowledge management in the project-based organizations.

First of all, in project environment, it is pivotal to explore knowledge sharing mechanisms, which are defined as *formal and informal mechanisms for sharing, integrating, interpreting and applying know-what, know-how, and know-why embedded in individuals and groups that will aid in the performance of project task*s (Boh, 2007). In particular, in accordance with the dicithiy between codification versus personalization strategies, it is interest to analyze the difference between *individualization* and *institualization*. The first one better suits tacit knowledge knowledge, while the latter explicit knowledge, which can be indeed codified. Furthermore, it is relevant to consider the distinction between *knowledge sharing within projects and knowledge sharing between projects*. The first concept regards the process through which knowledge is shared within the boundaries of a certain project. On the other hand, knowledge sharing between projects concerns a situation in which information are shared with individuals who are not working toward the same project. It means that knowledge goes beyond the boundaries of the project. Although sharing knowledge between projects is more challenging, it is pivotal for developing the long-term success of the organization. Furthermore, it is critical to take into consideration knowledge integration dynamics, which is defined as an *ongoing collective process of constructing, articulating and redefining shared beliefs through the social interaction of organizational members* (Huang, 2003). Hence, it is interesting to explore the dynamics of knowledge integration in cross-functional projects teams, since there is an increasingly reliance on project-oriented organizational structure, but also because *knowledge integration within the context of a project team is not limited to a focus on the dynamics occurring within the team boundary.* Indeed, it is pivotal to take into account how knowledge integration work *beyond the*

team boundaries (Huang, 2003). In this context, it is possible to recognize two different approaches. On the one hand, an organization can rely on a *traverse approach*, which involves significant efforts in terms of time and resources in order to ensure a *deep dialogue*, which allows individuals to be aware of the knowledge of the other members (Majchrzak, 2012). On the other hand, a firm can follow a *transverse approach*, which is composed of five main practices: *voicing fragments, co-creating the scaffold, dialoguing around the scaffold,moving the scaffold aside* and *sustain engagement*. Still, even if in both in both approaches, dialogue results pivotal, its roles is very different, since in the first case, dialogue aims at emphasizing the differences among the knowledge background of each member, while in the second case, dialogue is used in order to obtain a collective perspective on the problem.

Additionally, learning in project-based organizations, that refers to the *practice of utilizing real-world work assignments on time-limited projects to achieve mandated performance objectives and to facilitate individual and collective learning* (DeFilippi, 2001), is crucial in this regard, since it can support the success of knowledge management practices in the PBOs. It is pivotal to both intra-project and inter-project learning, indeed it important to be able to manage learning at both levels, by adopting a *broader approach capable of identifying the links between intra-project learning and the transfer of learning to the wider organization* (Kotnour, 2000). However, the discontinuous and temporary nature of project work makes it very challenging to enable learning across project boundaries, since prevents the functioning of three major mechanisms of knowledge management, which are *opportunity, motivation, and ability* . However, literature offers remedies used to overcome barriers to organizational learning, such as *memory objects, post-project reviews and the role of social context* (Bartsch, 2013).

In this context, the role of the project management office gains a lot of importance, since he has responsibilities related to the centralization and coordination of projects under its domain. In particular, PMOs can exert seven major functions: *lessons-learnt database, PM standards and methods, consulting and education, strategic management, project resource management, monitoring and controlling, and discussion of synergies among functions* (Eriksson, 2015) . Similarly, according to Muller (2013) a PMO has three basic roles: *serving, controlling, and partnering*. However, a PMO has to foster coordination coordination of knowledge and other resources in PBOs, in order to act as a *knowledge broker* between projects, and between project an top management.

Furthermore, in project environment, knowledge governance is pivotal, since it aims at *strategically influencing knowledge processes by implementing governance mechanisms* (Pemsel, 2016). The main activities of knowledge governance regard the choice of *organizational structures and mechanisms that can influence the process of using, sharing, integrating, and creating knowledge in preferred directions and toward preferred levels* (Foss, 2010).

As the whole project cleared out, it is important to implement an effective knowledge management strategy in PBOs, since it represents a strong tool to establishing and sustaining a competitive advantage. However, it results to be quite challenging, since the temporary nature of projects do not support the creation of routines and organizational memory, hence, PBOs lack a mechanism for knowledge capturing, storing and disseminating.

Therefore, it appears a need for a re-conceptualization of projects as a vehicle for fostering knowledge creating, capturing and storing. Indeed, the use of knowledge management in project based organizations can increase the chances of a project success, which depends on the ability

and willingness of project team members to create and share knowledge within the organization. Hence, it is important to encourage familiarity with knowledge management processes, improve coordination among employees and departments, create incentives for knowledge efforts, establish an authority that carries out knowledge activities and a system for handling knowledge tasks, and build an organizational culture that supports knowledge management.