IDENTIFICATION AND MITIGATION OF RISKS IN IT PROJECTS: A CASE STUDY DURING THE MERGER PERIOD IN THE TELECOMMUNICATIONS INDUSTRY

ABSTRACT

This paper identifies risks in IT projects in the merger period in telecommunications companies and proposes mitigation actions. It adopts an interpretive epistemology in an exploratory case study. The results include a list of 13 exclusive risks in IT projects in such a period and recommendations for mitigating the risks identified in the study. The theoretical contribution lies on the identification of 13 exclusive risks in IT projects in the merger period between two telecom companies, and the contribution to practice enables project managers to apply the findings identified and mitigations in risk management in IT projects in a similar setting.

Keywords: Project Management; Risk Management; It Projects; Merger; Telecommunications; Risks; Case Study.

IDENTIFICAÇÃO E MITIGAÇÃO DE RISCOS EM PROJETOS DE TI: UM CASO DE ESTUDO DURANTE O PERÍODO DE FUSÃO NA INDÚSTRIA DE TELECOMUNICAÇÃO

RESUMO

Este artigo tem como objetivo identificar riscos em projetos de TI durante o período de fusão em empresas de telecomunicação e propor ações de mitigação. Foi adotado uma epistemologia interpretativa em um estudo de caso exploratório. O resultado apresenta uma lista de 13 riscos exclusivos em projetos de TI durante esse período e recomendações para mitigar os riscos identificados neste estudo. A contribuição teórica se baseia na identificação de 13 riscos exclusivos de projetos de TI durante o período de fusão entre duas empresas de telecomunicação e a contribuição prática permite aos gerentes de projetos aplicar os achados da pesquisa assim como as mitigações na gestão de riscos em projetos de TI com uma configuração similar.

Palavras-chave: Gestão de projetos; gestão de riscos; projetos de TI; fusão; telecomunicações; riscos; caso de estudo.

Irapuan Glória Júnior[1]
Marcirio Silveira Chaves[2]

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[1] Doutorando em Engenharia da Produção pela Universidade Paulista - UNIP. Professor de Pós-graduação do Centro Universitário Senac. Brasil. E-mail: **profirapuan@ndsgn.com.br**
[2] Doutor em Informática pela Universidade de Lisboa, Portugal. Professor da Pontifícia Universidade Católica do Rio Grande do Sul - PUC/RS. Brasil. E-mail: **mschaves@gmail.com**

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1 INTRODUCTION

The origin of risks lies in the uncertainties that exist in all projects (PMI, 2012). Planning is the key management component to deal with uncertainties in the development of products and services (Zwikael, Pathak, Singh and Ahmed, 2014). Risk management is one of the main factors attributed to the success of projects (Boehm, 1991; Wallace, Keil & Rai, 2004; Gallagher, Case, Creel, Kushner & Williams, 2005; Bannermann, 2007; PMI, 2012) and therefore to long-term success in organizations (Hartono, Sulistyo, Praftiwi & Hasmoro, 2014). Mergers and acquisitions often have a significant number of risks involved, especially the integration between companies (Baker & Niederman, 2014). In addition, the number of risks is greater in Information Technology (IT) projects, as they have a high degree of technological dependence (Sauser, Reilly & Shenhar, 2009).

Furthermore, the project rate ending in failure is high (Sauser *et al.*, 2009), even with project managers using tools present in current frameworks, such as *Project Management Body of Knowledge* [PMBoK] (Project Management Institute [PMI], 2012) and International Project Management Association – National Competence Baseline [IPMA-NCB] (International Project Management Association [IPMA], 2006), to try to change this scenario. PMBoK (PMI, 2012) uses the approach of splitting information through knowledge areas, which include groups of processes that make up management: integration, scope, time, cost, quality, human resources, communication, risks, stakeholders and acquisitions. Except for risk management, these are focused on the assumptions and constraints that have been defined and should be coordinated by the project manager (IPMA, 2006; PMI, 2012). Risk management is the only area responsible for trying to foresee and prepare the project to respond if the risks become real (Boehm, 1991; Wallace et al. 2004; Bannermann, 2007; PMI, 2012).

The merger period in a company may cause great uncertainty and impacts on projects. The media, such as newspapers and magazines, tend to group together in the same category the merger a acquisition or division between companies (Ross, Westerfield & Jaffe, 2002). During this process, the companies suffer from changes in their structure and culture, and projects are impacted directly, with possibilities of generating new situations (Ross *et al.*, 2002; Lemes Júnior, Rigo & Cherobim, 2005; Feitosa, Silva & Firmus, 2012). A merger is a risky operation, often with interruptions in business activities (Baker & Niederman, 2014). In some extreme cases, this scenario of changes can lead to the emergence of new risks (PMI, 2012). Therefore,

IT projects at the time of company mergers may entail specific risks in this period.

The telecommunications industry (telecoms henceforward) is represented by companies that provide services for the transmission and reception of sound and image, and answers technologically to the market in accordance with the regulations of the regulatory agency (ANATEL, 2014). In Brazil, between 2002 and 2012, there were around 19 mergers per year in this sector (KPMG, 2014). The impact that companies suffer from this type of operation is very great (Ross *et al.*, 2002; Lemes Júnior *et al.*, 2005), and in the case of telecoms it is much higher, due to the fact that they use technology as their core competency (ANATEL, 2014). In addition, their IT projects can generate more risks in this period of uncertainty (Sauser *et al.*, 2009; PMI, 2012), where the correct identification of risks can contribute to success (PMI, 2012). In this context, the objectives of this paper are twofold:(1) Identify the risks associated with IT projects on the merger of two telecoms and (2) Propose risk mitigation actions for future mergers of telecoms.

This paper proceeds as follows. Section 2 describes the theoretical background of merger and acquisitions, IT project management and risks and uncertainties. Section 3 introduces the design of the research. Section 4 describes the analysis of the results. Section 5 and 6 present the theoretical and practical implications, respectively. Section 7 identifies the limitations and further works and finally, Section 8 presents the conclusion.

2 THEORETICAL BACKGROUND

2.1 Mergers and Acquisitions

Mergers and acquisitions is a business expansion strategy that can change the setting in which organizations compete (Lemes Júnior *et al.*, 2005), and is applied to any corporation or limited liability company (Lemes Jr. *et al.*, 2005; JusBrasil, 2014). The parties receive specific labels: 1. "Acquiring company" is used to name the company that wishes to purchase another; 2. "Target company" is the corporation that will suffer the action; and 3. "resulting company", the company generated by the merger (Lemes Jr. *et al.*, 2005). The types of mergers and acquisitions are (JusBrasil, 2014): 1. Incorporation, which is an operation whereby one or more target companies are absorbed by another; 2. Merger, in which two or more companies create a new company; and 3. Spin-off, which is an operation whereby a company transfers asset portions to one or more companies (Lemes Junior *et al.*, 2005). The National

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Telecommunications Agency (ANATEL) is a government agency whose mission is to manage the telecom industry and protect the interests of users (ANATEL, 2014). In Brazil, this industry has room for further mergers and acquisitions (KPMG, 2014) and is characterized by a few companies, among which are EMBRATEL, VIVO and CLARO (ANATEL, 2014).

2.2 IT Project Management

In the case of IT projects, there are two principal groups: 1. Development, in which the deliverable is a computer system, a customized ERP or another process that requires development in a computer language (Pressman, 2011; Somerville, 2011) and 2. Infrastructure, which is characterized by the installation of software, availability of computer services, environmental reliability and control of IT items (Pressman, 2011). An important aspect of system development in IT projects is the possibility of using an Agile methodology like Scrum (Schwaber & Sutherland, 2013). In a dynamic environment with changes, agile methodologies promise to deliver higher productivity, quality and a greater chance of success in software development projects (Beck et al., 2001). Scrum is applied in development projects with small teams, using small development cycles, which facilitates faster adaptation to changes in volatile environments, the use of up to two-week task cycles and turnover in the various functions of members of the development team (Schwaber & Sutherland, 2013). IT can be also affected in the merge period in aspects as change in Stakeholders behavior (Glória Júnior & Chaves, 2015a; Shehzad, Awan, Lali, & Aslam, 2017; Aragonés-Beltrán, García-Melón, & Montesinos-Valera, 2017), scope and organization (Glória Júnior & Chaves, 2015b; Khazanchi & Arora, 2016).

2.3 Risks

Risks have their origin in an event or uncertain condition that can affect at least one project objective (PMI, 2012). Project risk management includes processes that increase the probability of positive events and decrease the probability of negative events (PMI, 2012), and its process is continuous (IPMA, 2006; PMI, 2012). The main risk management approaches include: PMBOK (PMI, 2012) and the IPMA-NCB (IPMA, 2006). The process of risk identification should be done early to prevent failure in projects (Jani, 2008, 2010; PMI, 2012). Project managers should investigate the types of risks and plausible mitigation means (PMI, 2012), as well as considering the nature of the company (Alao & Adebawojo, 2012). Inadequate identification of risks

can contribute to project failure (De Bakker, Boonstra & Wortmann, 2010; Jani, 2010). The use of risk management in the company's strategy can be achieved by application of Enterprise Risk Management [ERM] (COSO, 2004). The risks should be part of the IT strategy (Mayer & De Smet, 2017).

3 RESEARCH METHODOLOGY AND PHILOSOPHICAL UNDERPINNINGS

Establishing epistemological and ontological guidelines helps to understand the assumptions and analysis of the items that make up the research (Sarker et al., 2013). This exploratory study adopts a predominantly interpretive epistemology (Eisenhardt, 1989), with the qualitative technique (Yin, 2014) and inductive approach (Smyth & Morris, 2007). The study deals with the operational connections that should be drawn over time, more than just frequencies or incidences (Yin, 2014). The case study is an empirical investigation of a phenomenon in depth and context, especially when both are not evident, in which the context must be considered (Yin, 2014). The unit of analysis is IT projects in Company-A in the merger period from 2007 with Company-B. Data collection was through (1) Semi-structured interviews with employees who worked during the merger and had a project management function or similar; (2) Collection of documentary information; and (3) Information provided by written or digital media. Data analysis was carried out by data triangulation (Hussein, 2009). The flow of processes carried out in this study is as follows:

(1) **Listing the risks in IT projects in literature:** We looked for papers that identified risks in IT projects of local teams obtained by searching the words "Risk", "Project" and "IT" in the following leading journals between 1981 and 2014: Project Management Journal, International Journal of Project Management (IJPM), Information Systems Journal, Journal of Management Information Systems, Journal of Management Research, MIS Quarterly, Technovation and Telecommunication Policy, Brazilian Journal of Management, and Iberoamerican Journal of Project Management (IJoPM);

(2) **Categorizing risks found in literature:** The identified risks received a label that represents the focus that is referenced in an IT project. The creation of categories was

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associated with the list of identifications performed;

(3) Interviews with IT project managers in Company-A: We designed a semi-structured questionnaire based on the interview protocol presented in Appendix A. The interviews were carried out with people who had the function of or close to a project manager. The interviews could not be recorded, at the determination of respondents. For this reason, they were carried out with another researcher simultaneously taking down notes, which were put together in a single document;

(4) Listing the risks in IT projects from interviews, projects and media artifacts: All documents generated in the interviews and the risks or problems identified by respondents were the basis for the identification of risks. We used specialized industry magazines and large circulation newspapers;

(5) Classifying Risks in IT Projects: We classified each risk identified in the previous item according to the taxonomy created in item 2;

(6) Identifying exclusive risks: We kept the risks identified in the triangulation, which have no equivalence in the risks listed in literature. Comparison with literature builds internal validity, raises the theoretical level, and improves the construction of definitions (Eisenhardt, 1989);

(7) Proposing mitigation actions for the risks identified: Mitigation actions were suggested for the risks identified in the item 6.

The propositions of this study that provide guidance for the study are as follows:

- Proposition 1: There is preparation for the moment of merger between telecoms. The directors and others in management positions make preparations for the merger. This time may vary according to the reason for the operation (Ross *et al.*, 2002; Lemes Júnior et al., 2005);

- Proposition 2: IT projects receive risk management treatment in Company-A. Risk management should be carried out in all projects (PMI, 2012);

- Proposition 3: Other functions, in addition to that of project manager, can carry out risk management. Risk management is one of the areas of knowledge conducted by the project manager (PMI, 2012). It is common in companies for the IT Manager or the person responsible for the system to carry out all the management of a system according to the experience of the professional (Sommerville, 2011; Pressman, 2011). Thus, the positions of project manager, IT managers, those responsible for systems or similar positions will be considered. Any other position will be disregarded;

- Proposition 4: Risks are easily identified in IT projects. The risks are identified by project managers using specific techniques (PMI, 2012);

- Proposition 5: There are mitigating actions for the risks found. After identifying the risks, it is necessary to implement mitigations, and opportunities should be potentialized (PMI, 2012).

3.1 The Study Objects

The two companies analyzed have specific characteristics from the point of view of their organizational structure, market and maturity in project management. The "acquiring-company", called Company-A, is a multinational installed in Brazil for nearly two decades and initially had landline services in a few states. It has a weak organizational matrix and the presence of project managers is not part of the available positions (PMI, 2012). Despite this feature, staff in many positions, usually coordination, exercised the function of project managers individually.

The target-company, called Company-B, is a multinational installed in Brazil for over a decade and always had a mobile-phone focus. It does not have a project culture and, like Company-A, has a weak organizational matrix (PMI, 2012). It has increased its market share in recent years (KPMG, 2014), and has been periodically sounded out by Company-A, which came to acquire interests through the purchase of shares (Folha de São Paulo [FSP], 2014).

The operation carried out was characterized from the legal point of view by the incorporation of company-B by company-A (ANATEL, 2014; RF, 2014), but it was considered a merger when publicized in the media (FSP, 2014; TELECO, 2014; Gazeta Mercantil [GM], 2014), (before) and also by the executives of their respective companies. In this work, for the sake of standardization of the various sources, we will be considering the label "merger".

Chronologically, the preparations for the operation began in 2007 through the purchase of assets (FSP, 2014; TELECO, 2014; GM, 2014),

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which was confirmed in the interviews. The telecom agency approved the merger with three conditions to be addressed by mid-2012 (ANATEL, 2014). Other communication channels also covered the events (FSP, 2014; TELECO, 2014).

3.2 The Interviews

Despite the hostile setting characterized by an environment of distrust, fear of dismissals and many organizational changes in both companies, we conducted eleven interviews with employees involved in the merger period. We followed the recommendations of Guest, Bunce and Johnson (2014): 1. The respondents have expertise regarding the subject and they share a common experience; 2. Respondents report their experiences independently and there is a consensus on the events; 3. The respondents are of a relatively homogeneous population and the objectives are clear; 4. There was saturation of the data, from the sixth interview; and 5. The sample was for convenience, in which patterns can be identified, even in small groups, as they all had experience in the same phenomenon. The end of the interview process occurs when there is saturation of the data and the continuity of interviews returns insignificant improvements (Eisenhardt, 1989). The three project managers interviewed mentioned some risks in engineering. Based on these reports, we interviewed an engineer who confirmed the data collected by the project manager.

The proportion of the source of the respondents to the interviews is greater in Company-A (82%) than in Company-B (18%). Company-A does not have the position of project manager, but one can find employees acting as project managers. This is common in business, and one can consider it as an employee who just did not get the label, but is fully capable of responding as a project manager (Richardson, 2014). In this research, the respondents were those who acted as project managers, even when holding such positions as "IT Consultant", "IT Coordinator", "Department Administrator", "Engineer", "Process Analyst", "Business Analyst" or "Senior Systems Analyst". Appendix A lists the function of each respondent in the merger period.

3.3 Categorization and Classification

In this paper, the categorization of the risks listed in the literature received a term to identify its activities within the area of IT projects, resulting in the following categories: (1) **Project Management**, which includes the risks related to project management; (2) **Team**, concerning the integration of the members, relationships with others and the level of technical knowledge; (3) **Development**, the type of development of IT project risk, with coverage from systems analysis to the use of components; and (4) **Infrastructure**, risks attributed to the type of IT infrastructure project, with coverage from deploying a server to communication between systems.

4   ANALYSIS OF THE RESULTS

4.1   Risks Identified in the Literature

The risks identified in the state of the art in IT projects were classified according to the four categories created. In the category Project Management (see Figure 1), the lack of skills on the part of the project manager (LP01) is one of the main items cited in the literature, followed by the lack of control regarding estimates (LP02) and failure to keep to the schedule (LP03). Other topics listed include flaws in estimates, quality and insufficient expertise in various areas, such as risk management.

Figure 2 lists the risks in the Team category. The main risk is having a team that lacks technical competence (LT01), commitment (LT02) and is accompanied by an insufficient number of technicians for the project (LT03). Other risks include team integration, turnover and integration issues.

Regarding the Development category shown in Figure 3, one can identify that the highest incidence in the literature concerns problems with partner artifacts (LD01) such as components. The literature then gave as the main risks constant changes in technical requirements (LD02) and technical innovations during the project (LD03). Another risk raised concerned failures in development in relation to security and the lack of logs to detect errors or anomalies (LD04).

The Infrastructure category, shown in Figure 4, demonstrates two important risks: Failure to identify technical needs (LI01) (in which the functionary was unable to identify customer needs and possible technical novelty) (LI02) with the release of new versions of hardware and software.

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Figure 1 – Risks in the Project Management category in the literature. In the ID column, "L" stands for Literature and "P" stands for Project.

ID	Risk / Description	Authors
LP01	**Lack of skills** Absence of skills expected of a project manager, among which and not limited to are: leadership, conflict management, communication, etc.	Boehm (1991); Jiang & Klein (2000); Schmidt *et al.* (2001); Wallace (2004) Bannerman (2007); El Emam (2008); Khan (2010); Lamersdorf (2011); Gholami (2012); De Wet (2013)
LP02	**Lack of control in estimates** Overestimated or underestimated estimates.	Boehm (1991); Schmidt *et al.* (2001); El Emam (2008); Lamersdorf (2011); Khan (2010); Wet (2013); Wallace (2004)
LP03	**Failure to keep to the schedule** Difficulties in managing to keep to the schedule already established.	Boehm (1991); Nakashima & Carvalho (2004); Schmidt *et al.* (2001); Wallace (2004); De Wet (2013)
LP04	**Failure in project management** Lack of knowledge necessary for the implementation of a project management methodology.	Schmidt *et al.* (2001); Bannerman (2007); El Emam (2008); Lamersdorf (2011); Khan (2010); Wallace (2004)
LP05	**Quality below expectations** The product or service quality has performed below that agreed with the client.	Boehm (1991); El Emam (2008); Khan (2010); Gholami (2012); De Wet (2013)
LP06	**Failed partner management** Mistakes in supplier management regarding delays, choices and their relationship with existing client products.	Schmidt *et al.* (2001); Khan (2010); Lamersdorf (2011); Wet (2013)
LP07	**Artificial deadlines** Creating unrealistic delivery dates.	Schmidt *et al.* (2001); Khan (2010); Wallace (2004)
LP08	**Failure in risk management** Lack of ability to recognize / interpret risk indicators created and of awareness of the importance of risk management.	Bannerman (2007); Schmidt *et al.* (2001); Khan (2010)
LP09	**Failure in Knowledge Management** Failure to create lessons learned and / or use lessons learned.	Pinna & Arakaki (2009); Gholami (2012); Lamersdorf (2011); Khan (2010)
LP10	**Failure to manage expectations** User expectations were not managed, generating unrealistic expectations in end users.	Boehm (1991); Schmidt *et al.* (2001); El Emam (2008)
LP11	**Inability to create commitment to user** Absence of creation of commitment to the Project with users	Schmidt *et al.* (2001); El Emam (2008); Wallace (2004)
LP12	**Change in the nature of activities** Changes in activities already defined by the project manager him/herself, but considering the same scope.	Jiang and Klein (2000); Gholami (2012)
LP13	**Misunderstanding requirements** Failure to understand client/user requirements	Boehm (1991); Schmidt *et al.* (2001)
LP14	**Nonexistent Control** Lack of control of one or more items: time, cost and activities.	Schmidt *et al.* (2001); Wallace (2004)
LP15	**Realistic project configuration** Failure to estimate project time.	Bannerman (2007); Khan (2010); De Wet (2013)
LP16	**Gold Plating** Use of Gold Plating as a workaround for crisis.	Boehm (1991)

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Figure 2 - Risk in the Team category in the literature. In the ID column, "L" stands for Literature and "T" stands for Team.

ID	Risk / Description	Authors
LT01	**Lack of technical competence** The team has no knowledge of how to use the tool, language or database. It is considered new to the group but not necessarily to the market	Boehm (1991); Jiang & Klein (2000); Schmidt *et al.* (2001); Nakashima & Carvalho (2004); El Emam (2008); Lamersdorf (2011); Wallace (2004)
LT02	**Lack of commitment** Absence of commitment to and involvement in the project on the part of the team	Schmidt *et al.* (2001); Khan (2010); Buckl *et al.* (2011); Lamersdorf (2011); Gholami (2012)
LT03	**Insufficient staff** Number of people with insufficient technical knowledge. Included are analyst, network administrator and similar positions.	Jiang & Klein (2000); Schmidt *et al.* (2001); Bannerman (2007); El Emam (2008)
LT04	**Communication failures** Problems with the communication of tasks, decisions and other items between the Project and IT Managers and the development team	El Emam (2008); Khan (2010); Wallace (2004)
LT05	**Lack of maturity in the development team** Lack of maturity / experience in the development team	Pinna & Arakaki (2009); Khan (2010); Lamersdorf (2011)
LT06	**Lack of trust** Absence of an environment of trust between team members	Lamersdorf (2011); Gholami (2012)
LT07	**Turn-over** Exchange of technical staff caused by resignation or an action of the Project manager/IT Manager	Jiang & Klein (2000); Schmidt *et al.* (2001)
LT08	**Constant Team adaptation** Changes in technology employed forcing the team to adapt	Buckl *et al.* (2011)
LT09	**Significant Cultural barriers in the project team** Cultural, social or status-quo differences between team members	Pinna & Arakaki (2009)

Figure 3 - Risks in the Development category in the literature. In the ID column, "L" stands for Literature and "D" stands for Development.

ID	Risk / Description	Authors
LD01	**Problems with partner technical artifacts** Problems with partner components regarding the dependence of the current system, communication compatibility and integration	Boehm (1991); El Emam (2008); Pinna & Arakaki (2009); Khan (2010); Lamersdorf (2011); De Wet (2013)
LD02	**Changing technical requirements** Constant changes in technical requirements after project approval	Boehm (1991); El Emam (2008); Pinna & Arakaki (2009); Lamersdorf (2011)
LD03	**Technical novelty in development** Technical breakthrough in development of the system during the project	Jiang & Klein (2000); Schmidt *et al.* (2001); El Emam (2008); Lamersdorf (2011)
LD04	**Technical failure in development** Failure resulting from systemic access security and not using logs for error detection	Pinna & Arakaki (2009); Lamersdorf (2011); Gholami (2012)
LD05	**Lack of tests on the system** Insufficiency of tests and/or failure to perform testing of components/system	Pinna & Arakaki (2009); Lamersdorf (2011)

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ID	Risk / Description	Authors
LD06	**Failed systems development management** Failures in conducting and/or the application of an Agile methodology for the management of systems development team	Pinna & Arakaki (2009); Khan (2010)
LD07	**Failed deliveries** Late deliveries or anticipations of different products suggested in an Agile methodology used by the team	El Emam (2008); Buckl *et al.* (2011)
LD08	**Lack of componentization** Failure in the design of componentization, error in abstraction, lack of flexibility and guidance problems concerning? the object	Pinna & Arakaki (2009)
LD09	**Lack of systems documentation** Non-existent, incomplete or outdated documentation	Khan (2010)
LD10	**Failure to identify the communication format** Failure to identify the communication format with components/systems supplied by partners	Pinna & Arakaki (2009); Gholami (2012)

Figure 4 - Risks in the Infrastructure category in the literature. In the ID column, "L" stands for Literature and "I" stands for Infrastructure.

ID	Risk / Description	Authors
LI01	**Failure to identify technical requirements** Failure to identify the technical requirements with regard to the chosen hardware configuration, software licensing form and other issues regarding the IT infrastructure	Pinna & Arakaki (2009); Gholami (2012); Khan (2010); Verner (2014)
LI02	**Technical novelty Infrastructure** Indicates that the technology used in infrastructure project is new on the market	Jiang & Klein (2000); Schmidt *et al.* (2001); Lamersdorf (2011)
LI03	**Technical Infrastructure failure** Failure resulting from hardware or access to the systems	Gholami (2012); Khan (2010)
LI04	**Lack of contingencies** Absence of services contingency for the project may result in whole or momentary stoppage of processes	Khan (2010)
LI05	**Immature technology** The technology is not consolidated with the manufacturer or market	Wallace (2004)
LI06	**Missing documentation** Nonexistent documentation, incomplete or outdated infrastructure environment	Khan (2010)

4.2 Risks Identified in the Interviews

The analysis conducted based on the notes of the interviews gave information about the preparation of the merger, processes, risks, problems and finalization, generating 19 risks. According to respondents, the risks identified in the category Project Management, showed in Figure 5, reflect the absence of information on the part of the manager (RP01) responsible for changes to the systems, shown as follows in an excerpt from the interview with Project Manager R3: "... changes (...) caused by the lack of technical knowledge and processes on the part of the project manager... ."

Another risk concerned shared management (RP02), in which the project managers (from Company-B and Company-A would work together and make joint decisions (due diligence) until such time as the project manager from Company-B could take full control. Here is an excerpt from project manager R11: "... initially there was shared management (due diligence)... ."

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Figure 5 – Risks in the Project Management Category. In the ID column, "R" stands for source in
Respondent and "P" stands for Project.

ID	Risks / Description	Respondents
RP01	**Lack of manager information** The manager had no knowledge of the systems and lacked technical capacity	R3
RP02	**Shared management** In the beginning there was (the) shared management between executives from Company-A and Company-B	R11

Regarding the Team, as shown in Figure 6, the sense of insecurity and anxiety was in evidence (RT01) and permeated the corporate environment, compounded by promises from senior management, followed by contradictory actions, such as voluntary layoff programs (VLP). Business manager R4 asserts: "... We were insecure and anxious about our future (...) the new director assured us that there would be no dismissals, however we had a VLP ... ." Process analyst R7 adds: "... we learned through the media that a merger was taking place and internally everything was very superficial ... ."

The reduction of the teams (RT02), labeled internally as grid, occurred. Project Manager R2 said: "... reducing grids (...) at all levels without defined rules ... ." The same manager commented that the layoffs generated by the decisions of Company-B or voluntary layoffs (RT05) caused the loss of know-how (RT04): "... there was a loss of know-how (...) recently trained employees would lose their job... ." In many instances, the fragmentation of teams (RT03) occurred, as in the story of Project Manager R8: "... the impact on the area (...) restructuring teams (…) with the dismissals… ."

There was still widespread insecurity and a feeling of impending dismissal (RT07), resulting from turn-over (RT06) at times and at other more critical times the early resignation of the executives (RT07) due to the incompatibility of strategies. Some excerpts taken from interviews with Project Managers R2 mention: "... the risks identified in the project (...) feeling of impending dismissal ..." and R3: "... high turn-over in a year (...) is too high for the systems development area due to its complexity... " and business manager R4: " ... our director said in the meeting that Company-A would be in control of the decisions regarding the new structure. But exactly the opposite happened and because of that our director and other executives from my area have agreed on early resignation... ." In this scenario, there was the creation of competition among the remaining employees (RT08) while the environment was instable, as reported by Business Manager R4: "...While we were waiting for the new organization chart to be defined, the meetings became ego battles, with everyone fighting for survival... .

Conflict between the different teams from Company-A and Company-B (RT09) was imminent, in the interview with Project Manager R2: "... possible conflicts of synergy in Company-A and Company-B with the elimination of positions and merging the staff of the two companies in the same team (...) creating competition between Company-A officials (landline) and Company-B (mobile)… ." It was also mentioned that, thanks to dismissals, there were situations (that had) where there were no technicians to perform certain tasks, according to the interview with Project Manager R3: "... lack of staff (...) for testing (...) the tests were made using basic scenarios... ."

Figure 6 - Risks in the Team category. "R" stands for the origin of respondents and "T" stands for Team.

ID	Risks / Description	Respondents
RT01	**Insecurity and anxiety** Insecurity and anxiety among employees regarding the continuity of work	R2; R4; R7; R8
RT02	**Reduction in staff** Reduction of the teams (grids) at all levels and in all departments, except the engineering department	R2; R8; R11
RT03	**Fragmentation of the teams due to resignations** The teams could be dispersed and relocated to other teams, possibly creating delays in the project	R2; R8; R11
RT04	**Loss of know-how** Employees being laid off or adhering to the voluntary layoff program with loss of know-how	R2; R8

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ID	Risks / Description	Respondents
RT05	**Voluntary layoff** Process of voluntary layoff programs (VLP) in two situations causing unexpected loss of resources	R4
RT06	**Turn-over** Business manager of the trade-key systems	R3
RT07	**Early resignation of executives** The director and the executives have resigned	R4
RT08	**Creating competition among employee** Competition between executives in the companies in order to define who should prevail	R2
RT09	**Possible conflicts in synergy between different teams** Possible conflicts in the synergy of the companies with the elimination of positions and merging employees from different companies in the same team	R2
RT10	**Insufficient staff** Lack of technical preparation for the work	R3

Figure 7 presents the risks in the Development category, which demonstrate a failure in systems integration (RD01), mentioned by five respondents. These data interaction failures occur in the sharing of information between systems. Engineer R6 reported "... I took part in the systems unification process, which ended up not happening ..." and senior Systems Analyst R10: "... It was interesting to note that in the management of Company-A, part of the systems did not evolve into a consolidation systems, such as occurred in Company-B (...) Company-A seemed very conservative keeping systems or platforms that it had used for more than 20 years, generating an increase in maintenance costs and difficulties in making short-term improvements... ."

Other relevant issues mentioned were: the lack of documentation or systems documents being out of date (RD02), the absence of an environment for tests due to lack of qualified personnel to generate the different environments that each test needed (RD03), caused by dismissals and the inexperience of the remaining employees, as reported by Project Managers R2: "... due to the lack of Company B-documentation, systems were analyzed with further delay ..." and R3: "... lack (...) of environment for testing (...) tests were done using basic scenarios ... ." Temporary systems with parallel services (RD04) were created to promote continuity of services until further orders arrived from top management or the integration of systems were established, as the respondent acting as Administrator R5 reported: "... to keep the services running, we have created some makeshift systems to tide us over… ." There were employees who remained working and refused to transmit information or omitted to do so (RD05) because they were afraid of being fired, said Project Manager R2: "... Analysts restricted access to information systems and processes ... ."

Figure 7 – Risks in the Development category, "R" stands for the origin of respondents and "D" stands for Development.

ID	Risks / Description	Respondents
RD01	**Failure to integrate systems** Failure to integrate systems that could result in 'operating blindly' generate "blind operations"	R1; R2; R5; R6; R7; R10
RD02	**Lack of system documentation** Due to lack of documentation, systems were analyzed with more delay, because the situations that could occur in systems were uncertain	R2
RD03	**Lack of environment for testing** Failure to test primarily with other systems, where the tests were done with the use of basic scenarios	R3
RD04	**Need to create parallel control systems** There was the need to create parallel and temporary systems to suit the existing ones in order to be able to continue with the projects	R5
RD05	**Restrictions to information systems and processes** Possible restriction to information systems and processes by analysts, since they would not know whether to continue or whether they were no longer needed	R2

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Regarding infrastructure, the resulting list of risks is shown in Figure 8. The risk related to a possible shutdown of services due to the lack of resources to meet the operational capacity of Company-A (RI01) was mentioned by Project Manager R2: "...the identified risks (...) could result in a standstill due to lack of operational capacity..."

On another occasion the lack of documentation from the infrastructure environment, and its updating, occurred in relation to the environment of Company-B (RI02), as reported by the same project manager: "... due to lack of documentation from Company-B (...) they did not know what they might find... ."

Figure 8 - Risks in the Infrastructure category, "R" stands for the origin of respondents and "I" stands for Infrastructure.

ID	Risks / Description	Respondents
RI01	**Possible shutdown due to lack of operational capacity in infrastructure** Possible shutdown due to lack of operational capacity in one of the phases of the project resulting from dismissals, mainly as regards the issue of technical assistance and customer service	R1; R2; R4
RI02	**Lack of infrastructure documentation** Due to lack of documentation on infrastructure procedures	R2

4.3 Exclusive Risks in the Merger Period

We analyzed the risks found in the interviews to identify those that have no reference in the list of risks identified in the literature. The comparison was carried out using the risks listed in sting categories. Figure 9 shows the results of categories, which does not include the risks found in the interviews that were referenced in the risks identified in the literature. We analyzed the exclusive risks by categories as follows:

- Project Management: There is a lack of information on the part of the project manager (RP01) since he has no knowledge of the systems and lacks technical ability. In this case, it is possible to establish the relationship between the lack of knowledge of the systems and the risk of lack of skills (LP01) expected of a project manager and the risk of failure in project management (LP04). As a result, there is an absence of knowledge necessary for the application of project management methodology. Another risk in the same category, missing in the risks mentioned in the literature, is shared management (RP02).

- Team: The risk of insecurity and anxiety (RT01) has not been included in the literature list of risks, and neither have the risk of reduction in teams (RT02) and fragmentation of the teams due to layoffs (RT03). The voluntary layoff plan (RT05) is a risk since it was a decision taken by senior management, who then informed the project manager and thus this risk was not foreseen. The risk of turnover (RT06) was quoted in the literature as a risk with the same label (LT07). The risk of early dismissal of executives (RT07) and creating employee competition (RT08) has no relationship with the risks identified in the literature. The risk of potential conflicts in synergy between different teams (RT09) can lead to error compared to the risk mentioned in the literature of major cultural barriers in the project team (LT09), but cannot find arguments when its origin is verified, which is related to cultural social or status-quo differences, which is definitely not the case. References to risks concerning insufficient staff (RT10) to carry out the work are supported by the risk with the same label (LT03).

- Development: Risks begin with the failure to integrate systems (RD01), which finds reference in the literature on risk issues with partner technical artifacts (LD01). If staff analyze the source, they will find that they are problems with partner artifact components, communication programs, system compatibility and integration. Another risk is the lack of systems documentation (RD02), which was related to the risk with the same label (LD09). Considering the same category, there is a risk of a lack of environment for tests (RD03), having as reference the test failure risks in the system (LD05). The need to create parallel control systems (RD04), such as performing controls while the main company systems were not integrated found no reference in the literature. The risk of information on systems and processes being withheld (RD05), because it is staff who are withholding it, is not found in the literature, which only mentions the withholding of information on the part of users

- Infrastructure: The risk of a possible resignations due to lack of infrastructure operational capacity (RI01) has no reference in the literature. This is because its origin is in a possible interruption due to lack of technicians who have been hired for projects, rather than being a project manager error (LP02, LP04 and LP10), but may be related to insufficient staff.

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Figure 9 – Exclusive risks in IT projects in the merger period of telecom companies: categories Project
Management, Team and Development.

Category	ID	Risk / Description
Project Management	RP01	Lack of manager information
	RP02	Shared management
Team	RT01	Insecurity and anxiety
	RT02	Reduction in staff
	RT03	Fragmentation of the teams due to dismissals
	RT04	Loss of know-how
	RT05	Voluntary layoff
	RT07	Early resignation of executives
	RT08	Creating competition among employees
	RT09	Possible conflicts in synergy between different teams
	RT10	Insufficient staff
Development	RD04	Need to create parallel control systems
	RD05	Restrictions to information systems and processes

4.4 Analysis of the Propositions

The propositions were verified using the results obtained from the data triangulation as a basis:

- **Proposition 1: There is preparation for the moment of mergers between telecom companies**. In news of the merger in the media outlets (FSP, 2014; TELECO, 2014) and in the interview with the Administrator R5, we can observe that the preparation did not happen in the same way at all levels: "... we knew that everything would be divided and that each one would go to his own corner (...) the grapevine was buzzing and everyone had a story to tell... ."

- **Proposition 2: Company A's own IT risk management projects.** According to the data collected in the interviews, risk management is carried out almost casually. Respondents with a project manager function managed to list the risks in the interviews, but there was no formal document on the subject.

- **Proposition 3: People in other functions, in addition to the project manager, can perform risk management.** Due to Company-A not having a project management culture, the risks were created informally, based on the experience of those involved.

- **Proposition 4: Risks are easily identified in IT projects.** Respondents related risks in the projects directly associated with their department. Only two respondents, who work close to top management, commented on the concern of the company's image in the market, proving that the company image impacts directly on the amount and ease of identification of risks, as Project Manager R2 reports: "... the standstill due to lack of operational capacity could lead to the degradation of image ..." and Business Manager R4: "... we were getting over the most critical period experienced by the company, motivated by the lack of quality of our services and products (...) the work aimed at rescuing the credibility of customers, protection and regulatory agencies, as well as the media. The goal was accomplished successfully and at that time, the challenge was to maintain the rates achieved. The focus was quality... ."

- **Proposition 5: There are mitigating actions for identified risks.** It was possible to group together the actions carried out in the period to mitigate the risks, according to the data collected in the interviews. The first action relates to the impact of layoffs on the team with the change of periods of work for the remaining employees to stay longer, as reported in the following passage by Project Manager R2: "... [changing] shifts, [leaving] staff on alert, changes in days off.. ". In another group, the risks were centered on gathering information and processes, in which the breakdown of established workflow was necessary so that the most reliable information could be obtained, as related in the extract by Project Manager R3: "... made contact directly with users (...) contact with other teams from other projects... ." Other actions were related to remaining suppliers who helped in the understanding of the services, called "assisted supervision," and the creation of documentary procedures, as can be seen

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in the interview with Project Manager R2: "... creating rollback procedures (...) 'Assisted supervision' by suppliers ... ." Thus, mitigation measures were taken so that the projects could continue, even with the shortage of staff and all the adversities of the period.

4.5 Considerations for Analysis of Results

The merger took place at three main moments. The first in 2007, when Company-A bought Company-B shares. The second stage took place almost two years later, with the preparations for the operation and management level of some key processes. In the final phase, there was the official statement by ANATEL, internal disclosure and communication by the media.

IT projects have suffered in various ways: dismissals of team members, immediate need to integrate systems, new services, new development methodologies and different databases. The risks identified in the interviews revealed the environment of speculation and dismissals into which the employees were inserted. Some executives tried to defuse the situation, but their actions were frustrated.

The interviewees mentioned actions that are being carried out: 1. The main system, which is more than two decades old, is being changed; 2. The documentation of systems and environment is being updated; 3. Attempt to recover the (lost) know-how lost through dismissals; 4. The generation of documentation for environmental understanding; and 5. The reformulation of teams with members of Company-A and Company-B.

The deadline for this research was August 31, 2014, and up to now, the merger has not yet been fully finalized. Many systems were still in the integration phase, with speculation regarding some specific layoffs and the creation of a new cultural identity still taking shape.

4.6 Recommendations for Mitigating Risks

From the 13 identified risks, we propose mitigation actions to be incorporated into the project risk management in future mergers of telecoms. These recommendations are based on both the reality found in the companies and the best practices in the literature.

- Mitigation 1: The Use of Scrum: The application of Scrum methodology is suitable for small teams (Glória Júnior, Oliveira & Chaves, 2014) and in dynamic environments, such as the period of merger between companies (Lemes Júnior et al., 2005). The fact that the development team members do not have fixed positions – for the same member can act as a Systems Analyst, Developer or another function – allows changes to occur in functions according to activity and enables all staff to operate in different activities (Glória Júnior *et al.*, 2014), promoting the continuation of activities, even with dismissals or turnover of the members. Therefore, the application of Scrum, as shown in Figure 10, can mitigate risks RT02, RT03, RT05 and RT09 by use of small teams, and RT02 and RT10 risks through having flexibility of roles on the team. The characteristic of fast deliveries within two weeks with an executable product, called "done", covers RD04, RP01, RT01 and RT07 risks. The mandatory presence of a Scrum Master, responsible for establishing guidelines and standards to be executed (Glória Júnior *et al.*, 2014), refers to risk RT08. The volatile environment is related to all these risks.

Figure 10 - Mitigation of risks using Scrum.

ID		Risks
Small Teams	RT02	Reduction in staff
	RT03	Fragmentation of the teams due to dismissals
	RT05	Voluntary layoff
	RT09	Possible conflicts in synergy between different teams
Flexibility in Roles	RT02	Reduction in staff
	RT10	Insufficient staff
Fast Delivery	RD04	Need to create parallel control systems
	RP01	Lack of manager information
	RT01	Insecurity and anxiety
	RT07	Early resignation of executives
Scrum Master	RT08	Creating competition among employees
Volatile Environment	All previous	

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- Mitigation 2: Use of System Documentation: The generation of project documentation is required in all situations (PMI, 2012), regarding the systems having specific records protocols such as diagrams of use cases, class diagrams and the description of other computing devices (Pressman, 2011; Sommerville, 2011). This includes mitigating risks RP02, RT04, RD05 and RT07.

- Mitigation 3: Use of a Project Management Framework: The application of PMBoK (PMI, 2012) may assist in mitigation for the application of requirements elicitation techniques, such as a brainstorm and mind map in risk RD05. Cost management can contribute to the financial control of projects (PMI, 2012) contemplating new board interests in controlling costs and eliminating the need to use shared management and thus mitigating risk RP02.

5 THEORETICAL AND PRACTICAL IMPLICATIONS

This research contributes to theory by means of an investigation of the origins and consequences of identified risks. The risk of shared management (RP02) suggests an investigation into the impacts on projects regarding the performance of the Project Manager and his team with the intervention of another project manager from the acquiring company (Company-A). Regarding the team, there is a risk of fragmentation of the teams due to layoffs (RT03), which lacks a study of productivity after layoffs. The risk of early resignation of the executives (RT07) and the reduction in teams (RT02) generated an environment of insecurity and anxiety (RT01). It is possible to conjecture that one result of these risks was the creation of competition among employees (RT08).

Research should also be directed to IT concepts, in which the need to create parallel control systems (RD04) should be widely studied and their origin determined. In the context of requirements gathering, research can be carried out regarding various actions for the restriction of information systems and processes (RD05) coming from the team members. An analysis of the levels of service availability, resulting in a stoppage due to a lack of infrastructure operational capacity (RI01) should also be investigated.

As practical implications, the risks identified in this study allow project managers to rethink their strategies so as to develop risk management in IT projects in telecom companies in the merger period. In addition, the contribution of this work goes beyond identifying and proposing mitigating actions for each of the 13 new risks identified through the application of the actions described in the Risk Mitigations section: use of

Scrum, documentation systems and Project Management frameworks. These tools constitute the necessary assistance for the IT project managers to be able to make implementation easier because they are closer to the team techniques.

The research allows project managers to rethink their risk strategies in IT projects in telecom companies in the merger period, in which they can include the risks identified in their risk matrices. One can use the risks identified in the work as recommendations for mergers in other industries. These risks can also be used as input in Enterprise Risk Management (COSO, 2004) in a company.

6 LIMITATIONS AND FURTHER WORKS

The limitations for this research include mergers in a single sector, the barriers to obtaining IT projects documents, the merger still being in process, which can contribute to the emergence of other risks not listed in this research, the restrictions in applying interviews with employees, the impossibility of interviews with the senior management in the companies involved and the need for validation of the Scrum methodology in such an environment. It is appropriate to clarify that this case study, as an experiment, is generalizable to theoretical propositions as an analytical generalization (Yin, 2014), used in a similar situation, in which the findings may not be replicable, but theory may be (Lee, 1989).

Proposals for future work include the use of exclusive risks and mitigation proposals in other mergers between telecom companies; the application of the same study using the action research method; the study of the impact of the merger on the organizational culture of the target company during and after the merger; the creation of a model focused on Scrum methodology for telecoms; and the creation of document templates for integrating systems in IT projects.

7 CONCLUSION

This research adds to the body of knowledge of projects by the identification of 13 exclusive risks in IT projects in the merger period between two telecom companies. Among the most frequently reported risks identified are the insecure environment that permeated all areas and the high rate of layoffs that impacted the IT projects. From the list of exclusive risks, it was possible to propose mitigation actions, as follows: (1) the use of Scrum methodology, suitable for small teams, volatile environment and constant deliveries; (2) the use of system documentation to reduce the loss of know-how due to layoffs; and (3) the application of project

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management techniques, which were related to the knowledge areas of PMBoK to address the specific risks presented, such as cost management and conflict management.

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Appendix A - Profile of the Respondents

Respondents	Function	Area	Company
R1	Operations Consultant	Projects	A
R2	Project Manager	Projects	A
R3	Project Manager	Projects	A
R4	Project Manager	Process	A
R5	Administrator Department	Process	A
R6	Engineer	Engineering	A
R7	Process Analyst	Process	B
R8	Project Manager	Projects	A
R9	Business Analyst	Process	A
R10	Senior Systems Analyst	Projects	B
R11	Project Manager	Projects	A

Appendix B - Interview Protocol

#	Question
1	Company mergers typically occur in secret meetings held by senior management. When did you have the feeling that there would be merged companies?
2	Before the official date of the merger, was there any preparation to deal with the impact from the operation?
3	What was the period of time forecast for the project and how much time was taken to carry it out?
4	What are the project objectives?
5	Had the project already started before the merger period?
6	What risks can you comment on in this project?
7	Did you participate in the identification of risks in the project?
8	How the risks were documented (e-mail, formal document, etc.) in the project?
9	Was there any risk mitigation action?
10	Was there any restructuring in the IT field after the merger?
11	What has changed in relation to the company as a telecom? Was the IT department informed in advance?

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