Absorptive capacity in information technology projects: a multiple case study in the telecommunication industry

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Abstract: The aim of the present study is to introduce absorptive capacity (ACAP) use in projects developed by information technology (IT) departments in four telecommunication firms – hereinafter called telecom(s) – in Brazil. Data collection was based on interviews. Data analysis was performed in Atlas.ti software by following a three-level encoding stream, namely: open, axial and selective. According to the results, up-to-date telecoms that follow a more agile project-management methodology are often successful in using ACAP; consequently, they account for shorter time-to-market. The current empirical study on ACAP in project environments was a contribution to the literature, given the scarcity of studies in this field. It also provided a list with five propositions to encourage further research about this topic.

Keywords: absorptive capacity; ACAP; project management; telecommunication companies; telecom; information technology; innovation; knowledge management.

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1 Introduction

Telecommunication companies all around the world are trying to understand the current competitive landscape, mainly due to the 5G system (Delloite, 2020). Online streaming, entertainment and education services have been used in a more intense way, and they are just few examples of activities this industry is dependent on. App stores are often downloaded to give access to services from banking services and games to photo filters. According to Delloite (2020), the transition from current communication forms to 5G is expected to lead to new relationships among network, infrastructure and equipment suppliers. Gartner (2019) predicted that revenues with 5G network infrastructure will reach $4.2 billion in 2020, which corresponds to 89% growth a year. Companies in the telecommunication industry need to innovate in order to remain competitive, even in the current 3G, 4G or optics fibre competition context.

Accordingly, telecommunication companies deal with globalised competition and with greater demand for data flow. Adenfelt and Lagerström (2006) stated that the effective management of different knowledge management enablers in transnational projects makes it easier to innovate. Structures featured by high centralisation and formalisation degree make it difficult to develop knowledge and, consequently, greater innovation capacity. On the other hand, structures guided by a culture of collaboration,

learning and trust among several stakeholders allow the better acquisition of external knowledge and its conversion into innovation.

The telecommunication industry faces great pressure for the fast delivery of new products and services due to fast changes in consumption habits, to reduced product lifespan and to accelerating technological advancements. Telecoms must adapt to changes in internal and external environments (Kosaroglu, 2009; Letangule and Letting, 2012; Zenaide and Castro, 2017) so they use projects developed by their information technology (IT) departments to accomplish technological innovation (Terribili Filho, 2013). According to Patterson and Ambrosini (2015), managing knowledge assets in intensive research firms depends on the ability to assimilate and effectively use information from collaborating partners to develop their own new-product development activities. These authors reinforce that alliance and collaboration management, as well as project-resource management, are necessary to make the effective and efficient use of information transferred to and from partner companies easier. Although technological competition and project management application are actions observed in several sectors, issues such as legislation, regulatory bodies and technical training are the differential in telecoms.

Scholars such as Brady and Davies (2004) and Popaitoon and Siengthai (2014), who deal with organisational learning, emphasise that developing new products demands closer attention to how to manage the transition from one project to another, since it is the main criterion for long-term success. Therefore, projects are getting more complex and accountable for more variables influencing their success and failures (Lobo and Whyte, 2017; Lima and Quevedo-Silva, 2020). Despite the failures, projects are important means for changes, mainly when it comes to project complexity, as pointed out by Bjorvatn and Wald (2018). Thus, it is necessary taking into consideration the flaws and improving success indices by acquiring new knowledge (Havermans et al., 2019).

Innovation and project management success in telecoms are closely related to knowledge (Zhang et al., 2018; Lindner and Wald, 2011). So, firms must invest in their project management departments, as well as in research on new technologies, in using new tools and methodologies, and in developing new professional competences in order to mitigate project management issues and to improve project success indices and competitiveness (Terribili Filho, 2013). Leal-Rodríguez et al. (2014) and Bjorvatn and Wald (2018) understand the relationship between project management and firms' ability to manage available knowledge as the way to develop new knowledge and products. Interaction with the external environment enables firms to acquire new knowledge and to develop their abilities; then, it is a relevant factor for a company to achieve successful outcomes. Firms must develop their absorptive capacity (ACAP) in order to develop the ability to positively interact with the external environment (Patterson and Ambrosini, 2015; de Moraes et al., 2020).

There is a discussion about understanding ACAP based on dimensional aspects (Todorova and Durisin, 2007; Apriliyanti and Alon, 2017) and levels (Ojo and Raman, 2015; Sjödin et al., 2019; Ojo et al., 2017). According to Zahra and George (2002), ACAP has two general dimensions, namely: potential absorptive capacity (PACAP) and realised absorptive capacity (RACAP). PACAP is found in the acquisition and external knowledge assimilation dimensions.

RACAP includes the transformation and exploitation of newly acquired knowledge. ACAP is perceived as organisational capacity resulting from three levels of routines and processes:

1 micro level (Sjödin et al., 2019), which regards individual competence based on the ability to learn and apply knowledge

2 meso level (Nemanich et al., 2010; Ojo et al., 2016; Bjorvatn and Wald, 2018), which concerns set of capabilities from knowledge interaction and management by teams

3 macro level (Patterson and Ambrosini, 2015; Ali et al., 2018), which is an organisational capacity embodied from interaction between processes and mechanisms, and the external environment, in order to absorb knowledge in inter-organisational relationships.

ACAP is a growing field for management research, since it is mainly related to the capacity to innovate (Menezes et al., 2020). Therefore, ACAP development based on acknowledging the value through a process to acquire, assimilate, transform and exploit external knowledge is among the ways to reach competitive advantage (Cohen and Levinthal, 1990; Zahra and George, 2002; Todorova and Durisin, 2007). Firms in highly competitive sectors must present ACAP capabilities to achieve their innovation capacity. Telecoms belong to a fast technological-change environment, since most innovations in this sector derive from 'borrowing' rather than from 'inventing' new knowledge (Garner and Ternouth, 2011). Accordingly, the aim of the present study was to introduce ACAP using in projects developed by IT departments in telecoms.

IT is a very important field for all actions taken in firms; it is seen as basic condition for firms' competition and survival (Albertin and Albertin, 2008). The research question guiding the current study was: *How do telecoms use absorptive capacity in projects developed by their IT departments?* A multiple case study was carried out with four telecoms in Brazil in order to reach the herein proposed aim. The research was substantiated by 12 semi-structured interviews with IT professionals from the four assessed telecoms in charge of project development. Based on the results, telecoms presenting more agile competence and greater maturity in project management, have greater ACAP-process using, which reflects on a shorter time-to-market. The present research contributed to up-date ACAP theory in telecoms in order to fulfil the knowledge gap observed in these firms.

2 Theoretical background

The main concepts related to ACAP and to project management are presented in this section. In addition, the context of both ACAP and projects in telecommunication firms is also addressed in here.

2.1 Absorptive capacity

Knowledge is one of the most important innovation and competitive advantage generation resources (Feng and Ma, 2020). Innovation allows firms to adapt to fast changes in the market they are inserted in Tidd (2001). Firms depend on fast innovation in order to reach competitive advantage in highly competitive environments (Machado and Fracasso, 2012; Schumpeter, 1949). The literature in innovation argues that firms need to reinforce their ACAP to improve their innovation performance (Hemert and Iske,

2015; Mueller et al., 2020); in other words, they need to acknowledge the value of, as well as identify and externally acquire knowledge critical to their operations (Todorova and Durisin, 2007; Zahra and George, 2002).

Thus, ACAP plays a fundamental role in producing organisational dynamic capabilities able to influence the acquisition of sustainable competitive advantage by firms due to business value creation (Zahra and George, 2002). Competitive advantage results from the ability to turn knowledge into new forms to interacted with several actors from external environments (Silva et al., 2014). The ability to acknowledge the value of new external knowledge is an essential ACAP component as shown by Patterson and Ambrosini (2015) and Lane and Lubatkin (1998). The organisational learning process is not naturalised, so knowledge evaluation is not automatic and needs to be promoted in order to enable its absorption (Todorova and Durisin, 2007). In case firms have already developed some ACAP in a specific sector, they will be able to further explore the external knowledge available (Cohen and Levinthal, 1990; Zahra and George, 2002); thus, firms are not capable of evaluating new information without having previous general knowledge about it (Sjödin et al., 2019). Thus, without prior knowledge and ability to access and evaluate external knowledge, these firms stop embodying such factors (Cohen and Levinthal, 1990; Tortoriello, 2015).

Barriers between knowledge assimilation and transformation can be reduced by social integration mechanisms that can lead to increased ACAP (Zahra and George, 2002). However, Todorova and Durisin, (2007) have understood that such an influence can be positive and negative at any of the four ACAP dimensions (acquisition, assimilation, transformation and exploitation). Acquisition refers to the ability of a given firm to identify and acquire externally generated knowledge – which is a critical factor for its operations. Assimilation concerns firms' routines and processes; it allows analysing, processing, interpreting and understanding information provided by external sources. The transformation dimension points out the ability of a certain firm to develop and refine routines by combining the existing knowledge to newly acquired and assimilated knowledge. Exploitation is based on routines that enable firms to refine, broaden and boost existing competences or to create new ones by incorporating acquired and transformed knowledge to their operations (Zahra and George, 2002).

Social interactions boost organisational processes and their social integration mechanisms influence social interactions. Nemanich et al. (2010) address the role played by social interactions as key process to absorb external knowledge, which will depend on the cognitive skills and on the ability to disseminate information to others. Consequently, social interaction mechanisms influence knowledge processes set between firm members and between firms themselves (Todorova and Durisin, 2007). So, these mechanisms have built connectivity, allowed knowledge sharing and influenced knowledge absorption processes at micro, meso and macro (Todorova and Durisin, 2007; Ojo and Raman, 2015; Sjödin et al., 2019; Ojo et al., 2017).

ACAP in firms depends on employees developing the firm/external environment interface or the interface between departments within one single firm. When knowledge of some individuals in a firm is different from knowledge expressed by others, it is likely observing that such individuals would end up playing the knowledge gatekeeper role. Gatekeepers must monitor the external environment, assimilate and translate technical information, so internal teams in firms can also understand it (Lyng and Brun, 2020). Gatekeepers' individual ACAP does not comprise the firm's ACAP as a whole. ACAP firms mostly depend on communication-process flow between gatekeepers and

employees they are providing information to. The success of such a process depends on the groups' previous knowledge as a whole (Cohen and Levinthal, 1990). According to Movahedian et al. (2017), ACAP is a process moderated by activation triggers, social integration mechanisms and appropriability regimes.

2.2 Projects and their management

Project is an organisational unit dedicated to develop a product within a deadline by following a budget; the project must be in compliance with established specifications (Gaddis, 1959). According to the Project Management Body of Knowledge (PMBOK), project is a temporary effort to create a product, service or exclusive outcome (PMI, 2017). Project is also a process unit consisting of a set of logical, coordinated and controlled activities, based on a pre-set schedule (begin and end), as well as on time, cost and resource requirements and limitations set by a standard (International Organization for Standardization, 2003). According to Bjorvatn and Wald (2018), some project management performance perspectives oppose project performance because project management performance is typically measured through time, cost and quality, and project performance is a far broader concept, which involves the objectives of all stakeholders throughout project's lifespan.

Waterfall and Agile are two methodologies used to manage projects (PMI, 2017). Waterfall methodology, also known as linear-sequential life cycle model, was the first process model to be introduced in project management scenario (Hassani et al., 2018), it is rational and normative, as well as ideal for simple, predictable and linear projects (Špundak, 2014). Each phase of it must be fully completed before the next one starts (PMI, 2017). Optimisation and efficiency come from project planning and go all the way to its deadline, budget and scope (Špundak, 2014). This methodology has little interaction with customers and project teams (Hassani et al., 2018). If one takes into consideration that changes are part of the current reality in business environments, and that projects are becoming more complex due to the larger number of tasks and inter-relationships, the waterfall methodology cannot reflect the total complexity of projects (Špundak, 2014).

Agile methodology is an incremental model whose development takes place in fast and incremental cycles (Hassani, et al., 2018). Changes in the agile methodology are seen as inevitable; however, planning the full creation of a complete project from its very beginning is impossible (Špundak, 2014). Individuals familiar with this methodology are used to deal with frequent changes. They use to improve their interaction with customers by promoting competence development, planning and project control based on short cycles in project environment (Conforto and Amaral, 2016), as well as on small incremental changes and versions subjected to different tests to ensure quality at product delivery (Hassani et al., 2018).

Team members are more involved in decision-making processes in the agile methodology, as well as in formal and informal communication (Špundak, 2014). Interaction with users, customers' collaboration and action in changes throughout project conduction are essential values of the agile methodology (Špundak, 2014; Conforto and Amaral, 2016), which takes into account the reality of a dynamic world where users' final needs always change, either in business or in IT (Hassani et al., 2018). The agile level adopted for a given project is highly significant and has strong impact on the three success-dimensions of a project, namely: efficiency, stakeholders' satisfaction and perception about project performance (Serrador and Pinto, 2015).

2.3 ACAP in projects and in telecoms

ACAP in projects depends on knowledge processing systems capable of enabling the learning process and adjusting certain capabilities (Love et al., 2016). PACAP contributes to the performance of future long-term projects and makes it easier to accumulate knowledge through knowledge management programs (Popaitoon and Siengthai, 2014). Being aware of the existence of rework, for instance, is a lesson learned, it contributes to avoid future occurrences of rework (Love et al., 2016). Lessons learned register the acquired experiences, issues and solutions observed throughout a given project. They teach the appropriate solutions given to previously faced issues and point out inappropriate processes, practices and decisions that must be avoided in further similar situations. Thus, lessons learned must be recorded, registered and, most of all, outspread (Love et al., 2016).

The environment in telecoms is rough, competitive and faces fast technological changes; besides, it has been facing deep changes deriving from technological innovation and from the evolution of regulation sector that force telecoms launch new products and services before their competitors (Kosaroglu, 2009; Letangule and Letting, 2012; Zenaide and Castro, 2017). This process also makes firms support each other during project development in order to innovate in their processes, products and services or, yet, in their internal structure (Vargas, 2016; Verzuh, 2005).

Having ACAP competence in the telecom sector and investing in innovation are determining factors to get adapted and generate competitive advantage (Moreira et al., 2019). Project alignment with learning processes and continuous knowledge acquisition tend to generate competitive capacity in firms (Von Krogh et al., 2001). Projects create information and outspread knowledge to firms (Angeloni et al., 2016). Active telecom firms started incorporating new technologies and providing diversified products given the features of activities performed by staff outsourcing and sector restructuring (Silveira, 2014).

Firms acquire new knowledge when they face unpredictable market conditions by adopting new trends and by entering new markets (Cadogan et al., 2002). Thus, knowledge is an organisational strength linked to strategies developed to guide decision-making about ‘what’ and ‘how much’ to invest (Hall and Mairesse, 2006). The more knowledge telecom firms acquire, the greater their dynamic capability to survive in unstable environments (Gyemang and Emeagwali, 2020).

RACAP has strong effect on project development in the short-term (Popaitoon and Siengthai, 2014). Todorova and Durisin (2007) point out that assimilating means transforming and exploiting, as well as adopting agile project management approaches and developing knowledge in an incremental way. Innovation resulting from transformation and exploitation processes helps company’s competitiveness. According to Patterson and Ambrosini (2015), ACAP is not a linear process, but an iterative process that favours learning and innovation.

Project team members’ accountability and awareness can enable ACAP maximisation (Love et al., 2016). Knowledge sharing at team level enhances project performance and contributes to ACAP (Faraj and Sambamurthy, 2006). The capacity to transform helps developing new ideas based on the existing processes and capacity to exploit makes it easier to convert knowledge into new products within demanded deadline (Popaitoon and Siengthai, 2014).

3 Research methods and techniques

We herein followed a qualitative approach based on a multiple case study (Yin, 2001) involving four Brazilian telecoms.

The choice made for this method derived from three features of the present research:

1 its descriptive character (Eisenhardt, 1989), given its aim of describing ACAP using in projects developed by IT departments in telecoms

2 case study is the favourite strategy applied to research based on the 'how' type (Yin, 2001)

3 the researcher has little or no control over events – study-focus lies on the contemporary phenomenon (Yin, 2001) of ACAP adoption in projects developed by IT departments in telecoms.

Due to confidentiality reasons, we have adopted fictional names for the assessed telecoms in the current study, namely: Aguia, Cristal, Target and Veloz. These firms were chosen because they are important players in the Brazilian telecom market and because they represent potential cases that have much data available about the herein assessed phenomenon, as recommended by Gioia et al. (2012). In addition, interviewees will be called interviewee 1, 2, 3 and so on.

Semi-structured interviews were the main data collection source in the present research. We interviewed 12 professionals, in total, three from each telecom. We made the option for making the interviews through videoconference, since researchers and interviewees were in different geographical locations. The first interviewee was chosen by convenience (Pramanik et al., 2017), based on the social network of one researcher; the other ones emerged by indication, as in the strategy known as snowball (Alam, 2005).

We have selected the interviewees to fulfil the theoretical sampling rule (Glaser and Strauss, 1967), which is based on three requirements:

1 senior professionals (at least five-year experience) acting in IT project management in telecoms

2 professionals with at least one-year experience in the telecom they are working in at the moment

3 professionals who have participated in, at least, one project in the referred telecom

We have developed an interview protocol based on the literature about ACAP (Cohen and Levinthal, 1990; Todorova and Durisin, 2007; Zahra and George, 2002), as well as on dynamic capabilities (Teece et al., 1997) and organisational routines (Nelson and Winter, 1982; Feldman and Pentland, 2003). The interviews were carried out from June 2019 to August 2019 by one of the researchers. Interviews were recorded, transcribed and sent to the qualitative data analysis tool called ATLAS.ti (Bandeira-de-Mello, 2006).

Interviews composed the research primary data, but secondary data such as:

1 business documents made available by interviewees – for instance –, meeting minutes, sector indicators, reports on projects' updates and standard documents

2 commercial reports and public-access press-news about the assessed telecoms, were used in the research.

This process has configured data triangulation to diversify the research's evidence sources, as suggested by Eisenhardt (1989). We also made a documental search on the internet (Bernard and Barbosa, 2016) about the four firms to find information about their background and to better understand their cases.

Interview transcriptions were subjected to reading proof, which was divided into two stages:

1 reading by one of the researchers who did not participate in the interviews

2 reading by the 12 interviewees. However, there was not request by interviewees for any adjustment in the transcriptions.

All the collected material was assessed through the grounded theory technique (Glaser and Strauss, 1967; Charmaz, 2006). Table 1 shows a summary of interviewees' profile, as well as details about the interview itself, such as conduction date, number of transcribed pages, among others.

Data encoding was carried out in the ATLAS.ti tool by following a three-stage flow (Bandeira-de-Mello and Cunha, 2003), namely:

1 open coding

2 axial coding

3 selective coding.

Each stage was followed by an encoding process conducted in pairs, and it reinforced the reliability in research findings due to the convergence of observations addressed by more than one researcher (Eisenhardt, 1989).

First, the codes were individually identified by two researchers, in separate. In a second moment, researchers got together to introduce their codes to each other in order to conclude a final list of codes, based on consensus between the two of them. The fact that one of the researchers did not have contact with interviewees mitigated likely biases in the analysis applied to the interviews. The next stage would take place after the codes were identified by both researchers, based on a cyclic process to go back and forth between codes and the literature, until finishing the coding process (Bernard and Barbosa, 2016) the entire encoding process was followed by memos (Charmaz, 2006) allowing researchers to record insights throughout data analysis. Next, one last stage – known as clustering – has finished the encoding process. According to Charmaz (2006), clusters are used to plot graphics and maps based on a non-linear way to help researchers to better understand research material by visualising it. We started writing down the outcomes shown in the following section at the end of the encoding stages (memos and clustering).

Table 1 Interviewees' profile

Participants	*Telecom*	*Age (years)*	*Gender*	*Formation*	*Function*	*Department*	*Experience in project management*	*Time in the firm*	*Interview date*	*Number of transcribed pages*
Interviewee 1	Cristal	50	Female	Data processing technician	Project Manager	IT PMO	19 years	9 years	07/22nd/2019	9 pages
Interviewee 2	Cristal	52	Male	Economy	Project Manager	Strategic Project Management	26 years	18 years	07/31st/2019	12 pages
Interviewee 3	Target	40	Female	Computer engineering	Project Expert	Customer Project Management	10 years	8 years	08/12th/2019	9 pages
Interviewee 4	Target	35	Female	Information systems with emphasis on system analyses	Project Expert	Customer Project Management	8 years	11 years	07/23rd/2019	14 pages
Interviewee 5	Aguia	40	Male	Electric engineering	PMO Coordinator	Corporative PMO	18 years	18 years	07/25th/2019	8 pages
Interviewee 6	Veloz	42	Male	Computer sciences and business	Scrum Master	Ecommerce Projects	12 years	1 years	07/22nd/2019	13 pages
Interviewee 7	Veloz	43	Female	Industrial design	Agile Coach	Digital Transformation	30 years	1 year	06/02nd/2019	10 pages
Interviewee 8	Aguia	40	Female	Computer sciences	Project Manager	Digital Transformation	7 years	18 years	08/07th/2019	13 pages
Interviewee 9	Veloz	37	Male	Data engineering	Head of Project Operations	Digital Projects	15 years	7 years	07/22nd/2019	10 pages
Interviewee 10	Cristal	52	Female	Data processing technician	Project Manager	IT PMO	10 years	18 years	08/12th/2019	7 pages
Interviewee 11	Aguia	43	Male	Computer sciences	Strategic Partnership Manager	Digital Transformation	13 years	19 years	07/29th/2019	10 pages
Interviewee 12	Target	36	Male	Computer sciences	Project Expert	Customer Project Management	14 years	9 years	08/15th/2019	20 pages

Source: Elaborated by the authors

4 Result presentation

The encoding/data interaction gave birth to the five main principles of the current research:

1 demographic data of telecoms

2 innovation

3 competences

4 organisational routines

5 ACAP.

4.1 Demographic data of telecoms

Aguia telecom has approximately 10,000 employees, it ranks the 5th position in the rank of telecoms in Brazil. It has offices in other three countries: Colombia, Argentina and Mexico. It was launched in 1954, but it has no controlling agency outside Brazil. Cristal has approximately 13,500 employees, it covers 16 countries in the Americas and is controlled by a foreign company. Target counts on more than 9 thousand employees; it ranks the 3rd position in the Brazilian rank of telecoms and has 12 offices in 12 countries. It was launched in 1995 and has a controlling office abroad. Finally, Veloz has 122,000 employees, nowadays, it is in the 1st position in the aforementioned ranking and has offices in 17 countries worldwide. Veloz was launched in Brazil in 1998 and is controlled by a foreign company. Subsequently, we will make a brief featuring of project departments in the assessed firms.

Aguia counts on a department called project management office (PMO), which was launched in 2009. It corroborates the use and outspread of a single project management methodology. All Aguia projects, regardless of their nature, were led by a project manager linked to corporative PMO structure. Agile methodology practices were implemented in some Aguia departments approximately four years ago. Agile brought along benefits, among them one finds from two years to six months in the time needed to launch new market offers. The methodology installed by corporative PMO must be followed by the 23 project managers in the firm and applied to the 200 projects developed per year (data reported in July 2019 by interviewee 5). However, there is still room for improvisation, as long as it leads to better project outcomes.

Cristal is experiencing a rough moment in its history, because it has recently passed through a fusion process. So, it is integrating systems, processes, people and business departments of three different telecoms. Approximately six months ago (information reported in July 2019), Cristal migrated from a decentralised project management type – project managers located in business units – to the centralised management type. Yet, the firm has some project managers in business units who still act in separate. Based on interviewee 1, there is lack of overall consensus in the firm about the roles and accountabilities of project managers – it can be observed in Cristal analysts' comment about its board of directors. Such lack of consensus makes it harder to set relationships between departments involved in projects. Interviewee 1 has reported communication flaws between departments. Decisions are superficially informed, mainly from the high to the middle management level.

Target works with decentralised project management, each business department has its own project department – called client management –, which accounts for linking the project-requiring department (internal client) to the technical departments in charge of putting it in place. This department follows the whole project lifespan, from demand-conceiving to final project delivery. IT system projects demand software development and the supplier is the only external supplier capable of fulfilling all Target's software development demands. Therefore, it creates a competitive environment among several business departments within a single firm.

Veloz has high adaptability profile. Based on the interviewees, the agile methodology is ideal for short projects, because it provides agility and flexibility to decision-making processes and to project delivery. IT projects are managed based on framework scrum and on its daily meetings, sprint planning, as well as on project review and retrospective meetings that take place in all projects. These meetings make projects agile; hence, they are followed-up day by day.

The four telecoms are big-sized firms that count on several internal direction boards; eventually, these direction boards have conflicts to each other, a fact that makes decision-making slower. High competitiveness between firms is another feature of this department, as well as the need of often launching new products or services in the market. The so-called time-to-market, or the time a product needs from its development to its launching in the market, is a critical efficiency factor for telecoms and essential condition for them to reach competitive advantage.

4.2 Innovation

We aimed at finding how the project department adjusts itself to growing technological changes inherent to telecoms based on interviewees' testimonies. Aguia has been experiencing deep changes in its structure. It is investing in its transformation into an 100% agile and digital telecom; thus, it has been looking for professionals with agile mindset and focused on problem solving, on professionals who think different and are innovation driven. Changes in the project management methodology are managed by a specific department within corporative PMO. Every six months this department meets the direction board to gather lessons learned and to plan improvements in project-department processes. Teams accountable for providing innovative technological solutions at Aguia belong to the engineering department, which works along with the planning department. These departments aim at feeding the project with market innovation; the 5G technology is an example of such process. This technology is the next target of new launchings in this firm (reference: July 2019).

Agile methodology has been applied in Cristal through projects developed by the IT department throughout the year, but, according to Interviewee 1, the benefits of it are not yet observed. However, interviewee 2 has shown certain resistance to adhere to the agile movement at Cristal; in his opinion, long-term strategic projects (two years, or longer) cannot be managed by agile methods. Based on interviewees 1, 2 and 10, the architecture department in IT accounts for bringing technological innovations and for providing solutions to Cristal's IT projects.

Based on interviewees in the present research, technological innovations at Target are brought by the architecture department, which comprises expert technicians from specific departments, as reported by interviewee 12: "there is an expert from the assistance department, and from the billing and collection departments, for instance". Target is

going through a time of changes in its project management processes, which have been implemented by the process department. Interviewee 12 explains that, in fact, such a department should be pro-active and aim at improving business governance processes; however, it waits for someone to feel uncomfortable with a specific process and to request the implementation of a change in it.

Veloz has been investing in digital transformation and in chatbot technologies. Interviewee 7 believes that agile methodologies are more appropriate to innovation projects because they give more flexibility to them and focus on customers and faster responses to the market than the traditional ones. Veloz underwent a hybrid project management methodology stage that mixed predictive methodology concepts to the adaptive methodology. Veloz has concluded that the best results were reached when the methodology was fully twisted into the agile methodology. Interviewee 9 added to this statement by saying that approximately 90% of projects at Veloz are managed based on agile routines. Veloz gathered a team exclusively to:

1 have insights

2 analyse them

3 propose changes based on their assessment

4 present them to business managers in order to have them approved or refused.

4.3 Project management competences

Interviewees gave a quite eclectic answer when they were asked about the project management competences their firms had been developing in the last few years and that could actually help them reach competitive advantage. Aguia has encouraged its employees to invest in qualification in agile methodologies; moreover, it affords part of expenses with such a qualification process. Aguia managers rather hiring certified project managers and develop solutions along with customers – who attend meetings at Aguia to give their opinion about projects. Negotiation, communication and business vision were other addressed competences.

Despite being a knowledge field well-assessed by researchers, time management has been the target at Cristal. This firm rarely delivers its projects within the deadline, as reported by interviewee 1: “delivery at the expected time. Yep, it’s a very serious issue here at [name of the firm]. Yep, [thinking], only few projects, very few, are delivered within the deadline”. Cristal is facing a time when innovation and leadership are essential competences for project success.

Target is a departmentalised company: several departments, such as the requesting business, customer management and technical departments, gather to develop a project. This segregation makes the firm encourage the employee-collaboration competence, as well as the problem-solving one. It encourages each employee in the project team to feel like owning the project, as explained by interviewee 3. In addition, Target is going opposite to routes taken by other telecoms. It has been aiming at hiring project managers who present a more technical profile, so they can play both the manager and technician roles. This strategy aims at saving time with technical analyses applied to business requirements by project managers.

Veloz has been encouraging the acquisition of certifications in more traditional methodologies, such as the Project Management Professional (PMP) or Project in

Controlled Environments (PRINCE2). Communication was also mentioned by the Interviewees. According to interviewee 7, users' experience is the main competence in Veloz, or, yet, focus on users' experience to stay close to market demands.

4.4 Organisational routines and changes

Although projects are unique, they have repeated activities, although they have different aims and nature. Project approval, monthly governance sessions with PMO to present and evaluate the progress of all projects in course and framework scrum events (daily, planning and retrospective meetings that take place throughout project sprints) are some examples of routines mentioned by Aguia's interviewees. Aguia's PMO meets every six months to systematically revise its project management routines. All firm levels are involved in the feedback session set to evaluate what must be changed, how it is going to be changed and change priorities.

Interviewee 1 (Cristal employee) has mentioned that some routines are repeated in all projects: pre-project when project request is analysed before its setting); resource hiring (Cristal uses staff outsourcing resources) – test stage and scope changing are some examples of them. According to interviewee 1, routines mean bureaucracy. Interviewee 10 added information about project formalisation meetings, the elaboration of material about project situation and meetings to present project advancements to Cristal managers. Cristal is revising some of its routines (demand and project management, and project approval); however, these process reviews are rarely approached in the firm. This reality is in compliance with the statement by interviewee 1: "It [project management routine reviews] is not that frequent, ok? Throughout these nine years I have been here, I think that,…, Well! I don't know! [outburst]. It is the third time I see such a thing: let's think, let's change something". Routines change in a punctual way, there is no formal process to review the changes. The process is slow, as reported by interviewees about the changes in projects' daily routines.

Teams at Target follow a project check-list system developed by managers, regardless of project type. Besides, all projects need to make an impact analysis of all departments involved in them, as well as a cost benefit analysis (it comprises the analysis of what the project is going to spend in comparison to what will be the financial result from it) and a meeting to formalise the end of the project. In other words, the project is declared over, and the involved people are deallocated, as explained by interviewee 12. Target is nowadays revising its internal project management. This process has been carried out by a multidisciplinary team gathered by representatives from each project and business department in the firm. There is no open room for process reviews, or for the implementation of different methodologies, within project routines because, as mentioned by interviewee 4, projects are always performed in a hurry – this statement was reinforced by interviewee 3:

> "we are always stopping fire,…, it is very difficult for us to apply a nice methodology, because every time we want to start a given project, it is always, 'blululu' [sounded and performed as indicating a mess, confusion]. One thing crosses over the other, we have a target and then we find out that the law must be enforced within a deadline, we have to anticipate it one week in order to meet the schedule, then, it is all changed. Then, it is quite difficult, though, for us to get organised because it is all very dynamic, very".

Veloz manages its project routines through standard operational procedures (SOP) mapped for similar projects. Accordingly, new projects may benefit from a given script described in the work procedures. However, there are also routines for project follow-up, as stated by interviewee 7, such as the routine of analysing the very root of project issues. Interviewee 6 also mentioned framework scrum events. Veloz follows the routine of evaluating each project in its own sprints, during retrospective meetings. Changes are discussed by members in the project team who are committed to conduct them. These changes are made official in meeting minutes. The subsequent retrospective meeting will evaluate the actions that were taken. The ones that were not taken will be rescheduled, based on a cyclic process. Outside project scope, the project department sets a quarterly conformity analysis meeting to evaluate suggestions for changes in routines, at corporate level.

4.5 Absorptive capacity

The last stage of interviews was based on questions about internal and external knowledge management and on investigations about ACAP using in yelecoms' project departments. Results in this section were designed based on the four dimensions of the model by Zahra and George (2002): acquisition, assimilation, transformation and exploitation, which meet the same elements mentioned by Todorova and Durisin (2007) in ACAP composition.

Aguia's engineering and planning departments are directly involved in IT department projects. This department, in its turn, accounts for evaluating market technological evolutions and for relating them to projects, either at hardware or software level, i.e., they are the gatekeepers of knowledge. Aguia has a system to encourage new ideas. According to interviewee 8: "the employee who has a new idea posts its suggestion in a portal of ideas, in case it is approved by the committee in charge, the employee is awarded after the suggestion is implemented". Aguia keeps project information in a single database centralised in a Microsoft tool called project portfolio management (PPM). Each project has its own page on the internet with information about its evolution-information can be accessed by firm managers and project team members.

Knowledge gatekeepers at Cristal are supervised by the research and development (R&D) department, which decides about the innovations the firm will invest in. The IT project management department files project information in SharePoint – this firm has recently implemented the PPM tool. Nowadays, due to the fusion process, Cristal is combining tools from all firms to support project management; consequently, internal knowledge management has been suffering to collect information widespread among different departments.

Technological innovations at Target are assessed and evaluated by a team composed by representatives from the engineering and innovation departments. This team plays the role of knowledge gatekeeper, so it must evaluate what are the new technologies in the market and find ways to incorporate such an innovation to Target's projects. Target's project information (but not all of it) is filed in its PPM tool; however, project monitoring and control are not supported by a software. Some project managers keep data about their projects in folders filed in clouds, and it highlights low internal project knowledge management maturity at Target. According to interviewee 3, the firm is investing in developing a software inside the Power BI tool just for information filling.

Similarly, Veloz also does not count on a single database to keep information about its projects: part of it is recorded in SharePoint, which is integrated to the Asana tool (market tool for agile project management). The remaining information is kept in project folders spread in the cloud. Knowledge management is decentralised; in other words, each project manager keeps and shares information in its own way, because not all of them have access to corporate tools. Thus, interviewee 9 has informed that, at first, keeping project information was not mandatory; however, he has felt a kind of attitude changing. Nowadays, team members record information about their projects because they see added-value in having a single place where one can find information about all projects available for consultation.

External knowledge management, i.e., data and information coming from outside the firm, shows its degree of maturity when it seeks its strategic goals That is what telecoms have shown in the current study, which has evidenced the weakness of this particular field. There is no formal process for external knowledge management at Aguia or Cristal; however, Aguia appeared to be much more receptive to new knowledge coming from the outside. Interviewee 11 has mentioned that the firm is willing to fast test, but it fails to quickly correct the route. Target has specific departments to monitor competitors. Whenever possible, they bring new technologies to the firms' internal departments so they can be absorbed by the on-going projects. Yet, there is no formal process to treat these new technologies. Veloz innovation department seeks new technologies in the market – a proof of concept project is implemented to test a new technology before it is launched for external customers. Once the new technology is approved, a greater money input is made by Veloz in it. Thus, Veloz hires specialised consultancies and trains some of its employees to replicate the new knowledge to the other employees in the firm. Interviewee 6, from Veloz, has said that the search for, and management of, external knowledge is much more centred in individuals than in organisational processes.

Based on the analysis applied to interviewees' testimonies, and on other sources of evidence, it was possible observing how ACAP stages are influenced in telecoms' processes.

4.5.1 Acquisition

The means used by Aguia professionals to acquire knowledge outside the firm comprise:

1 participation in events, fairs and national and international congresses about topics linked to innovation and project management

2 training

3 hiring consultancies for mentorship.

Every three months, Aguia provides an internal lecture carried out by external lecturers experts in the project management topic to boost employees' qualification. In addition, the firm encourages employees to attend training in its online teaching platforms, which are available for its employees. Insights about improvements in project management routine activities are absorbed by project members, without much bureaucracy; however, when they concern changes in project management methodology, they must be approved by PMO. According to interviewee 8, participation in congresses is only allowed to few employees due to costs with applications and transportation. However, the one allowed to participate in them has to replicate all the acquired knowledge to the other employees.

Cristal acquires external knowledge by hiring consultancies specialised in a given project management tool or methodology, or in new technologies. These consultancies are physically allocated at Cristal and account for outspreading information to target departments in the firm. Cristal also counts on its architecture department to bring in market innovations and demands to encourage the search for new knowledge. The human resources department uses the corporate tool (e-learning), which manages training – that employees can take throughout time to contribute to knowledge acquisition. Interviewee 10 has also explained that Cristal employees' participation in external events helps the acquisition of new knowledge.

Target also uses knowledge acquisition through training; managers in this firm identify gaps in their employees' knowledge and ask them to take the necessary training to make sure that the project department will account for good outcomes. Knowledge acquisition at Target mostly depends on employees, they must identify their own weaknesses and seek knowledge outside the firm. Knowledge acquired though individual initiatives by professionals in the project department must be outspread; moreover, there are cost-zero initiatives. Target nominates an expert in a given topic and this expert elaborates and presents seminars on a specific topic to the other employees in the firm.

Knowledge acquisition in Veloz's project department is done by training, integration with other internal departments, certification afforded by the firm, as well as by hiring specialised consultancies to bring accumulated knowledge from other projects developed by other customers. Veloz employees' training is monitored by the human resources department. Based on interviewee 9, the factor driving the search for new knowledge is often linked to a market demand, since Veloz's innovation department focuses on market trends. In addition, Veloz needs to follow the guidelines set by the international headquarter, which points out a reactive acquisition.

4.5.2 Assimilation

The process to assimilate new knowledge at Aguia lies on deepening in what was learned by seeking in-depth information provided by external suppliers. When knowledge is acquired through training or courses, it is assimilated through tests applied by institutions that provide qualification training or through pilot projects implemented by the project department to test new knowledge. Interviewee 11 recalls that, at Aguia, when a new knowledge becomes part of the project management methodology, it also becomes a rule. In this case, it becomes a routine process that all in the firm are forced to follow.

New knowledge at Cristal often reflects on changes in the project management methodology – these changes are first discussed and, then shared among teams. From this point on, project team members must add the new process to the daily routines of their project; however, great adhesion is not always reached. Therefore, the management team carries out audits to assess whether the new knowledge is actually being embodied, or not. Interviewee 1 has informed that mere inspections are not always effective; sometimes, a new knowledge is not well-assimilated by project team members at Cristal – its managers have started thinking about some punishment actions.

External knowledge assimilation at Target lies on knowledge-using by project team members in their daily routines. According to interviewee 3, assimilation comes along with practice. Target also sets project meetings to share new knowledge with the teams.

Veloz deals with new knowledge as new ideals previously acquired through their application in its project routines. Moreover, Veloz also invests in recycling training on a weekly basis in order to keep knowledge levered among all, in the project department.

4.5.3 Transformation

After all external knowledge is assimilated at Aguia, it is often enhanced. Such a process is possible because Aguia counts on avant-garde departments that are always seeking to turn knowledge into use, depending on the need. Feedback is the activation triggering the transformation process of something that is already at use by project team members. Interviewees 8 and 11 have associated their own agile methodology routines – in this case the retrospective meeting that takes place at the end of all sprint – with the information source working as input for further transformation in the project department.

Recently, Cristal started to think about alternatives to transform acquired and assimilated knowledge; however, such a move remains quite incipient, as explained by interviewee 1. The need for transforming an already implemented knowledge at Cristal is firstly evaluated by the management team, which can follow, or not, the transformation-proposition in question. There is no formal process to guide knowledge transformation in Cristal's project department.

Knowledge transformation at Target's project department is reactive, there is no formal process to it. Transformations take place due to the recorded demands and are agreed by project team members, but they stay at the informality sphere.

The weekly meetings of the agile methodology used by Veloz are the forums where transformations in project departments are discussed by team members. Interviewee 9 has added to this statement that changes successfully implemented in the project department mostly depend on members' sponsorship at high-management level, be it financial or moral.

4.5.4 Exploitation

The fourth dimension at Aguia – exploitation – is not formally carried out. Interviewee 5, for example, has mentioned that shortened product-launching deadlines generate higher profit to the firm, but there is no consistent measurement to prove such a statement. Interviewee 11 completed this statement and has said that the project department delivers information, but "it does not get information in return from its internal departments" – it is not informed whether sales have increased or decreased. There is no information flow about profitability issues related to the project department in the firm. Only project management indicators help Aguia's project departments to keep internal clients' satisfaction at a certain level. The efficiency of the project department is measured based on project governance indicators, such as the rate of projects that have met the deadlines. These indicators must remain higher than 80%, or than the rate of projects that have exceeded the budget. These key performance indicators positively influence variable 'income' of employees involved in the evaluated projects.

Cristal seems not to be prepared to face the exploitation stage of transformations implemented in projects. Interviewee 1 has explained that transformation or innovation projects, at this moment, are on-going projects; so, the idea of generating profit remains at prediction sphere. Cristal does not have formal methods to evaluate whether the transformed knowledge has led to profitability and to what extent. Interviewees 1 and 10

have reinforced the statement about lack of initiatives to evaluate whether changes in project departments were successful, or not.

Target project department is aware that transformations are the exploitation aim when people take the transformed or adapted knowledge for granted. According to Target, a good transformation is the one that would make employees lose lesser time with operational activities and free them to embrace new projects, but it cannot be measured in the firm. No technique to measure the benefits from knowledge transformation was installed in the firm, so far; right now, the firm is building a single project-management tool, according to which, Target managers can follow project evolution in a single and centralised space. Project metrics construction will come out soon; therefore, topic 'exploitation' is still seen as early, at Target.

Project department at Veloz is quite aware of targets deriving from firms' strategic planning; thus, it is closer to accomplishing exploitation. The project department acts as bridge to fulfil key performance indicators established by the firm. Such a department was limited to carry out a monthly evaluation to correct likely deviations between the firms' strategy and project management itself. Interviewee 7 has confirmed that commercial rules are defined by other internal departments and that, in this case, the project department is a performing one – it is not in charge of assessing whether the project will be profitable, or not. Veloz project department uses internal client satisfaction as instrument to measure satisfaction because it does not have access to information about external customers' project results. Such a checking is performed every two months through a survey known as net promote score (NPS). Adjustments in Veloz's project management methodology are made whenever necessary; these changes are mostly agile.

5 Discussion

The search for new knowledge makes firms develop new technologies or ideas that take to innovation and that, consequently, generate competitive advantage. This study is in compliance with studies by Ojo and Raman (2015), who are based on the sense that individual ACAP is one of the blocks building organisational ACAP, which also depends on organisational mechanisms. Jansen et al. (2005) and Patterson and Ambrosini, (2015) showed that project team's knowledge about ACAP contributes to innovativeness planning in the short run and to business strategic flexibility in the long run. According to Mueller et al. (2020), ACAP implementation is consistent with the company's overall performance, as well as with its responsiveness, which results from processes that allow successful innovation outcomes.

The current research has shown that the time-to-market set to launch new products and services in comparison to competitors is the main factor for telecoms to reach competitive advantage. Bjorvatn and Wald (2018) point out that project success is different from project management success; then, the assessed companies must be concerned with resource management to reallocate them and generate added-value to customers. Such a fact corroborates findings by Barney (1991), who created the concept of 'advantage of being the first to act' as competitive advantage source for companies in the same market sector. Such a concern with pioneering in telecoms' project departments could not be different, since competitiveness is rough in this sector. Project management maturity varied among the four telecoms, but, yet, it was possible identifying some

affinities among them. Reflections in this section allowed addressing five propositions throughout the current text. They represent the academic contribution of the present article.

Interviews have shown that Cristal and Veloz evidenced similar profile to each other, but it was different from that presented by Aguia and Veloz. The process to create an IT project in the four assessed telecoms was quite similar, i.e., based on demands from business departments (marketing, finances, accounting, legal, among others). The project is real after the impact, effort and cost analysis applied to the demands is approved by the executive committee. From this point on, each telecom has its own project management methodology. Corporative PMO has been in place at Aguia and Veloz for more than ten years, and it makes their project management more centralised and mature, with well-established metrics. This situation, mainly understanding ACAP at macro level, it is an important component of suppliers' learning capabilities to create the set of organisational routines and processes highlighted by Zhang et al. (2018). Project teams' knowledge about ACAP contributes to project innovativeness in the short run and to business strategic flexibility in the long run (Patterson and Ambrosini, 2015) by developing the project management culture and forming PMOs. Aguia and Veloz are using agile methodologies in framework scrum for at least four years. They are engaged to digital transformation achieved through projects set to create products and services available for customers in websites or applications. Aguia and Veloz have shown concern with fulfilling the real needs of their final customers. Aguia uses to ask customers to attend their work meetings and Veloz has a department fully focused on customers, the so-called 'user's experience', which addresses market demands and implements them in their projects. All these factors have shown that Aguia and Veloz have greater maturity in terms of project management. This process description corroborates recommendations by Leal-Rodríguez et al. (2014) and Bjorvatn and Wald (2018), who understand the association between project management and the ability of a firm to manage knowledge available in order to develop new knowledge and products. Furthermore, it is necessary understanding that the ACAP process in knowledge using to generate innovation is iterative, as pointed out by Todorova and Durisin (2007) and Patterson and Ambrosini (2015). This reasoning allows understanding the adjustment between the agile approach and approaches in compliance with ACAP applied to generate innovation.

If, on the one hand, Aguia and Veloz are developing project management competences focused on customers, on the other hand, Cristal and Target focus more on technical competences, such as time management, the definition of project management metrics and the development of technical profile in telecoms. Both companies have decentralised management projects whose project managers depend on the department they belong to and on their own management style. There is prevalence of more traditional project management styles to the detriment of the agile method in these firms. Cristal and Target are redefining roles and accountabilities to improve their internal processes and revise their work methodologies. Cristal, for example, is developing a new corporative PMO after the fusion venture, although this department only counts on three professionals (data collected in July 2019), as indicated by interviewee 1. Target, in its turn, is doing its best to redefine roles and accountabilities, as well as system integration. Interviewee 12 has reported that systems that should be integrated, actually, are not. Therefore, data are filed in different repositories, and it can lead to lack of information integrity and to rework. However, Target is aware of the need of revising its processes, and this statement has been proven by the time taken to analyse a demand – three months,

on average -, as highlighted by interviewee 12. On the other hand, Aguia takes six months to complete the whole life cycle of a project, from its design to its delivery (the launching of a new product in the market) due to its agile project management methodology. Based on the routines in the assessed firms, the project-management oriented vision limits ACAP promotion (Mueller et al., 2020). On the other hand, when project management is in compliance with the development of dynamic capabilities – which adhere to agile practices – companies present greater capacity to perform both PACAP and RACAP (Todorova and Durisin, 2007; Apriliyanti and Alon, 2017). The reflex of the aforementioned information gives birth to the first proposition.

Proposition 1: The more evolved the agile project management methodology in firms, the greater their possibility to develop their own ACAP.

We have once more found two poles in the organisational routine aspects of the four firms: Aguia and Veloz on the one side, and Cristal and Target, on the other. Aguia and Veloz have more up-to-date project management routines than Cristal and Target. Such a fact is explained by the adoption of the agile methodology, which leads to the analysis of project management processes at every sprint; this process takes these routines to a much more stable level. Mistakes in these firms are not punished, actually, they encourage the correction of and success in further short-term opportunities. Thus, project teams' knowledge on ACAP contributes to project innovativeness in the short run and to business strategic flexibility in the long run, as shown by Jansen et al., (2005) and Popaitoon and Siengthai (2014). This practice is in compliance with Danneels (2002), who sees mistakes as opportunities to learn, as well as with Breznik and Hisrich (2014), who advocate that intelligent mistakes help firms to learn and to develop new capabilities. Cristal and Target interviewees have explained that they rarely reassess their processes, except when it is requested by the firms' high management sphere. Damanpour (1991) explains that innovation means change; so, it is possible inferring that Cristal and Target's project departments are lesser receptive to innovation. This discussion leads to the second proposition.

Proposition 2: The greater the possibility of making a mistake, the greater one's possibility to develop its own ACAP.

Aguia appeared more up-dated in terms of knowledge management because it keeps its project data in a single tool, which is widely used either by high management spheres or by project team members. Veloz also files project documents. Although information remains widespread among different departments, it tends to have data generating knowledge accountable for new projects. Cristal and Target remain at sketchy knowledge management levels, since there is no corporative project-management tool fully implemented in these firms – without data it is not possible having information and, consequently, without information, there is no knowledge generation. Guedes et al. (2016) have warned that if communication is not easily and quickly outspread within firms, then transformation processes and innovation are impaired. Access to information can develop prior knowledge about ACAP (Nemanich et al., 2010; Ojo et al., 2017), which is based on the association between memory and learning at micro, meso and macro level. Thus, an individual is able to acknowledge and internalise external information related to what is already stored in his memory (Cohen and Levinthal, 1990; Ojo and Raman, 2015; Sjödin et al., 2019). Social interaction mechanisms and knowledge management have impact on group learning and on firms' ability to learn. Therefore, the

aforementioned experience allowed the development of PACAP and has positive effect on RACAP (Todorova and Durisin, 2007).

The four telecoms count on their own internal departments, such as engineering, innovation, R&D and architecture, to play the role of knowledge gatekeepers (Todorova and Durisin, 2007). As Yu and Washida (2018) describe, gatekeepers need to understand and transform external knowledge, so it can be transmitted to others: 'knowledge transfer' is an incentive to external knowledge embodiment (Sjödin et al., 2019). These departments are also focused on bringing new market knowledge to the firm. Such a knowledge reaches each project department and is absorbed as improvement by project management methodologies, or as new technologies that become the scope of further projects. Because innovation capability depends on knowledge evolution (Carneiro, 2000; Murovec and Prodan, 2009; Bjorvatn and Wald, 2018), we have identified that Aguia has greater potential to innovate in its project departments and it led to the third proposition.

Proposition 3: The greater the knowledge management system in a firm, the greater its possibility to develop its own ACAP.

As explained by Zahra and George (2002), capabilities are divided into PACAP and RACAP. ACAP using investigation at Aguia, Cristal, Target and Veloz's projects led to quite similar PACAP results, but they showed discrepancies in RACAP. Project departments in the four firms use the acquisition and assimilation dimensions in a very similar way. The acquisition of new knowledge takes place through participation in congresses, training and by hiring external consultancies for mentorship promotion. Firms that invest in ACAP encourage their employees to participate in technical training (Cohen and Levinthal, 1990). This situation is likely based on human resources policies, as pointed out by Popaitoon and Siengthai (2014). ACAP generated by demand is based on market knowledge acquired through interactions with suppliers, customers, competitors, partners, professional conferences and fairs (Murovec and Prodan, 2009). ACAP generated by science is based on scientific knowledge resulting from academic and institutional research, and from R&D companies (Murovec and Prodan, 2009; Sjödin et al., 2019; Ojo et al., 2017). According to Becker and Peters (2000), firms need to reach a higher ACAP level to use scientific knowledge, but it is not the case of any of the herein assessed firms. Consequently, we reach the fourth proposition.

Proposition 4: The greater the scientific knowledge available in a firm, the greater its possibility to develop its own ACAP.

According to interviews in the present research, the assimilation of new knowledge takes place when such a knowledge materialises itself into changes. This process must be based on the project management methodology and incorporated to project daily routines. On the other hand, transformation and exploitation have differed among the four telecoms. Aguia and Veloz are similar when it comes to the transformation dimension. They use their project retrospective meetings to often evaluate the need of transforming already assimilated knowledge. Whenever it happens, an agreement among project members is set in order to achieve the referred change in the next sprint. This situation meets the model by Todorova and Durisin (2007), which defines transformation dimension as alternative for the assimilation dimension, rather than the consequence of it. In other words, the firm can return to the structure of previous knowledge and transform it after the acquisition of new knowledge, without even assimilating it. Ali et al. (2018) indicate

that knowledge sharing practices develop ACAP to create a knowledge stock and an environment to enable knowledge transfer to make assimilation and transformation easier in order to meet project needs. Consequently, the relationship between PACAP and RACAP in project management makes it easier to achieve adequate performance and to increase the capacity to innovate and compete. Therefore, focus on transforming knowledge in Cristal and Target comes from high management spheres; whenever they take place in low management spheres, they are treated as a reactive and localised achievement, i.e., it is not something institutional.

Finally, the exploitation dimension has similar features in all four firms. According to Zahra and George (2002), this is the last dimension in its linear ACAP model. But we have noticed that the project departments in the assessed telecoms are not able to measure whether the generated transformations in their projects were profitable. Aguia and Veloz have outstanding metric systems to evaluate the evolution of their projects, but such firms cannot measure the effect of their transformations on project outcomes. In case a project indicator gets improved, firms cannot map what was the initiative triggering such an improvement. On the other hand, Cristal and Target are a little delayed, because they do not have a mature and corporate metric system to evaluate their projects. Then, too little is known about the profits these projects bring to their firms.

Proposition 5: The greater the accomplishment capacity of a firm, the greater its possibility to exploit its ACAP.

According to the classification adopted by Cohen and Levinthal (1990), firms presenting higher ACAP level tend to be more proactive. Firms showing higher ACAP level are always seeking new opportunities, regardless of their performance. On the other hand, firms evidencing lower ACAP level are seen as more reactive, because they aim at exploring alternatives in failure situations (Silva et al., 2014). Accordingly, we can conclude that Aguia and Veloz are proactive, whereas Cristal and Target are reactive.

The current research has shown that there are two extremes among the four assessed firms. On the one hand, Aguia and Veloz have achieved three ACAP dimensions: acquisition, assimilation and transformation; on the other hand, Cristal and Target only reached two dimensions: acquisition and assimilation. However, what do Aguia and Veloz have in common that other firms do not? Actually, each firm has shown its particularities, but Aguia and Veloz are in compliance with the following aspects:

1 prevalence of the agile project management methodology

2 existence of a corporative PMO centred in project governance

3 development of competences focused on customers

4 corporate project management tools already assimilated by the firm

5 routines that are often reassessed in order to improve project performance.

By defining ACAP as a dynamic capability, Zahra and George (2002) emphasised the strategic nature of it. We could actually observe closeness between strategies to project management at Aguia and Veloz; however, we must highlight that there is room for improvement in the link between business strategy and project management in these firms.

6 Conclusions

Results in the present research have shown that PACAP is the most advanced ACAP type to the detriment of RACAP. The four assessed telecoms use similar procedures to acquire and assimilate external knowledge; however, transformation is more up-dated at Aguia and Veloz – none of the telecoms has shown maturity in knowledge exploitation. Besides, the most common source of knowledge is that generated by demand, rather than that generated by science. This situation highlights a more reactive or passive attitude towards change, which results from the acquisition of new knowledge. By analysing similarities among firms, we could conclude that the more firms promote the agile culture, the greater their maturity in project management (one can easily observe the valuing and use of the ACAP process in them) and, consequently, the shorter their time-to-market.

Data have shown that Aguia and Veloz are agiler firms that present common behaviour at all their organisation levels, they head towards innovation, mistake 'flexibilisation', routine improvement, focus on customers and susceptibility to learn. Cristal and Target have shown that their project departments are quite reactive, they focus on performance without self-awareness. These departments remain concerned with the triple restriction: cost, deadline and scope. They seek solutions about what project advancement metrics to create, and about how to make communication flow among departments, not mentioning other traces evidencing that they still have low project management maturity. Thus, Aguia and Veloz have more mature ACAP than Cristal and Target; however, the four firms have to advance on ACAP using in their projects and, consequently, to reach higher innovation level.

The merely performance character of these telecom's project departments has shown the distance between project management and business strategy in them. The project department acquires knowledge, assimilates and transforms it, but it does not measure whether there was any gain due to the new learning, or yet what was the level of such a gain. This fact has evidenced that the project department in these telecoms has to act at strategic level and to improvise their knowledge management. Without this process, project departments will never properly use ACAP.

Our academic contribution lied on the five propositions that have emerged from data collected based on the grounded theory technique. These propositions represent our suggestion for further research. Because they regard fields yet to be explored, we recommend future exploratory studies on ACAP using in project departments to be carried out in other companies for comparison purposes. It is worth highlighting that the current research counted on the participation of 12 interviewees, all of them are active in projects developed by the IT department in their telecom. As we see it, this number of participants was enough to identify the first findings, but a larger number of respondents will certainly give greater reliability to analysis results.

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