Symmetric Information and Cooperation in IT Project Success

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Research Article

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SYMMETRIC INFORMATION AND COOPERATION IN IT PROJECT SUCCESS

Complete scientific paper

Abstract

With the advancement of technological solutions and the increasingly agile and competitive business context, Information Technology has played an essential role in organizations. As a result, the number of IT demands has significantly increased, which requires the use of project management practices. IT projects require high generation and flow of information and interaction between different areas, which demand proper, sensitive communication procedures associated with the success or failure of a project. This study investigated the effect of information symmetry and cooperative actions on project success. After an extensive bibliographic review, we elaborated three research propositions. Data collection was conducted in two large multinational companies, and a strategic project was qualitatively analyzed in each of them. Both projects found unsatisfactory results. Failures in the communication process, especially information asymmetry, were the main factors that produced unsatisfactory results. In addition, communication inefficiency directly impaired cooperative actions.

Keywords: Information technology; IT projects; project management; symmetry of information; cooperation; information sharing; success in IT projects.
1. Introduction

In most organizations, especially large ones, the demands for Information Technology (IT) services is high and grows daily, making IT an increasingly important area in organizations. This phenomenon derives from the evolution of technological solutions, which aims to optimize companies' operational and strategic processes and insert them in a very competitive and agile business context, seeking success in an increasingly digital economy (Meirelles, 2004).

As a result, project management is essential to meet the demands of business areas and the IT area itself, which ranges from understanding to implementing these demands to transform them into results. According to the International Project Management Association, the number of projects, programs, and portfolios has been growing worldwide (IPMA, 2015). Project success rates have not increased proportionally to the emergence of several project management methodologies supporting and optimizing management processes and the increase in the number of trained project managers (O’Brochta, 2008).

IT projects have an intense relationship between professionals from different areas and companies. This may cause communication failures in demand identification, planning, and use and generate unnecessary investments and low satisfaction for operational and strategic users.

In this context, cooperation is essential to obtain good results and, as a consequence, project success. However, organizations must properly disseminate information about the project, so cooperation has added value. Given that different internal and external areas of an organization participate in a single project, cooperation among all subjects involved—either company employees or third parties—is increasingly necessary.

This research is motivated by the author’s own personal perceptions and also by those found in the literature (Kerzner, 2015, Valentin, 2014, PMSurvey.org, 2014, & Henderson, 2008). It is justified by the fact that poor communication is one of the main reasons for unsatisfactory IT projects. Communication among those involved in a project—third parties or company employees at any organizational level—is often poor, and some essential information—such as objectives, deadlines, main project deliverables, organizational impacts, and expected benefits—is unclear.

2. Research question and objectives

The research question is: “In IT projects involving employees from different areas of the organization and third parties, do information distribution and information symmetry facilitate cooperation and affect the success of a project?”

This research aims to identify (i) cooperative relationships among the participants of an IT project, (ii) the information symmetry, and information distribution by means of communication management, and (iii) their influence on project success, demonstrating the main causes of inefficiency in the communication process. The research results provide important resources to deal with these factors to encourage collaborative actions and to minimize their negative impacts on IT project results.

3. Theoretical Framework

3.1 IT Project Management

According to Dinsmore and Cabanis-Brewin (2009), IT projects have recently been impacted by their rapid advancement, mainly due to their complexity and short deadlines. Planning and coordination are paramount to the success of project management (Kerzner, 2013). According to Belout and Gauvreau (2004), IT project management has become an important activity in most modern organizations.

Carvalho and Mirandola (2007) state that the main communication barriers in IT project management are the different languages used by the IT team, the business team, and other members of the project, and their resistance to share information.

3.2 Cooperation in IT Project Management

According to Nesheim and Hunksaar (2015), information flow and exchange between project participants are essential components in a project scenario with clear, specific deadlines, unique problem solution, and close interaction. Sharing knowledge and information can improve the quality of project activities and one's ability to learn and acquire knowledge between projects.

Kerzner (2013) affirms that cooperation—cooperative actions performed by all project participants that are willing to work towards a common goal—is based on the team’s voluntary actions to achieve the best results. Cooperation is mandatory in companies with excellence in project management and is not related to the interference of the immediate superior.
Over the years, several studies have aimed to determine the factors that lead to failures in IT projects, and they have pointed out the following common factors: lack of early user involvement, poor governance, and isolated decision making. All of them identified the need for cooperation in IT projects (Kersner, 2015).

According to Filev (2008), project management has undergone significant changes due to the introduction of new technologies in team project management. The new wave of project management tools highlights cooperation and increases team productive. These tools are equipped with modern collective intelligence and emerging structures that empower project managers.

Rodriguez-Repiso, Setchi, and Salmeron (2007) classify the main characteristics of IT projects as follows: abstract constraints, difficulty of visualization, excessive perception of flexibility, hidden complexity, uncertainty, tendency to software failure, and goal to change existing business processes. These features lead to serious consequences during project management, such as unrealistic expectations, over-ambitious projects, frequent changes, time over-run, additional costs more expensive than the budget, difficulty in defining requirements, problems in the implementation of the system, and late problem detection.

According to Williams, Naumann, and Jackson (2015), the dimensions of project performance throughout its life cycle are more strongly related to quality of the relationship between those involved in the project than to customer satisfaction when a project is completed on time.

The IT project performance is related to corporate culture. Growing competitive and regulatory pressure affects the relationship between corporate culture and IT project performance. In this context, corporate culture (i.e., collectivism, risk tolerance, positive work environment, results-driven behavior) positively affects IT project performance (Gu, Hoffman, Cao, & Schniederjans, 2014).

### 3.3 Information Distribution and Information Symmetry in IT Projects

Monteiro and Falsarella (2007) state that projects highly use and produce information. Moreover, they have an intense information flow during its life cycle. In project management, information distribution is essential to ensure that project information is provided in due time in all phases of the project (Dinsmore & Cabanis-Brewin, 2009).

Lin, Geng, and Whinston (2005) pointed out that asymmetry negatively affects the transfer of knowledge. Peppard and Ward (2005) described that information asymmetry affects individuals’ perceptions and attitudes. When employees have access to different sources of information about changes in projects, they consequently form different views about a planned change by using information whose completeness, accuracy, and reliability are not concrete; all this results in lack of communication.

According to Valentin (2014), the appropriate access, sharing, and use of information by employees allows the reduction of similar situations with different levels of uncertainty. Bredillet, Tywoniak, and Dwivedula (2015) showed that transparent and available information should be a standard to support information-based actions. Project participants should use this information to make rational choices, set goals, and make normative and assertive decisions.

Henderson (2008) believes that communication in project management is more related to the comprehension level and clear dissemination of information, which is a critical competence for project management. This competence inherent to the manager has an impact on the team’s satisfaction and productivity.

### 3.4 Cooperation and Information Sharing

According to Bukowitz and Williams (2002), companies do not know that information sharing is directly impacted by their structures, environment, and values. In addition, these barriers in information sharing arise when the several information and/or idea holders are concerned only with the activities of their department, and not with the whole organizational flow; this intentional or unintentional lack of information sharing compromises the project performance.

Ipe (2003) identified the main factors that influence the sharing of knowledge among individuals in organizations: the nature of knowledge, the motivation and opportunities to share, and the culture of the work environment. Motivation is a major factor that influences information and knowledge sharing. People do not share knowledge without strong motivation (Stenmark, 2001).

According to McInerney (2006), partnership and trust among project participants can prompt information sharing. In this scenario, participants are aware that the information sharing process produces a positive effect on results. Sambamurthy and Subramani (2005) demonstrated that the expectation of reciprocity is positively related to sharing attitudes.
4. Methodology

Based on the bibliographic review, IT projects are essential for the application of new technologies or improvements, maximizing operational and strategic processes in companies and maintaining their competitive advantage in an increasingly globalized environment. IT projects are complex and involve different company departments and individuals, which makes the communication process equally complex. It requires appropriate information distribution and, as a consequence, cooperation and information sharing among project participants; these are relevant factors to achieve project success.

In this context, we propose a conceptual model proposes in Figure 1.

![Proposed conceptual model](image)

Fig. 1. Proposed conceptual model.

4.1 Research Propositions

According to the theoretical framework and the research model proposed, we defined the following propositions:

- **Proposition 1**: Information symmetry in IT projects prompts cooperative actions.
- **Proposition 2**: Cooperative actions influence the final result of IT projects.
- **Proposition 3**: Efficient communication and information symmetry, by means of cooperation among project participants, are key factors for project success.

4.2 Research Approach and Type

A qualitative, exploratory, multiple-case study approach was used to carry out this investigation. Data was collected by gathering information and facts with the participants of IT projects. The existence of information symmetry and its influence on the results of the projects, by means of cooperative actions between the participants and stakeholders in the project, was also investigated.

We collected data by analyzing project documentation and interviewing managers, the person in charge of the leading business area, and the main project supplier. Then, triangulation was performed.

The inclusion criteria selected large retail companies with an IT department essentially involved in operations and strategic decisions and developing a highly complex IT project with high impact on the business areas. Table 1 describes the information of the companies selected.

<table>
<thead>
<tr>
<th>Company</th>
<th>Industry</th>
<th>Number of employees</th>
<th>Annual sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>Food wholesaler</td>
<td>19,000 employees</td>
<td>16 billion reais</td>
</tr>
<tr>
<td>Company B</td>
<td>Fashion retailer</td>
<td>17,000 employees</td>
<td>5.5 billion reais</td>
</tr>
</tbody>
</table>

Projects were selected according to the companies’ strategic planning and their criticality for companies’ business based on the following criteria: having an assigned project manager and transversality, being part of the strategic IT planning, and having at least one external supplier. Table 2 describes the projects selected and their main characteristics.
Table 2. Study projects

<table>
<thead>
<tr>
<th>Company</th>
<th>Project</th>
<th>Participants</th>
<th>Deadline</th>
<th>Affected areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>Implementation of an Enterprise Resource Planning in one of the company’s units</td>
<td>90 employees, 3 suppliers</td>
<td>Expected time: 23 months, Actual time: 28 months</td>
<td>Logistics, store operations, purchases, and sales</td>
</tr>
<tr>
<td>Company B</td>
<td>Smartphone app development and launch</td>
<td>50 employees, 3 suppliers</td>
<td>Expected time: 9 months, Actual time: 18 months</td>
<td>Marketing, e-commerce, and sales.</td>
</tr>
</tbody>
</table>

4.3 Data collection

We carried out informal, semi-structured interviews and performed documentary analysis. The interviews were conducted in two stages. The first one was carried out with the project managers with the aim to gather the main project information: to identify the most important phases, project deliverables, considerations on information symmetry and distribution, cooperation, and project success. They were also asked to indicate a person responsible for the business area and a supplier. In the second stage, the interviews were carried out with the individuals indicate in the first stage. They investigated the symmetry of relevant project information, such as scope, deadlines, purposes, benefits, considerations on information symmetry and distribution of information and cooperation actions as contributing factors to the project success. Table 3 lists all interviewees, their position in the organizations, and their role in the project, as well as the company's identification.

Table 3. Information about the interviewees

<table>
<thead>
<tr>
<th>Interviewee (acronym)</th>
<th>Position</th>
<th>Role in the project</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP-A</td>
<td>IT Director</td>
<td>Project Manager</td>
<td>Company A</td>
</tr>
<tr>
<td>FO-A</td>
<td>Product Manager</td>
<td>Supplier</td>
<td>Company A</td>
</tr>
<tr>
<td>NE-A</td>
<td>Specialist</td>
<td>Responsible for the business area</td>
<td>Company A</td>
</tr>
<tr>
<td>GP–B</td>
<td>Coordinator</td>
<td>Project Manager</td>
<td>Company B</td>
</tr>
<tr>
<td>FO-B</td>
<td>Delivery Manager</td>
<td>Supplier</td>
<td>Company B</td>
</tr>
<tr>
<td>NE-B</td>
<td>Product Manager</td>
<td>Responsible for the business area</td>
<td>Company B</td>
</tr>
<tr>
<td>TI-B</td>
<td>IT Senior Manager</td>
<td>IT Manager</td>
<td>Company B</td>
</tr>
</tbody>
</table>

The main questions asked in the interviews were based on the model and propositions defined in this study. For a better understanding, the questions were divided into three categories: (1) information symmetry and distribution, (2) cooperation and information sharing, and (3) project success.

4.4 Result Presentation and Analysis

In the data analysis process, the information collected was edited in order to become understandable and allow consistent data analyses and representation. We also intended to reduce the distance between theory and data, between context and action, seeking to understand the phenomena by describing and interpreting them.

Data collection resulted in a large volume of material. To treat this material, we used Creswell model (2010) for content analysis and categorization because of its linear and hierarchical process and its inter-related phases.
In this research, the data analysis and interpretation process was divided into two stages: first, the information of interviews was analyzed; and secondly, the data obtained in the previous stage was compared to the data of documentary analyses and the companies' official websites. The process of checking the information found in different sources is called data triangulation. The treatment and manipulation of data were carried out using NVIVO software as a support tool.

4.4.1 **Company A – A Project to Implement an Integrated Management System**

Company A belongs to the self-service wholesale segment of a Dutch group and operates in five countries in South America: Argentina, Brazil, Colombia, Peru and Venezuela, currently with 160 stores. It has more than 19,000 employees, 8 million registered customers, and annual sales of approximately 16 billion reais.

The main business processes were built within a system exclusively developed for the company. Over time, the system has become inefficient: operational and strategic procedures were slow and little flexible for customers and suppliers. Among the 38 main processes of the company, 25 were identified as inefficient. In this scenario, the controlling group decided to create a project to adjust 25 processes by implementing a single tool in all the five countries.

**The Project**

The pilot project took place at the company unit based in Peru, which is the object of this study, and began in November 2014, with completion scheduled for March 2017. Until the beginning of this research, 4 of the 5 planned project phases had already been completed in this unit. Deadlines and scope changed in all project phases, leading to a five-month delay.

Regarding project information, objectives and benefits, interviewees showed symmetry (Table 4).

**Table 4. Information about the main objectives and benefits of the project**

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Synthesis of objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP-A</td>
<td>“[…] the project aims to balance the three main elements of the company, i.e., inventory, availability, and margin.”</td>
</tr>
<tr>
<td>FO-A</td>
<td>“[…] the project aims to modernize the whole infrastructure of the stores, in order to modernize and increase the quality of the product distribution chain.”</td>
</tr>
<tr>
<td>NE-A</td>
<td>“[…] to plan more efficiently the inventory we have today; as the Company works with wholesale, its main resource is its inventory.”</td>
</tr>
</tbody>
</table>

**Information symmetry and distribution**

Information symmetry can clarify doubts regarding the execution of activities and assignments, eliminating the “gray” areas of the project; each project participant performs exactly what is necessary, and there is no excuse for not doing so. Cooperation and, consequently, project success take place in this context. Thus, information symmetry is necessary for cooperation and knowledge sharing.

The project manager stated that information symmetry has a significant influence on cooperation and knowledge sharing, but it does not guarantee its existence. Only a small, involuntary information asymmetry is enough to justify non-cooperation and create conflicts. As the project did not achieve an adequate information symmetry, the work environment was not cooperative, but conflicting. Consequently, the project did not reach the expected results.

The assignment of people in the definition process who do not have the necessary knowledge and, particularly, the empowerment for decision making leads to information asymmetry. From the supplier's perspective, symmetry has a strong influence on cooperative actions and project success. However, communication was not efficient in the project studied. The existence of many hierarchical and execution levels caused communication noise in the transfer of information, mainly from the business teams to the executors.

According to the person in charge of the business area, the project had a great communication problem. Much information that should be shared in a larger forum was shared only among managers, corroborating the supplier's view about the existence of many hierarchical levels. Regarding the influence of information symmetry on collaborative actions, this interviewee shared the same opinion. Information asymmetry has a strong presence caused by involuntary poor communication distribution. The main causes for these problems are:
Many hierarchical and operational levels.

Lack of a clear responsibility assignment matrix and inefficient project governance.

Interlocutors between business and IT without decision power.

Technical managers with little management skills.

Information was distributed in the project in a planned way through specific weekly forums. This project's governance did not adhere to any methodology. Information was distributed symmetrically among project participants and stakeholders, except for deadlines, which were intentionally asymmetrically distributed. Information on deadlines was asymmetrically distributed because of a history of numerous errors, mainly concerning deadlines scheduled with the supplier and shared with the business area. The project manager pointed out an important issue: information concerning deadlines must be symmetric, but at different moments, which depends on the areas involved in the project.

The main difficulties of project governance was to identify solutions to several problems and unplanned situations and to define a responsibility assignment matrix among suppliers, which create a "gray area" of responsibilities. Thus, the employees that should solve problems do not identify themselves as the responsible for it, stating that it was not clear that they should solve the problem.

These situations are created mainly when an employee in the business area who does not have enough knowledge presents a resource to solve a doubt or a problem; but, when the situation is better analyzed, the solution found was not the ideal. As a result, the scope of the solution is constantly changing.

The interviewee of the business area said that the division of responsibilities and deliverables between the Brazilian and the Peruvian teams was not clear, which caused inefficient activity execution. The supplier believes that there is a lot of conflict of interest between the parties due to the involvement of different countries, departments, and leaders.

Cooperation and Information Sharing

The exclusive workplace for the project—the war room—, was not collaborative, particularly among suppliers; assigning their activities was complicated due to the competition between them. Cooperation was never spontaneous in the project and required strong, noble arguments. A strong motivating agent, always related to financial awards, must exist in the project to promote spontaneous cooperation.

In the project, communication was not efficient, and its efficiency is essential for cooperation. Everyone involved in the project needs to have access to the same information; however, this depends on the managers’ competence, the application of a methodology, and the use of clear indicators.

According to the interviewee in charge of the business area, the lack of symmetry prevents collaboration and gradually creates an environment of conflict, because two different business units have different understandings about their priorities. In this context, the collection of results is improper. The following factors affected cooperation in the project:

- Executive officers’ support and distribution of bonuses and awards.
- Efficient communication and management skills.
- Use of a project management methodology.

According to the project manager's opinion, cooperation alone does not influence project results. Information symmetry and a clear definition of roles and responsibilities are mandatory, which corroborates the opinion of the head of the business area: "[...] cooperation has a good impact on results if there is symmetry." (NE-A)

All interviewees believed that the cooperative actions alone do not influence project results, because information symmetry is required.

Project Success and Results

Good governance, support from sponsors and executive officers, an adequate place for project implementation, and information symmetry are essential factors to achieve success. A clear responsibility assignment matrix help companies carry out complex successful projects—with many internal partners, business areas, and suppliers. According to the manager, the presence of experts on the topic is important to achieve success: "[...] democracy in a project is a problem: everyone has an opinion, everything is possible. So, if everything is possible, then we keep discussing and nothing is decided. The company needs experts on the topic to guarantee respect and acceptance of their solution.” (GP-A)

This factor was also mentioned by the person in charge of the business area: the local team must know the business processes. The regional analysis of processes is inappropriate, resulting in rework.
According to the interviewees, the following factors contribute to project success:

- Regional knowledge of the processes and scope aligned with the business areas.
- Experts in specific subjects and a complete and “strong” responsibility assignment matrix.
- Customer commitment and presence of a stakeholder with decision-making power.

They believe the main success criteria are customer satisfaction, tool adoption, and benefits negotiated during project planning. In the interviewees’ opinion, none of these criteria was satisfactorily achieved. The board also considers tool adoption a success criterion. The use of the tool in Peru is still not satisfactory.

According to the project manager, the assessment of success depends on the evaluator and their interest. However, the project was not successful overall because of delays, costs much higher than the estimated budget, change in the scope, and numerous post-production problems, leading to customer dissatisfaction.

The project delivery was delayed by more than five months and suffered shifts in scope. Consequently, its cost also exceeded the planned budget by approximately 17%, which is extremely significant for a 100-million-euros project. According to the supplier, not understanding the scope was the main factor that led to a result below expectations.

Regarding the project assessment, Table 5 presents one sentence from each interviewee.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Synthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP-A</td>
<td>“[...] product delivered satisfactorily through a poorly planned project.”</td>
</tr>
<tr>
<td>FO-A</td>
<td>“[...] very traumatic results.”</td>
</tr>
<tr>
<td>NE-A</td>
<td>“[...] well below expectations.”</td>
</tr>
</tbody>
</table>

4.4.2 Company B – Project to Implement an Smartphone App

Company B is a multinational retail company in the textile fashion industry, a pioneer in the fast fashion manufacture. The company is among the largest retail chains in the world, with more than 1,800 units in 24 countries.

It is specialized in fashion retail products and financial services, with focus on the sale of clothing and accessories. Its strategy is to translate international fashion trends to Brazilian consumers.

The Project

The project was born as an innovation proposal, an isolated initiative of the IT management. The initial idea was to digitally serve the company's target consumers.

The project aims to develop a customer service smartphone app for Brazilians, covering approximately 10,100 types of devices, considering variations in operating systems and cell phone models.

The main functionalities of the project were to promote institutional relationships with the company, such as the contact us section, to solve payment and store location problems, to discover new collections, to shop, and to reserve products in physical stores by scanning the barcode label. The entire sales and logistics process is carried out by the same e-commerce platform and distribution center. The main purpose of the application is to provide a closer relationship between customers and the company through mobile technology, generating a greater digital connection and creating opportunities for the company.

Regarding project information, main purposes, and benefits, interviewees presented converging information as shown in Table 6.
Table 6. Information about the main purposes and benefits of the project

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP-B</td>
<td>&quot;[...] a closer relationship with the consumer, generating a digital connection with the customer.&quot;</td>
</tr>
<tr>
<td>TI-B</td>
<td>&quot;[...] a solution to serve our consumers digitally.&quot;</td>
</tr>
<tr>
<td>FO-B</td>
<td>&quot;[...] the pioneer in mobile commerce, with the inclusion of one more digital sales channel.&quot;</td>
</tr>
<tr>
<td>NE-B</td>
<td>&quot;[...] the company's digital convergence.&quot;</td>
</tr>
</tbody>
</table>

**Information Symmetry and Distribution**

Symmetric communication and information deeply affect cooperative actions and a satisfactory product delivery. According to the project supplier, information symmetry is an essential factor for cooperation: "[...] if symmetry was greater, cooperation would surely be better." (FO-B)

After the second phase, the communication strategy took place naturally with the adoption of the agile methodology, so that meetings happened daily and fortnightly. Information symmetry, that is, information distribution and understanding, evolved satisfactorily. The adoption of the agile methodology did not favor the ideal information symmetry, as the project manager explains: "[...] I wish we used a traditional status report..." (GP-B).

The main supplier believes that communication problems have always existed, mainly regarding the comprehension of the project. He did not receive information in a satisfactory way, and many decisions were made without teams’ participation. The business area considered information symmetry and distribution flawed due to the company's lack of experience in developing smartphone apps.

In the first phase of the project, one of the major problems concerned stakeholders, as only the IT board was present. After the board came up with the idea, the marketing and e-commerce department welcomed it; but this support soon weakened.

In the second phase, after assessing the result of the first phase, the company decided to invest and create a new group formed by IT, marketing and e-commerce teams. At this time, the project had three sponsors. Each sponsor was responsible for the following assignment: the pillar of communication and marketing content; the pillar of technology development and solutions with the IT team; and the e-commerce area with customer experience. The supplier believed that the responsibility assignment matrix was weak and did not made clear the role of each participant.

**Cooperation and Information Sharing**

After a detailed definition of roles and responsibilities, cooperation in the project teams and knowledge sharing were efficient in the second phase with the adoption of the agile methodology, the implementation of the war room, and the establishment of an efficient governance. Cooperation, as well as information symmetry, evolved with the project's progress. In the opinion of the person in charge of the business area: "[...] cooperation is a matter of maturity." (NE-B)

Cooperation was stronger among IT members and more fragile between the business and IT teams, mainly due to the project interlocutor’s communication failures.

The main factors that fostered collaborative actions in the project were:

- The adoption of the agile methodology and the existence of a physical space for the project team.
- The presence of the supplier's technical team at the company.
- The presence of a strong responsibility assignment matrix, efficient governance, and team maturity.
In the first phase of the project, the product did not meet customers’ expectations concerning its scope. In addition, the IT director who had the idea and was the only one interested in it left the company.

Thus, the main contributing factors for the project failure were: the departure of the main sponsor and owner of the project; the lack of support from sponsors; the insufficient participation of the business area in the product design; the little experience of the technical, IT and supplier teams; the fragile dialogue between the technical and business areas; and the high turnover of the supplier's team.

The application delivery in the second phase was not considered successful, but satisfactory, because the app was launched in the production environment. In the project manager’s opinion, the increasing conversion of the post-production product is a success factor. The adoption of the agile methodology cannot be considered a successful factor due to the poor adherence of the project team to it. According to the person in charge of the business area, the sponsors’ approach was an important factor in product delivery.

The main factors for project completion were:

- Experience gained in the first phase of the project.
- The support and commitment of the sponsors of the IT and e-commerce departments.
- Efficient governance and team synergy and engagement.
- Leasing a physical space for the project teams (war room).
- Team cooperation and knowledge sharing.

The main reasons why the project was not considered successful in the second phase were weak people management, communication with gaps due to the presence of an interlocutor between the business area, the functional and technical teams, and the IT manager. The use of the agile methodology would facilitate communication; however, the presence of an interlocutor impaired it.

Other factors include improper management of customers’ expectations, a high turnover the supplier team’s employees, and the non-compliance with the roles and responsibilities defined. The lack of communication was a key factor for the project to be considered unsatisfactory by the business area.

The factors that contributed to this view are:

- Lack of client expectation management.
- Inefficient dialog between the business area and the IT department.
- Improper fulfillment of roles and responsibilities.
- Low team maturity concerning the use of the agile methodology.

The challenges faced by the IT team were identified as a criterion of success. Innovation, according to the IT manager, was also seen as a criterion of success. The delay in the second phase of the project dissatisfied internal customers (e-commerce). However, after the product delivery, customers showed a slight satisfaction with the final result.

Considering the classic criteria of success—term, cost, and scope—, this project did not succeed, but it was satisfactory considering it added value to the business. Table 7 provides a summary of the assessment of the project results.

Table 7. Assessment of project results – Company B

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Synthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP-B</td>
<td>“[.../] given some difficulties in terms of time and scope that we went through, we implemented the application, delivered the product, and started to generate value in an organic way.”</td>
</tr>
<tr>
<td>TI-B</td>
<td>“[.../] the product was satisfactory; you see, without any marketing, it has been downloaded more than 10,000 the last time I saw it, and it has an average rating above our competitors’, an average of 4.2 out of 5.”</td>
</tr>
</tbody>
</table>
“[...] it depends, if I were to tell you, I think there was a lot of problems, I wouldn’t see it as a success, it was done in a go-horse style, I believe clients are not satisfied. If I were the customer, I wouldn’t be happy, but the product added value to the business.”

“[...] to be able to solve our problem from the beginning of the year, as the company could present its first app. I don’t think it's great, it's a good app, we're not ashamed of it.”

5. Consolidation of Results

This study demonstrated a convergence of opinions among the interviewees about the topics studied in each model category. The two companies studied presented similar results regarding the study categories and questions, as shown in Table 8.

Table 8. Result similarity between the two companies

<table>
<thead>
<tr>
<th>Categories</th>
<th>Company A</th>
<th>Company B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influence of symmetry on cooperation and on project results</td>
<td>Interviewees mentioned the importance of information symmetry for cooperation and IT project results, but its presence was insufficient.</td>
<td>&quot;[...] sure, if there were greater information symmetry, there would be more cooperation... and it would certainly influence the results.” (FO-B).</td>
</tr>
<tr>
<td>Information distribution and symmetry</td>
<td>Presence of an information distribution process, but without adequate information symmetry.</td>
<td>&quot;[...] yes, there is a communication plan according to the agile methodology, but the information symmetry did not happen.” (GP-B).</td>
</tr>
<tr>
<td>Stakeholders and responsibilities</td>
<td>Although relevant in the projects, the sponsors’ support was insufficient.</td>
<td>&quot;[...] we changed governance a little. We had mixed roles, roles that were not clearly established.” (GP-B)</td>
</tr>
<tr>
<td>Factors for cooperation</td>
<td>They were reported, but little identified in the projects.</td>
<td>&quot;[...] I think cooperation will only exist if derived from information symmetry.&quot; (GP-A).</td>
</tr>
<tr>
<td>Influence of cooperation on project results</td>
<td>Cooperation does not directly influence results. It influences them if there is information symmetry, which was not identified in the projects.</td>
<td>&quot;[...] exactly, cooperation was certainly affected by information asymmetry.&quot; (TI-B).</td>
</tr>
<tr>
<td>Success factors</td>
<td>They were reported, but only a few was identified in the projects.</td>
<td>&quot;[...] cooperation alone will not help, cooperation influences results if there is symmetry.” F0-B.</td>
</tr>
</tbody>
</table>

"[...] we have an information distribution process at several levels, but we definitely don’t have symmetry.” (NE-A). |

"[...] the responsibility assignment matrix is important, because the gray area exists and people hide behind it.” (GP-A). |

"[...] I think cooperation will only exist if derived from information symmetry.” (GP-A). |

"[...] cooperation has a good impact on results if there is symmetry.” (NE-A). |

"[...] we had specific sponsors, they were even outside the company, and there was no adequate participation.” (GP-B). |

"[...] cooperation alone will not help, cooperation influences results if there is symmetry.” F0-B. |
Criteria identified and recognized in the project.

"[...] scope changes were the main reason why the tripod went astray." (NE-A).

"[...] the initial scope was set up with the IT team, but the business area was distant, so the app we have today is the third version of it.” (FO-B).

The products delivered had unsatisfactory results.

"[...] below expectations, I mean, we implemented the project, but we were unable to obtain the expected results.” (NE-A).

"[...] I think we are on a good path, I am on a regular to good level.” (NE-B).

In order to identify the main criterion of success pointed out by the two companies, we analyzed the content of the transcribed interviews and found 145 references. The time criterion had the largest number of references, 56, representing 38% of the total, as shown in Figure 2.

A content analysis indicated the factors that produced unsatisfactory results in both projects. A total of 222 references were found, 43 of them related to the involvement of the business areas, and 31 related to communication, as shown in Figure 3.

Fig. 2. Criteria of success
6. Conclusion

Although both projects finished and delivered their products, they did not obtain satisfactory results due to significant problems during execution. Both companies converged opinions in the interview; the respondents had similar views on the topics investigated, even working in different areas and having different roles. Regarding the propositions formulated, propositions 1 and 3 were confirmed, while proposition 2 was not, as Table 9 shows.

Table 9. Synthesis of the analysis of propositions

<table>
<thead>
<tr>
<th>Propositions</th>
<th>Company A</th>
<th>Company B</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Confirmed</td>
<td>Confirmed</td>
</tr>
<tr>
<td></td>
<td>GP-A Confirmed</td>
<td>FO-A Confirmed</td>
</tr>
<tr>
<td></td>
<td>NE-A Confirmed</td>
<td>GP-B Confirmed</td>
</tr>
<tr>
<td></td>
<td>FO-B Confirmed</td>
<td>NE-B Confirmed</td>
</tr>
<tr>
<td></td>
<td>TI-B Confirmed</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>Not confirmed</td>
<td>Not confirmed</td>
</tr>
<tr>
<td></td>
<td>GP-B Not confirmed</td>
<td>FO-B Not confirmed</td>
</tr>
<tr>
<td></td>
<td>NE-B Not confirmed</td>
<td>TI-B Not confirmed</td>
</tr>
<tr>
<td>P3</td>
<td>Confirmed</td>
<td>Confirmed</td>
</tr>
<tr>
<td></td>
<td>GP-A Confirmed</td>
<td>FO-A Confirmed</td>
</tr>
<tr>
<td></td>
<td>NE-A Confirmed</td>
<td>GP-B Confirmed</td>
</tr>
<tr>
<td></td>
<td>FO-B Confirmed</td>
<td>NE-B Confirmed</td>
</tr>
<tr>
<td></td>
<td>TI-B Confirmed</td>
<td></td>
</tr>
</tbody>
</table>

Concerning the first proposition, information symmetry in IT projects facilitates collaborative actions, and this opinion was emphatically presented by all respondents. However, projects did not have effective information symmetry, which consequently impaired collaborative actions. As mentioned before, the interviewees incisively stated that if there were information symmetry, there would certainly be more cooperative actions. The lack of information symmetry generates conflict, so the opposite direction of the proposition constructs also proved to be true.

The second proposition, which verified if cooperative actions influence the success of IT projects, was not confirmed. All respondents in both companies stated that cooperation alone does not promote project success, as information symmetry is also needed. In the interviewees’ opinion, cooperation without correct information wear the team down. Everyone needs to be well-aligned and informed so that cooperative actions are effective and help the project succeed. This proposition was not confirmed in both projects. Due to the lack of information symmetry, cooperative actions did not exist; if they did, they were not effective.

The third proposition was confirmed when verifying whether efficient communication and information symmetry are success factors in IT projects through cooperation among project participants. All respondents understood that clear communication and symmetrical information distribution influence cooperative actions and, consequently, IT project
success. The opposite direction of this proposition also proved to be true. Communication was inefficient in projects, so it harmed cooperative actions and led to unsatisfactory results.

In this study, information symmetry is a direct result of an adequate communication process. In the IT projects studied, the inefficient communication process and, consequently, the information asymmetry were very clear, representing the main cause of lack of cooperation among team members and of unsatisfactory results. The lack of support from executive officers, inefficient governance, inadequate dialog, and a weak responsibility assignment matrix were the main factors for an inefficient project communication.

A very interesting finding in this study is that cooperative actions alone are not a success factor in IT projects. Cooperative actions influence project results only if there is information symmetry. Even if associated with information symmetry, cooperation is not a success factor; it only facilitates the achievement of satisfactory results.

According to the author's experiences—approximately fifteen years working in IT project management in several market industries—, the most impacting factors on project results are related to the communication processes. In most of the projects I have directly managed, I noticed the importance of communication and its effects to keep deliverables within the scope, deadlines, budget, and customer satisfaction. In these projects, especially those with a high number of participants, communication was crucial for the good performance of project phases, and any communication failure could cause several problems, which included wearing down the team and producing results that did not meet customers’ satisfaction, as the deliverable was not in accordance with their expectations. The main factors that influenced these processes are the same found in this study, which leads to a reflection on how much we have evolved and how much we still have to evolve to minimize them.

The results of this study demonstrate that information asymmetry, that is, the lack of information distribution among all project participants, derives from an inefficient communication process. This is the determinant of project failure and lack of cooperative actions, which contribute to processes and activities to reach purposes in a satisfactory way.
References


