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Use of Competency Management Methods and Tools in Project-based Organizations

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Résumé – La gestion des compétences relève traditionnellement de la gestion de ressources humaines (RH) notamment dans une perspective d'évaluation et de gestion de carrière. Avec la compression des délais de mise sur le marché de nouveaux produits, les besoins accrus d'agilité face aux aléas et l'augmentation du turnover, la gestion des compétences devient un élément fondamental dans la gestion de projets. Elle permet d'abord de gérer les compétences individuelles dans le but d'affecter les acteurs les plus adéquats aux missions d'un projet, ainsi que la prise en compte des compétences collectives afin d'améliorer les performances. Par ailleurs, elle garantit l'évolution du capital humain ainsi que le transfert de compétences en cas de turnover. L'objectif de ce travail est d'étudier l'usage des méthodes et outils de gestion de compétences dans le pilotage de projets. Outre l'examen de la littérature, des entretiens semi-directifs ont été menés avec un nombre de praticiens travaillant dans des entreprises organisées par projets. Ces entretiens ont été analysés à l'aide d'une méthode qualitative afin de comprendre comment les entreprises gèrent leurs employés dans les projets. Les résultats de notre étude ont montré que la gestion des compétences reste en grande partie la responsabilité de la Direction RH et que les dispositifs utilisés à cet effet ne sont pas mobilisés dans les projets.

Mots clés - Gestion des compétences, Organisations par projets, Etude exploratoire, Entretiens semi-directifs.

Abstract – Competency management has traditionally been the responsibility of human resources (HR) management particularly to evaluate employees and manage their careers. With the compression of time to market for new products, the increased need for agility in the face of hazards and the increase in turnover, competency management is becoming a fundamental element in project management. On the one hand, it enables managing individual competencies with the aim of assigning the most appropriate people to a project's missions, along with the consideration of collective competencies in order to improve performance. On the other hand, it guarantees the evolution of human capital as well as the transfer of skills in case of turnover. The objective of this work is to study the use of competency management methods and tools in project management. In addition to reviewing the literature, semi-directive interviews were conducted with a number of practitioners working in companies organized by projects. These interviews were analysed using a qualitative method in order to understand how companies manage employees' competencies in projects. The results of this study showed that competency management remains largely the responsibility of the HR department and that tools used for this purpose are not mobilized in projects.

Keywords – Competencies management, Project-based organizations, Exploratory study, Semi-structured interviews.

1 INTRODUCTION

About 40% of the global economy is project-based, using management by projects as main process for producing both products and services [Turner et al., 2010]. Numerous benefits have been associated with the adoption of a Project-Based Organization (PBOs). They refer to better processes, control and lead-time reduction, higher output quality, increasing ability to respond quickly and flexibly to customers' needs, more flexible application and integration of organizational skills, learning within the project boundary, coping with risks and uncertainties and increasing ability to innovate in collaboration with clients and suppliers [Bonjour et al., 2002; Di Vincenzo & Mascia, 2012]. PBOs are especially needed in significantly customized industries, such as filmmaking and media, complex products and systems, software development, construction, engineering design, and biotechnology. Many authors confirm that PBOs are the prevalent mode in a variety of industries [Di Vincenzo & Mascia, 2012; Loufrani-Fedida, 2006].

One of the most challenging issue that such a work environment could arise is the management of human resources [Boucher et al., 2007]; in particular the management of human operational competencies within projects. Indeed, projects are considered as a favorable environment to highlight the important role that individual as well as collective competencies play in the

progress of companies. So, *how can enterprises effectively allocate people to do their tasks within a project and how can they advance their human capital for the success of projects?*

At the beginning of a project, there is no overall perception of what will be needed, what risks are likely to be encountered, or what technical skills are necessary for the project's success, etc. As the project progresses, the more problems are identified and the more insight is gained to identify the required skills [Boucher et al., 2007]. However, it is difficult to quickly find the appropriate competencies and integrate them effectively into the project [Midler, 1995].

In order to overcome this weakness, firms have to update their professional practices and search for new methods to manage the human capital along with competencies.

Before doing that, a preliminary study, subject of this paper, has to be done with the purpose of exploring methods and tools suggested in literature or currently used in industries to manage different human competencies. Based on the two theoretical and practical studies, the definition of a new competency management method will be pragmatic and well argued.

This paper consists of 3 sections. In section 2, a theoretical exploratory study is conducted and cover three main concepts: competency management, means used to manage human capital and articulation between competencies and project management

(PM). Section 3 deals with the empirical exploratory study based on the interviews conducted with different representatives of companies from different sectors. Finally, in section 4, a conclusion summarizes the most important results and the limits of this work. Future related possible work is also discussed.

2 THEORETICAL STUDY

2.1 Competencies Definition and Classification

Going through papers dealing with the topic of “competency”, a good number of different definitions and taxonomies was found. The aim of this paper is not to exhibit these definitions; rather the focus is on tools used to manage competencies. These definitions, although expressed in numerous ways, converge in their meaning. Thus, a holistic definition is proposed here for the term “competency”. It refers to the *ability of an individual, a work group or an enterprise to mobilize and combine material and immaterial resources in order to implement a given activity or a process of actions in a certain situation with the achievement of a result* [Durand, 2000; Le Boterf, 1994].

In some papers, the term “competency” is confused with the word “skill”. However, skill could be defined as the facility or the dexterity that is acquired or developed through training or experience, while as it was defined above a competency is more than just skills. It involves the ability to meet complex demands by drawing on and mobilizing environmental and psycho-social resources (including skills and attitudes) in a particular context. Competencies, therefore, may include skills, but their meaning is larger than the skills’.

Based on literature, competencies could be classified according to two separate aspects: the competency’s owner point of view and their nature or content.

From the owner’s point of view, two large clusters of competencies can be distinguished through the managerial literature: individual competencies and collective competencies. A wealth of definitions exists in the literature and among practitioners to present the concept of individual competencies. The triptych of “know, know-how and know-being” is one of the simplest and most widespread definitions [Gilbert, 1990]. The “know” corresponds to the structured set of information assimilated and integrated into a frame of reference that allows the individual to conduct activities and operate in a specific context, mobilizing for this purpose, different interpretations. Whilst, the “know-how” refers to the ability to act in a concrete way according to a predefined process or objectives. For “know-being” or attitudes, they are neglected in the resource-based perspective, as in the still emerging theory of competency. Yet the question of “know-being”, and even more of identity and will, is an essential part of an individual’s or an organization’s ability to accomplish anything [Durand, 2000]. However, as in [Le Boterf, 1994], it is not enough to have a list of knowledge, know-how and skills to be recognized as competent, it is rather the way in which an individual puts all these elements together with environmental resources to face a new or unexpected situation at the workplace.

Although the topic of individual competencies is the subject of a large literature, collective competencies are a surprisingly little explored field compared to the former. These appear essentially within the framework of project teams. The context of projects unquestionably represents the most widespread and oldest example to express collective competencies. These competencies do not consist solely of individual competencies’ aggregation, they are rather the manifestation and the interaction of these individual competencies within a group of people who share a common objective and work in a cooperative and

collaborative environment. Thus, the literature provides a definition of the collective competency that appears at the intersection between the individual and organizational level in terms of team line-up. However, it remains difficult to measure and mobilize. Only its descriptive character, rather than perspective gives it a usable aspect [Nordhuag, 1996].

From a content point of view, the nature of the competency depends largely on the context in which it is used and, above all, on the enterprise field of activity. There are papers that distinguish technical competencies from personal competencies, interpersonal competencies and methodological competencies [Gronau et al., 2017; Hertle et al., 2017; Müller et al., 2017; Bohlouli et al., 2017; Lili, 2017; Arous, 2011]. Other papers use an action verb-based taxonomy of competencies: “Remember, understand and apply” to address technical and methodological competencies and “analyze, evaluate, create” to address conceptual competencies [Enke et al., 2015].

2.2 Competencies Management

When going through scientific papers related to the research subject, such as in [Bonjour et al., 2002; Belkadi et al., 2007], it has been noted that competencies management addresses different aspects, namely the *identification*, the *modeling*, the *evaluation*, the *development* and the *usage* of competencies.

The identification of competencies can be declarative or deductive. Indeed, this operation could be done through annual appraisal or intermediate interviews with the individual or with his/her supervisor, or through tests, observation of the person and traces that he/she leaves [Berio & Harzallah, 2005; Loufrani-Fedida, 2006].

In order to identify and model competencies, companies such as IBM, HP and TEMEX have developed individual competencies repositories according to these up-cited identification approaches. The major goal of these repositories is to facilitate the assignment of employees, by helping managers identify and select the actors having the required competencies for the job [Loufrani-Fedida, 2006].

The literature also shows the use of other modeling tools such as matrix models [Daniel et al., 2009; Decius & Schaper, 2017; Hlaioittinun et al., 2008], competence trees [Bohlouli et al., 2017], Bloom’s taxonomy [Enke et al., 2015], a verb-based model that focuses on the knowledge of individuals and mathematical models [Müller et al., 2017; Bohlouli et al., 2017; Lili, 2017; Daniel et al., 2009; Shahhosseini & Sebt, 2011; Stadnicka et al., 2017; Guillaume et al., 2014; Harzallah, 2000, Hlaioittinun et al., 2008] that are useful in the competencies usage phase. In [Belkadi et al., 2007], a situation-based approach was developed in order to model and characterize competencies through the traceability of design activities, and led to a repository of design competencies.

As for competency evaluation, this operation can take three different forms. The first form concerns the individual’s level of competency itself. The second form consists in the comparison of this level with the level required by the company, define the gap (positive or negative) and act accordingly. Here, the development either of competencies (negative gap) or of career (positive gap) is addressed. The third form is necessary when comparing individuals with each other according to their level of competency. In this case, the problem of human resource allocation is tackled [Skorková, 2016], in other words competencies mobilization.

As for competencies development, it is done by means of training: it is provided by the company or is the initiative of the employee. Companies nowadays rarely use classical training in specialized centers or through e-learning interfaces; rather a

migration towards a model that ensures adequacy with work situations is noticed (training inspired from work situations, applied in work situations or based on work situation) [Berio & Harzallah, 2005]. Moreover, concepts such as workshops and learning factories have emerged. Throughout literature a special interest is given to learning factories [Gronau et al., 2017; Müller et al., 2017; Mayer & Toubal, 2016]. For example, in [Gronau et al., 2017], a didactic concept was developed enabling competencies development and training related to the IoT context by using an IoT laboratory. Festo, which is a German mid-sized company specializing in automation systems, experimented new training methods to develop the adaptability and versatility of its employees by the creation of mini training centers within its factories. These structures developed training programs as close as possible to the real conditions of production [Mayer & Toubal, 2016]. Workshops are also used within industries. For instance, in [Hertle et al., 2017], a work-oriented approach was proposed. It included five workshops and a company-specific learning factory, which aim to develop relevant technical, methodological and social competencies. In addition, problem-solving circles are used to integrate competency development into daily work routines.

When it comes to competencies usage, their mobilization is closely related to the possibility to inquiry the acquired and required competencies [Berio & Harzallah, 2005] with the aim of assigning the most competent person to work on a certain mission. For this, several different tools, between mathematical resolution and computer software, have been created. Some studies address mathematically the problem of task allocation under constraints of competencies [Guillaume et al., 2014; Nasibov, 2007]. There are some interesting papers where researchers have modeled the uncertainty on the competencies possessed by the person and the imprecision on those required for the task. Semantic methods based on keywords retrieval and research engines were also used for employees allocation. However, finding exact matches seems to be too much restricted. Therefore, a similarity measure between competencies or approximate search was added to these classical semantic methods [Colucci et al., 2011]. A solution that combines software technologies, mathematical and statistical methods and offers tools to experts in real enterprise environments to either evaluate employees for a job assignment and training or for recruitment processes, was as well developed [Bohlouli et al., 2017]. Another tool, quite simple, used by a good number of companies is the competencies matrix. It provides a visualization of the stock of competencies within the firm and serves as a decision-making tool regarding the staff allocation and the need for competencies development [Decius & Schaper, 2017].

In addition to the resolution models and computer solutions, software for competencies management were identified on the net. These latter are marketed in the form of solutions dedicated to the management of human resources, such as “Inser Compétences” which responds very concretely to the problem of proactive management of training tools. “Eurécia” is another human resources management solution with a module dedicated to the management of competencies by assessing the adequacy between the existing and the expected. “SkillsBoard” is also a solution that offers a collaborative competencies management and a wide range of functionalities such as the management of job/competencies repositories, the planning and management of evaluations and training, the search for competencies and their matching.

All of the methods and solutions mentioned above to mobilize competencies are just examples of what might be found online

or in the literature. The field explored through this work is too wide and cannot be limited to these examples. Furthermore, researchers and practitioners are constantly seeking for the best solution, scientific or commercial it is.

2.3 Articulation between Competencies and PM

The question that remains to be asked now is: *are such competencies management tools used to successfully manage projects? Are competencies addressed when dealing with project management?* Papers on this issue are rare. The majority of these works theoretically address the importance of projects and competencies articulation, but this importance has not really been quantified except in certain cases where the allocation of resources in projects was treated. Some of these cases are already drawn in [Boucher et al., 2007; Belkadi et al., 2007] and dealt with industrial engineering projects, such as design, production management, organization and supply chain projects.

In a context of project management, practitioners are more focused on the achievement of projects’ objectives while maximally respecting budget, due dates and clients’ requirements. However, in such entities of organization there is always risk of complications. The efficiency of the project is certainly based on the definition of tasks, their planning, the analysis of project risks, but also on the competencies of the actors involved, their ability to mobilize the relevant knowledge to design the product or service, or their ability to acquire them [Charue-Duboc & Midler, 2001; Loufrani-Fedida, 2006; Ben Mahmoud-Jouini, 1998]. The project is thus the result of the good combination of competencies within the enterprise.

While competencies require time to become more reliable and develop, project management increasingly responds to the need of reducing delays and developing new products and services. The combination of these two different logics raises difficulties and can be the cause of many discrepancies. However, researchers, such as [Loufrani-Fedida, 2006; Ben Mahmoud-Jouini, 1998; Charue-Duboc & Midler, 2001; Paraponaris, 2000], claim that this articulation is fundamental to ensure the sustainability of companies. However, their works were essentially exploratory and descriptive, even though it involved real PBOs studies. For these researchers, projects offer a validation environment, a basis for gaining experience, experimenting and memorizing competencies. It is therefore a matter of using existing competencies and building new ones.

Competencies were also linked to resource allocation within projects [Daniel et al., 2009; Stadnicka et al., 2017; Shahhosseini & Sebt, 2011; Hlaioittinun et al., 2008]. This is the case, for instance, of “the Best-Fitted-Resource methodology” helping decision makers allocate their human resources in software projects, by determining the suitability between the complete set of competencies available in candidates and required competencies for tasks. It is as well the case of aircraft maintenance projects where aircraft industries have to optimize the distribution of operators according to their competencies in order to minimize total service time and delays; or even more the case of construction projects where potential employees are traditionally interviewed and the most qualified one are subjectively selected. In [Hlaioittinun et al., 2008], a competency-modelling-based multidisciplinary team building method was developed. It uses jointly a competency matrix, a clustering algorithm and a task assignment mathematical model. Such a tool helps project managers, mainly design project managers, to balance between project costs and competency dynamics.

To summarize what was discussed in this section, literature

showed that competencies management tools and methods differ in terms of the purpose: identification, evaluation, development or mobilization. Each tool developed by researchers in the field is limited to a certain context of the industry. Some competencies management tools were created to try overcoming the limits of others. Commercialized IT solutions are more oriented towards the search for profiles and the assessment of the adequacy between required and possessed competencies. They are used rather in HR management (HRM) services and do not address projects.

As already mentioned, papers dealing with both competencies and projects management are scarce. Such papers only treated the importance of this articulation in terms of the role that competencies play in the success of projects and in terms of the role that projects have in the development of competencies. Little are the papers that were interested in their usage and are proving empirically the relevance of competency-based methods and approaches. However as it was discussed in literature, competencies management and PBO cannot be considered as two separate spheres. With this, the following questions could be asked: *are the tools identified in the literature used by real companies? If not, what tools and methods are currently employed in PBOs to manage competencies? Do such tools and methods mainly address competencies, as in the literature, from a human resources management point of view or do these organizations obey to the necessity of projects and competencies articulation?* Along this study, research papers dealing with real cases were found, especially in industrial engineering and IT fields [Daniel et al., 2009; Stadnicka et al., 2017; Shahhosseini & Sebt, 2011; Hlaotittinun et al., 2008, Belkadi et al., 2007; Boucher et al., 2007, Bonjour et al., 2002]. Still, it is not sure that such tools developed as part of research works are afterwards deployed within or supported by companies.

In order to answer the questions asked above, it is necessary to explore firms' world and involve people working within PBOs in this study. Real cases will therefore be treated in order to answer the research question in its practical aspect.

3 EMPIRICAL STUDY

3.1 Methodology

The study conducted through this research is exploratory. Indeed, the aim is to extract relevant information about how competencies are managed within real-cases of PBOs. The focus is particularly put on competencies management software and methods used to extract and mobilize competencies. To do so, a qualitative approach was adopted. Based on Blanchet and Gotman's book "Survey and its methods: the interview" (English translation of "L'enquête et ses méthodes: L'entretien"), the field of PBOs is explored through semi-structured interviews as a qualitative approach. These interviews allow collecting precise information on considered subject and giving the interviewees freedom to express themselves without deviating from the subject [Blanchet & Gotman, 2005]. To succeed in conducting these interviews, it was necessary to build an interview guide. In parallel, a sample for data collection was constructed. The study ends with a thematic analysis based on verbatim transcripts of the recorded interviews.

3.2 Data Collection

The phase of interview guide construction is considered critical since this guide is the basis of the empirical study. The development of the guide begins by defining what is

investigated, which is, in this case, the research question. It is then eligible to identify how the phenomenon under study takes shape in the practice of interviewees in order to finally define the points to be addressed to access it. Therefore, structuring factors of the guide were determined in the first place. As methods and tools mobilized by PBOs in competencies management together with the articulation between competencies management and project management are studied, the main elements structuring the questionnaire are the enterprise, the profile of the interviewee and his/her position, project characteristics, project dynamics as well as project management tools and competencies management tools. For each factor, indicators helping to solve the problematic are associated. Each indicator corresponds to one or more questions in the guide. Some questions serve as reminders to help the interviewees express their ideas. In fact, the guide is essentially based on situations' narration. The interviewees are asked to choose one example of the projects in which they participated. Hence, the interview is conducted around this project.

This exploratory study targets companies practicing management by projects. The objective is to interview a large number of people in different fields in order to answer the research question defined above. The data collection method is qualitative, thus, telephone interviews were conducted, due to the difficulty of visiting companies added to the possibility to record conversations. The key idea is to use social networks such as "LinkedIn". Indeed, it is a growing subject that attracts the attention of a large curious and ambitious community. Following this method, information was collected through seven interviews with individuals from different companies and domains. Table 1 summarizes the data for each of these companies. These interviews lasted on average one hour each. After they agreed to collaborate with us, interviewees were contacted by telephone to schedule an appointment. At the beginning of each interview, the context and objectives of the study are reminded. The interview procedures are then indicated. In addition, interviewees were asked permission to record the conversation and topics to be covered throughout the interview were presented. Two of the interviewees expressed their dissatisfaction with the recording by indicating that they will not answer anything that is confidential. The seven people who replied to us showed from the start their interest in the subject because it affects them directly and asked for feedback on the results.

3.3 Data Analysis

The interviews were recorded under the agreement of interviewees. This recording served to analyze the collected data. Indeed, these interviews were transcribed word by word and were studied thematically.

Thematic analysis is considered as the best method for conducting an exploratory study [Blanchet & Gotman, 2005]. The three most relevant interviews were used at the beginning to build a table of keywords related to the research topic: it is the coding phase. From these keywords, themes and sub-themes around which the analysis is articulated were defined. Then, the rest of interviews were examined and organized according to the identified themes. Succeeding this step, links with the literature and between themes and sub-themes were studied.

Examining the transcripts, a list of key words was organized according to four main themes, namely, project-based organization, competencies management, contextual framework and articulation between competencies and project management. The first two themes seem obvious as they explicitly reflect the research question. However, what was

Table 1. The studied sample and used tools

Interviewees	Positions	The enterprise's business sector	Project management tools		Competencies management tools & software				
			Tool name	Purpose	For Identification & modelling	For Evaluation	For Development	For Usage	Software
Interviewee 1	Strategy & innovation purchasing director	Digital transformation and automation of energy management	Unmentioned.	Unmentioned	Competencies repository. Individual annual interviews.	Individual competencies review. Procurement Excellence system to assess methodological and process competencies. SWOT to assess collective competencies.	Individual development plan. Training. Experience in projects.	Competencies assessment and identification are for developing and talent recruiting purposes. Mobilization is then done based on positions not competencies.	Talent Link
Interviewee 2	Co-founder and consultant	Information technologies and services	MS Project / Excel / Redmine	Manage schedule and budget.	Competencies matrix. Individual annual interviews.	Individual annual interviews. Self-assessment.	Individual development plan. Training. Self-training. External competencies recruitment. Experience in projects.	Talents chasing for project execution. Assignment is not purely based on competencies.	Competencies matrix on Excel
			Issue Log	Orders and organizes problems by type and severity in order to prioritize issues associated with the current milestone or iteration.					
Interviewee 3	Manager and electrical engineer	Building engineering (Energetic performance)	Excel	Manage schedule and budget.	Individual interviews every 2 years.	Individual interviews every 2 years.	Training. Experience in projects. External competencies recruitment.	Assignment is not based on competencies.	None
			Graphic interface	Model the processes of certain phases.					
Interviewee 4	Consultant and technical expert	Information management services	MS Project	Manage schedule and budget.	Competencies matrix on Excel.	Competencies matrix on Excel.	Training. Colleagues help.	Talents chasing for project execution. Assignment is not purely based on competencies.	Competencies matrix on Excel
			Internal software to assign HR	Assign project team members with respect to two conditions: the project capacity and the rest to be done, taking into account holidays as well.					
Interviewee 5	The head of the company's training academy and training consultant	Trade credit insurance	MS Project Excel	Manage schedule and budget.	Competencies repository. Individual annual interviews.	Competencies repository. Individual annual interviews.	Training. Colleagues help.	Management by profession.	None
Interviewee 6	Instrumentation engineer	Oil and energy (subsea, onshore/offshore and surface projects)	Tools developed by the company	Manage documents on internal databases. Manage the schedule.	Competencies repository. Individual annual interviews.	Competencies repository. Individual annual interviews.	Training. Experience in projects. External competencies recruitment.	Assignment is not based on competencies.	HRweb
Interviewee 7	Operation manager	Urban planning	GeoSas	Used by companies that practice urban planning. Allows to have financial balance sheets of the operations and to integrate all the project phases in terms of delays and budget distribution.	Individual annual interviews.	Individual annual interviews.	Training. Colleagues help.	Assignment is not based on competencies.	None
			The software "Gestion de projet"	Allows project follow up.					

Table 2. Data Analysis : Themes and Subthemes

Themes	Subthemes	Definition
Project-based organization	PBOs' characteristics	Organization and structuring of the company in the context of project-based management. The size of projects, their complexity and typology, as well as their place in the company are also considered.
	Actors	Participating entities and elements in all the activities related to project management. The constitution of project teams is also considered.
	Tools for project management	Tools mobilized to carry out the projects. They are computer-based solutions.
	Encountered problems	Difficulties and conflicts related to project management and to the complexity of PBOs context.
	Implemented solutions	The ways in which these problems were confronted.
Competencies Management	Required and acquired competencies	Competencies required to work on projects, as well as competencies that a person can acquire in such an environment. By this, one of the aspects of the articulation between competencies and projects is tackled. Collective competencies are also considered.
	Competencies management devices	Methods, approaches and tools used for competency management.
	Actors	Key actors responsible of competency management and the integration of employees in the enterprise and in projects.
	Encountered problems	Difficulties and conflicts related to competencies management, especially to the lack of competencies.
	Implemented solutions	Actions executed to solve the encountered problems.
Context	Internal	Impact of company internal elements on project and / or competencies management.
	External	Impact of external factors on project and / or competencies management.
Articulation between competencies and project management	Competencies importance in projects	Are enterprises aware of competencies role in the success of projects? → Determine competencies position inside the company.
	PBOs maturity in competencies management	The company's level of maturity in relation to competencies management and their mobilization in projects.

mainly studied through the analysis is the interaction between these two themes. Using the list of keywords, each mega theme was also broken down into sub-themes. Table 2 shows this decomposition and defines each subtopic. In what follows, details of the thematic analysis will be given by referring to excerpts from the interviews' transcripts.

Project-based organization. Among the companies dealt with in this empirical study, there are four large international companies. The rest are small businesses or startups. To measure the dependence level of the company's activities on projects, it was determined through the conducted interviews that all the enterprises use projects as a mode to operate on the market. For instance, interviewee 1 affirmed that they *"have a big part of activities organized by projects"*. Interviewee 6 said that *"the company is organized according to the sectors ... these are separate sectors ... and of course each sector is organized by projects"*. As for interviewee 3, they work in project mode they have no choice, all their activities are in project mode.

Interviewees have classified projects within their firms according to their size, complexity, activity or outputs. Large projects and small ones, complex projects and simple projects, business projects (B2B projects) and proposal projects (B2C projects), development or transformation projects are distinguished. Another classification has been proposed if the projects are addressed from a customer point of view: package projects and client-managed projects.

As for the actors involved in the conduct of projects, there are several appeals in the studied PBOs that are essentially related to the context. However, the project manager remains an essential element in such structures. The client is also a fundamental part because without its needs, we would have no project to lead. Internal and external resources to the company are as well solicited to execute projects.

In most of the studied cases, the project manager chooses project team members and the staffing. This project leader can be an outsider client or an employee within the company.

His/her choice is based on the availability, the skills, the knowledge, the experience and the reputation of individuals and is done in such a way that the members will have complementary competencies: the promoter will not pay twice the same thing. He arranges to have complementarities in all areas (interviewee 3). The goal is to vary competencies and to have a team where there is all the competencies that we seek for the project realization (interviewee 7). Moreover, it is admitted

by the interviewees that the project team composition changes according to the project phases and other factors. Staffing and members' selection are done according to the nature of activities during the project. Generally, there are phases in the project, and we do not find the same teams in each phase (interviewee 1). During one phase, the company tries to keep as much as possible the same team composition to avoid delays and leave a history, especially when this phase lasts a long time (interviewees 4 and 7). However, this composition can also change if individuals quit their jobs for either personal, professional or medical reasons (interviewees 3 and 5).

In terms of tools deployed to better manage projects, firms use either internal tools or the tools the client uses itself. The most commonly used software are Excel and MS Project (see Table 1). Nevertheless, some organizations prefer to use their own developed software such as the enterprise where work interviewees 4 and 6. In the interviewee 6 case, for example, they use their own-developed software. They have a large IT team who can develop software that exactly meets the enterprise needs. The nature of their work is such that they cannot work with standard software because they are not adapted to their way of doing.

Situational narratives were used to highlight the problems and conflicts that interviewees may encounter in a project management context. The examples mentioned by the interviewees were therefore various. These problems can be categorized into deliverable quality issues, dead-time issues and budget issues. Each class of problems can be the consequence of the other. Failure to meet deadlines, budget and quality may be related to organizational problems (interviewee 3), delays of suppliers or providers (interviewees 1, 5 and 6), complexity of tasks (interviewees 1 and 5), lack of communication and coordination (interviewee 2), lack of motivation (interviewee 1 and 4), poor expression of need (interviewees 1, 2 and 7) but especially lack of experience and competencies (all interviewees). Problems related to competencies will be addressed later in the competencies management part. Different solutions and action plans have been implemented to solve such problems. The resolution is done mainly through meetings where project team members meet to discuss ongoing issues and try to find answers (all interviewees). *"The frequencies of the meetings are adapted to the issues and problems. When everything is progressing well and there are no worries, the frequency is low and we increase the frequency when we have*

problems. We have topics that are treated, either problems or risks. Sometimes things do not work, or things may not work, or they may be questionable. In fact, this is just the problem solving of the project” (interviewee 4). For instance, the enterprise where works interviewee 6 uses a penalty policy to avoid problems with vendor delays. In addition, this company mobilizes a team of project engineers dedicated exclusively to resolving the difficulties encountered during the projects.

Competencies Management. Depending on the company intervention field, the competencies required in the projects and mentioned by the interviewees are different. However, they can be classified, like what was found in literature, into technical competencies related to the tasks and the used technologies, methodological competencies related to the experience and the expertise of individuals and personal competencies related to behaviors and attitudes, as well as interpersonal competencies of collaboration and mutual aid. Competencies building is done either outside projects or during projects. In fact, there are two methods deployed by the studied firms: either the training is used (all the interviewees), or the competencies are acquired and improved through the exploration and participation in projects (interviewees 1, 2 and 5). Some interviewees rely on self-training to develop their competencies (interviewees 1 and 2). As for the competencies possessed by the employees and the acquired competencies, they are assessed on an ad hoc basis through annual interviews and according to a declarative approach in which the evaluated person and / or his manager is involved. The actors involved in this evaluation are therefore the person whose competencies are assessed, his/her manager and HR managers. Before doing this assessment, a previous step is very important which consists in identifying the competencies for each position or task. The HRM team and a business referent create a repository where a generic list of key competencies needed for the execution of tasks exists. The individuals are then evaluated according to this two others use what is called a matrix of competencies on Excel as they claim that they find it quite simple and efficient. Table 1 summarizes the tools used by the under-study firms. All these are essentially deployed by the human resource department, in a logic of talent acquisition and for a main objective, which is the development of the company’s human capital.

The subject of collective competencies, despite the fact that it was mentioned many times by the interviewees, these competencies were always associated with the terms “project team”, “group work” and “company”. For interviewees, as well as their companies, collective competencies are not important as much as individual competencies. For them, as long the necessary individual competencies are available, a team can work all together to make the project a success.

Regarding competency-related problems, all interviewees mentioned these. They mentioned that there are always delays due to lack of competencies or poor staffing of the project. Sometimes it can happen that a conflict is misinterpreted and confused by a personal conflict when in reality the problem lies in a lack of competencies (interviewee 2). The solutions implemented to overcome this kind of problems is the replacement of incompetent people by others who are much more competent and we can even resort to external recruitment. Sometimes the client is dissatisfied with the competencies deployed by its provider, so it gets involved in the process of choosing members to critical tasks. The solutions are therefore instantaneous. Companies do not seek long-term solutions.

Context. Throughout the interviews conducted during this study, it was clarified that the context has an important influence on the way in which the company manages its projects, even the

competencies of its employees. Therefore, this mega theme has been divided into two parts. The first one concerns everything that is internal to the company and the second part is about the firm’s external environment. The internal context especially covers the nature of the company’s activity, its working strategy, its vision, its values and rules, the available means and resources, etc. As for the external context, it includes everything related to the market, customers, suppliers or service providers, regulations, technological evolution, etc.

The company’s activity sometimes forces it to use project management tools and work approaches among others. This is the case of interviewees 6 and 7 (see table 1).

Large companies have a clear policy in relation to the management of their projects but especially in relation to competency management. According to interviewee 3, they are few so they all know each other. They know their competencies and they improve them progressively. Yet they do not have that culture of saying, here are our competencies and let us make a list of them. Interviewee 1 shares the same opinion: *“very often in small structures as we do not have resources, when we created the four startups for example, we all did a little of different trades. It is good. However, at one point it has limits ... when a startup is created the first challenge is to build a team and then start assigning the roles, who does what. The more we are within matrix organizations where you have 10 leaders and you work around the world, the more complex it is and if you do not put everything in order it does not work”*.

The conversion in the PBO’s strategy has changed the required competencies in projects. The shift, for example, from production to services requires soft competencies around, according to interviewee 1, cultural cross, cooperation, partnership and networking. Further, according to all interviewees, the technological revolution has a major impact on management methods, especially on the required competencies within companies. Today’s trades are no longer those of tomorrow, so an adaptation of competencies is needed to deal with such changes (interviewees 1, 4 and 5).

In the “problems encountered in PBOs” section, it was already mentioned that the client and suppliers can delay the project: the client with its requirements, its poor expression of need, dissatisfaction with the competencies mobilized for the project and suppliers because of resources and competencies lack. As for the regulatory constraints, they are always taken into account before the start of projects. *“There were a lot of regulatory constraints. We have to anticipate everything to avoid problems of this kind”* (interviewees 3 and 6).

Articulation between competencies and project management.

The duality between PM and competencies management was mentioned by the interviewees only in terms of competencies development through projects. Even the tools used for competencies management are not deployed for the benefit of the projects; an independence between the two management systems is noticed. In fact, competencies management is done according to a job or a position and not to projects or tasks. Even if the project manager is the one who assigns people to projects, he bases himself on his intuition, his experience and/or on the perception of human resources managers.

In terms of maturity in competencies management, it has been noted that large international PBOs (case of the enterprises which interviewees 1 and 6 are part of) are more aware of such a concept importance in the progress of their businesses. Indeed, these companies have set up a whole system of competencies management, which remains highly depending on and managed by the HR department.

3.4 Discussion

Comparing what was found in literature with the results of the empirical study, it was concluded that both PBOs and researchers are aware of the role that competencies play in the success of projects. However, the policy used by these PBOs for competencies management is oriented for HRM purposes. A process of recruiting for positions (designer, production manager...) and not for projects is rather followed. In a logic of articulation, there is no tool used in the studied PBOs that deals simultaneously with projects and competencies management.

This leads to inquiry the fundamental causes of such weak instrumentation. Is it linked to the uncertainties on the projects, to their more or less long duration? Is it linked to the high turnover of employees in such organizations? Is it related to know-being-problems difficult to anticipate? In all cases, such uncertainties could cause difficulties in identifying competencies required for projects beforehand.

In addition, confusion around the project leader's authorities could prevent good competency management in a project context [Flamant, 2002; Midler, 1993], not forgetting to mention the confusion that business line actors in particular and actors in the company in general may have regarding to the definition of competency and its categorization [Coutant, 2014]. Indeed, these questions require further investigation, but what is as well certain is that a merger between the strategic and operational levels of PBOs must be made, the HR department and the project actors should work jointly within the company. A real paradox that needs to be resolved is the fact that human resources should not be directly related to HR department. Furthermore, companies should show more interest, invest in academic research and work together with researchers on the problematic of competencies and projects articulation. As far as possible, they could offer a validation or experimentation field to the already-developed methods and tools.

4 CONCLUSIONS & PERSPECTIVES

Although the tools for managing competencies vary in literature and there is a slight orientation towards what is deductive to identify and evaluate competencies, PBOs continue to use traditional declarative methods even if they were proved to be inefficient and do not necessarily give reliable results.

This study allowed confronting French companies with competencies management together with project management. Despite the significant results obtained, this research has some limits: the sample size is very small and the empirical analysis was done manually. The themes identified for the analysis depend heavily on the person conducting the study and may therefore not be the same if another researcher led it.

Thanks to this work, the design of an ideal tool for managing competencies in projects could be undertaken. Such a tool can cover all aspects from identifying human competencies to their evaluation, assignment and development. A questionnaire can be drawn up on the basis of the results here-presented to identify the selection criteria and the characteristics of an ideal tool for competencies management. Analysis could be done quantitatively for more relevance.

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