Software Projects Success and Informal Communication: A Brazilian Bank Case Study

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Abstract: Technology project management is challenging. However, there are few works in the literature related to informal communication and project success. Therefore, this research aims to analyse the influence of informal communication on the short - and medium - term success of software development projects in a Brazilian banking institution. This research is based on a literature review about project communication and success. The research has a qualitative and descriptive approach and used an ex-post-fact strategy. Ten software development project management professionals were interviewed at a large banking institution in the first half of 2019. The research found an association between informal communication with project efficiency and contribution to the project team. No association was found between this communication line and customer contribution. In addition, it made more contributions in waterfall projects than in agile projects.

1 INTRODUCTION

There is a perception among specialists that information technology projects fail regularly. Only 39% of software projects are completed on time and on budget (The Standish Group, 2013). Even worst, when considering different points of view from researchers, practitioners and academics perspectives (Al-Ahmad et al., 2009) there is still no single measure of software project success (Shenhar & Dvir, 2007). Even when a project is considerate well-done, there are still many reports of challenges and efforts to overcome them (Al-Ahmad et al., 2009).

Most of the project issues are related to the human aspects: behavioural, organizational or managerial aspects (Hartman & Ashrafi, 2002). Embracing all these aspects, the communication process is accountable for many issues, including both its inputs and outputs (Lu, Liu and Liu, 2009) and including the informal communication process.

Another research gap is that project data relating to communication is not usually collected and analysed in parallel with the project execution. These research approaches gap to capture the project

momentum data, such as informal communication data. Instead of that approach, it is suggested to collect and analyse data when the project is still going on or, if not possible, at least when the project has just been finished (Shenhar & Dvir, 2007; Lu, Liu and Liu, 2009).

Even further, we performed a research and discovered a gap that related communication and software project success: there were only 11 papers from both IEEE Xplore and ACM databases relating these two factors from 2010 to 2019. These researches were not related to developing countries.

Given these gaps relating communication and the project success, this research aims to answer the following research question: At a large Brazilian bank, what is the informal communication influence over the success when considered software development projects?

The research objective is to analyse the influence of informal communication on software development projects from both short and medium terms perspectives. We aim to analyse that objective through communication data gathered during real project development according to three following criteria: i) project efficiency; ii) impact to customer;

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and iii) impact to team members. This research preparation was done during the first semester of 2019. The field research and data consolidation occurred during the second semester of 2019.

2 LITERATURE REVIEW

Based on a literature review, this section defines the two main concepts used by this research: software project success, which is straight forward; project communication, which is more complex and also embraces informal communication definition. These concepts are related in section 3 through the framework used by this research to relate informal communication and software project success.

2.1 Software Project Success

Project success might be defined as the project has achieved its objectives and its benefits for the organization (Shenhar & Dvir, 2007). This definition sets at least three dimensions: cost, time, and scope dimensions (Dvir, Raz & Shenhar, 2003). These dimensions are also known as the triple constraint, given they take into account the project planning objectives. In order to accommodate both project success and user/business perspectives, we choose a multidimensional model to evaluate software project success, which endorses five dimensions (Shenhar and Dvir, 2007). **(1) Project efficiency:** the short-term measure that addresses if the project was completed in accordance with its plan, especially schedule and budget; **(2) Customer impact:** importance of customer requirements; **(3) Team Members / Staff impact:** satisfaction, retention, and personal growth of team members; **(4) Business/direct success impact:** the direct impact the project has on the organization; and **(5) Future impact:** the medium-term measure that addresses the organization's readiness for future projects.

2.2 Project Communication

Communication is an essential element of Project Management (PM) given it ensures the successful delivery of the project (Emmitt & Gorse, 2003). Communication has seven elements as follows: senders, encoding, the message itself, a transmission channel, decoding, receivers, and feedback (Zulch, 2014).

In addition, when we consider de pair send(s)/receiver(s), there is a need to consider at least five other elements - communication line, levels,

method, approach and geographic dispersion – that are detailed as follows. **(1) Communication Line.** Regarding the communication lack/issues on workplace and its root cause analysis, we choose two communication types (Djajalaksana, Zekavat and Moon, 2017) as follows: formal communication; and informal communication. **(2) Communication Method.** There are three communication methods used to share information among project stakeholders (PMI, 2017): interactive, active, and passive. **(3) Communication Levels.** Regarding the place where the members are located on, communication has two different levels (Dow and Taylor, 2008): internal, and external. **(4) Communication Approach.** There are five communication approaches (PMI, 2017): interpersonal, small groups, public, large scale, and network. **(5) Geographic Dispersion.** We choose the communication geographic dispersion according to (Paasivaara e Lassenius, 2001) which is split into three types: traditional, distributed, and inter-organizational.

3 RESEARCH FRAMEWORK

This section presents the framework that analyses the relationship between informal communication and software project success. The first subsection presents the research variables, and the second subsection details the research question.

3.1 Research Variables

The framework is composed of an independent variable, plus three moderating variables that may impact the project success (PS), the dependent variable. Figure 1 represents the research framework graphically and these variables are detailed.

3.1.1 Independent Variable

The research model has a single independent variable: informal communication (IC). It measures the degree of informal communication the project has according to three different levels: medium, high and very high. Due to research data limitation, we could not capture small or very small informal communication.

3.1.2 Dependent Variables

The research framework has three dependent variables based on the success dimensions (Shenhar and Dvir, 2007). These dimensions have negative or positive impacts. Although there are five dimensions
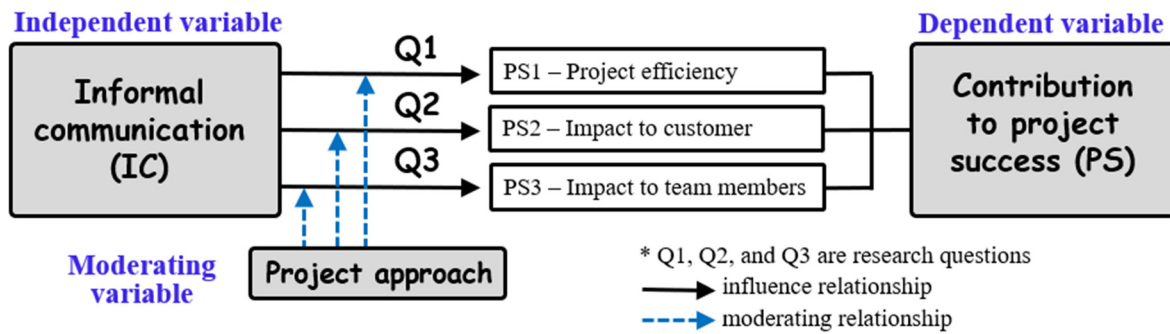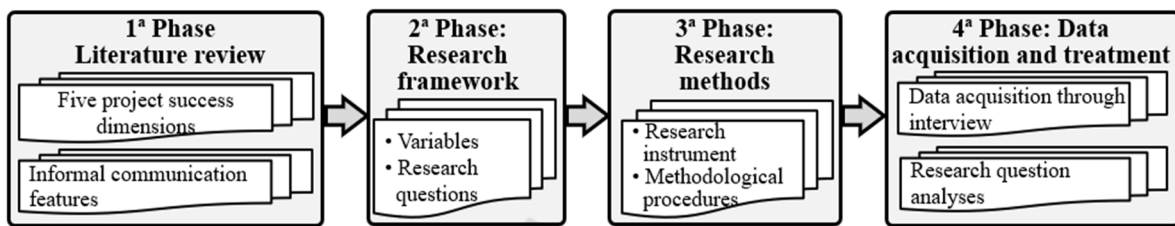
Figure 1: Research framework.

Figure 2: Research phases.

of success, only the first three refer to short and medium-term results, which are the scope of this research. The three dimensions used by this research are: **Project efficiency (PS1),** that measures the contribution to the achievement of time, cost, and scope goals; **Impact on the customer (PS2),** that measures the contribution to meet customer requirements, satisfaction, and loyalty; and **Impact on team members (PS3)**, that measures the contribution for staff satisfaction, employee retention and professional growth of team members.

3.1.3 Moderating Variable

The research framework has a single moderating variable: the project approach. This variable identifies the type of approach used in the project. It is a nominal variable with three categories: agile, waterfall and hybrid (a mix of the two previous ones).

3.2 Research Questions

At the beginning of this paper, we stated the research main question as follows: At a Brazilian bank, what is the informal communication influence over the success when considering software development projects? Thus, we defined three guiding questions (Q1 to Q3) based on the literature review (Mark & Wulf, 1999; Aranda et al., 2010; Cataldo & Ehrlich, 2012; Zulch, 2014; Djajalaksana, Zekavat & Moon, 2017). We then related the IC with PS (PS1 to PS3)

in short/medium term projects. **Q1:** Does informal communication have a positive impact on project efficiency (PS1)? **Q2:** Does informal communication have a positive impact on customer satisfaction (PS2)? **Q3:** Does informal communication have a positive impact on team members (PS3)?

4 RESEARCH METHOD

The case study is based on interviews with project professionals, thus having a quantitative approach (Creswell & Clark, 2013). The research phases, the procedures for data acquisition and treatment, are described as follows.

4.1 Research Phases

This research was developed according to four different phases as seen in Figure 2. I) Literature review: informal communication features and the dimensions of project success. II) We defined the framework, the research variables and the research guiding questions. III) We set the methods and procedures presented in this section. IV) We conducted the field research, collected data through interviews and consolidated the results present in section 5. The literature review and the research framework were completed in the first semester of 2019, while the data collection and consolidation were done by the end of 2019.

4.2 Organization Characteristics

The researched company is one of the largest banks in Brazil. It also has international projection. This Bank has a well-defined IT area that is scaffolded by a generous budget. This area has more than two thousand employees working on several technology projects. These projects serve in all areas, in which there are different sizing and different PM methods. These PM methods are mainly based on waterfall, agile or hybrid approaches.

4.3 Participants and Project Criteria

The participants accepted to engage to this research, which represented a unique and highly valuable opportunity for a case study based on (Yin, 2015).

Criteria to select participants were: (1) to have experience in software development projects within the financial industry; (2) to have participated in at least three different project phases (from project initial discussions to the implementation phase); (3) to have an education level should include is at least bachelor degree; (4) to have professional experience of at least five years; (5) to have professionals from several backgrounds, such as software engineers, system developers or project leaders, is important; and (6) to have at least ten IT professionals as participants.

Criteria to select projects for this case study (Yin, 2015) were: (1) projects must have come from different areas on the organization; (2) projects must have been completed recently or are still in the final stages or in the post-implementation phase, in order to have short/medium term data; (3) projects might have different sizing and (4) projects must have a clear methodology - agile, waterfall or hybrid.

4.4 Data Acquisition

We adopted individual interviews as an instrument for data collection due to the qualitative nature of the research (Yin, 2015). The interviews were conducted with ten professionals who participated in different projects related to software development.

We adopted the semi-structured interview (Selltiz, Wrigthman and Cook, 1987), due to it has a pre-establish a script that makes it easier to compare information among participants. The script of the interview consisted of open and closed questions. The first interview was used as a pre-test to guide the other interviews. Interviews were conducted in the second half of 2019.

4.5 Data Processing

Data were processed using two different techniques. First: content analysis, to categorize and interpret the data collected in the interviews. According to Neurendorf (2002), content analysis allows a qualitative exploration of messages and information.

Second: judge analysis. This technique advocates a judgment by a group of experienced experts in the field (Medeiros *et al*., 2015). The expert group was composed of participants from an individual interview. They analysed the relationship between IC and PS what was done previously one-by-one through individual interviews. A group agreement means: the number of specialists who agree with a statement is at least the double of those that don't agree with a statement (Medeiros et al., 2015).

5 RESULTS AND DISCUSSION

This section presents de results under two perspectives: the researched participants (people) and the researched projects (software development ones). We also present the informal communication results over the software project success, as well as discuss the results under the project approach perspective.

5.1 Samples: The Participants

Ten people have been selected for this research. We analysed in the interviews the level of success achieved by the projects and the research questions. Interviews were named from E01 to E10. The first interview served as a pre-test. We selected for the first interview a specialist with more project experience than the other ones to serve as a pre-test.

The questions and the script of the instrument were validated by the pre-test, and the instrument was adjusted to its final version based on this pre-test results. We conducted individual interviews at a quiet and private place in after-hours. The interviews were recorded. All interviewees we previously informed about the research objective and topics. We also collect their consent before recoding their voices for future transcription. Table 1 summarizes the interviewees most relevant characteristics.

5.2 Samples: The Projects

Ten projects have been selected for this research. software development activities in their scope, either in part or in full. These have been started at different

Table 1: Participants' Sample Summary.

ID	Age	Gender	Schooling	University course	Experience (years)	Interview duration (min)
E01	29	Male	Post-graduated	Information Systems	9	82
E02	25	Male	Post-graduated	Engineering	5	60
E03	26	Female	Post-graduated	Engineering	5	94
E04	28	Male	Bachelor	Computer Science	7	76
E05	28	Female	Post-graduated	Computer Science	6	47
E06	28	Female	Bachelor	Engineering	5	60
E07	31	Male	Post-graduated	Engineering	8	54
E08	29	Male	Post-graduated	Information Systems	9	38
E09	32	Male	Post-graduated	Engineering	5	51
E10	36	Female	Post-graduated	Engineering	18	52
Average: 29y					Average: 8y	Average: 61min

points in time between 2016 and 2019. The projects were developed in seven different areas of the Bank: three in the technology area, three in the risk analysis area and the other ones in four distinct areas.

Nine projects were finished during the field research, which made it possible to clearly identify short or medium terms success criteria. The size of the teams varied but an average was 49 members. The smallest team had five members and the largest one had 175 members. In addition, respondents participated in at least three distinct project phases. All projects achieved full or partial success, except project E05, which was discarded from the sample due to an issue with data. Table 2 summarizes the relation between projects and participants.

5.3 Informal Communication and Project Success

The research questions were analysed by means of the following steps:

(1) Data collection. We collected participants' data regarding informal communication in projects.

(2) Analyse the relationship between informal communication and project success. We analysed each interview to identify whether informal communication influenced the project's success or not. If so, we identified which dimensions of success were influenced. To highlight this influence, respondents were asked to give examples.

(3) Summary of results. We consolidated the influence of IC on project success (PS1 to PS3). If the results confirmed acceptance criteria, we then confirmed the research questions.

Table 3 illustrates examples of the use of informal communication by respondents. The following topics describe the analysis of research questions.

5.3.1 Informal Communication and Project Efficiency (Q1)

We asked participants if there is a positive association between IC and project efficiency (PS1). Six of the nine respondents (E02, E03, E04, E07, E08 and E09) recognized that positive influence, thus meeting the acceptance criterion (the number of respondents who answered affirmatively is twice as many as the others). Thus, the answer to question Q1 was confirmed.

The following examples of excerpts from the interviews that show that respondents recognized a positive influence between IC and PS1:

E02. IC proved to be important due to the timeliness of communication. That is, much faster and positively impacting the project deadline.

E03. IC contributed positively to project success. According to this respondent, "Telephone and instant messaging makes informal conversations a lot easier and this has contributed to the time efficiency".

E04. IC had a positive influence on project efficiency. "When communication occurs internally to the team, it is more informal; conversely, when the communication involves the customer, it tends to be formal".

E07. IC made it possible to know and understand facts about the project itself that were not described in the documents. It helped to better understand the project.

E08. IC was highlighted as being extremely important to the project. Even more important than formal communication, and that it contributed to communication efficiency.

E09. The interviewee considered that the IC was positive for the project efficiency in the same way as the interviewee E04.

Table 2: Projects Data Sample Summary.

ID	Projects areas	Success Achieved	Project Status	Team Members	Approach	Position in company*			Participation in project phases**					
						M	E	S	1	2	3	4	5	6
E01	Pay-out system	Succeed	Finished	175	Agile	•			•	•		•	•	•
E02	Risk analysis	Succeed	Finished	55	Waterfall		•	•		•	•	•	•	•
E03	Technology	Succeed	Running	15	Agile	•				•	•	•		•
E04	Technology	Partially	Finished	10	Hybrid			•		•	•	•	•	•
E05	Risk analysis	Failure	Finished	5	Agile			•		•	•	•	•	•
E06	Technology	Partially	Finished	100	Agile	•					•	•	•	•
E07	Customer relationship	Succeed	Finished	10	Waterfall		•	•	•	•	•	•	•	•
E08	Banking agencies	Succeed	Finished	70	Waterfall		•			•	•	•	•	•
E09	Risk analysis	Succeed	Finished	11	Agile	•			•	•	•	•	•	•
E10	Human resources	Succeed	Finished	40	Hybrid		•		•	•	•			

* M-manager; E-engineer; S-System analyst

** 1 ideation; 2 requirement definition; 3 software development; 4 test; 5 implantation; 6 post-implantation

Table 3: Use of informal communication.

ID	IC usage level	Examples		
		Daily project team IC activities	Customer interaction	Agile ceremonies
E01	Medium	In-person conversations and text messages		
E02	High	Daily conversations between staff	Customer calls for questions	
E03	Medium	In-person discussions		Ceremonies use IC
E04	Medium	IC with people who helped the project		
E06	Medium	It harmed the project because formal techniques were used informally		
E07	High	Talk to staff to check on task progress	Frequent conversations with customers	
E08	High	Physical proximity of staff had key importance to better communication		Daily meeting
E09	Medium	IC used daily with the project team		
E10	Medium	IC used daily with the project team		

5.3.2 Informal Communication and Impact to Costumer (Q2)

We asked participants if there is a positive association between IC and the impact on customers (PS2). Only three of the nine respondents (E01, E02 and E07) recognized a positive influence between IC and PS2, which does not meet the acceptance criterion. Thus, Q2 was considered as not valid.

5.3.3 Informal Communication and Impact to Staff (Q3)

We asked participants if there is a positive association between IC and the impact on staff (PS3). Seven of the nine respondents (E01, E02, E04, E07, E08, E09 and E10) recognized those affirmatives as true. And that meets the acceptance criterion. These are interview excerpts where participants recognized a positive influence between IC and PS3. These are the samples of positive impact on team interactions:

E01. "We need to know how to identify the subject and the manner of speaking, which can be talked to team members because they have different skills and personality."

E02. "IC allows you to answer questions quickly, like through instant messaging or phone calls."

E04. "The company has small meeting rooms with capacity for up to four people, where informal and productive conversations took place that positively influenced the project."

E07. "Did you understand? Is everything going well? How can I help you?" This kind of interaction had a positive impact on the team.

These are other positive impact samples on staff:

E08. "The number of test cases we ran when we were at a distance was much smaller than when we met in person".

E09. "With the project team, the contribution is greater, but with clients, formal communication is needed to keep track of requirements and priorities."

E10. For this interviewee, the informal language was linked to intimacy and mutual understanding between team members and collaborators from other areas. Thus, IC contributes to improving the relationship between team members and has a positive influence on the project team.

Table 4 summarizes the results of the interviews on IC that **PS1 and PS3 have been confirmed.** Thus, IC influences short and medium terms success in software development projects under two dimensions: project efficiency and impact on staff. This result is in line with the literature on informal communication (Mark & Wulf, 1999; Aranda *et al.*, 2010; Cataldo & Ehrlich, 2012; Zulch, 2014; Djajalaksana, Zekavat & Moon, 2017).

Table 4: Influence of IC on project success.

ID	IC usage level	Project success		
		PS1	PS2	PS3
E01	Medium		Positive	Positive
E02	High	Positive	Positive	Positive
E03	Medium	Positive		
E04	Medium	Positive		Positive
E06	Medium			
E07	High	Positive	Positive	Positive
E08	High	Positive		Positive
E09	Medium	Positive		Positive
E10	Medium			Positive
% positive answers		66,7	33,3	77,8

5.4 Analysis of Project Approaches

We also categorized the projects according to their approach: agile or waterfall. Table 5 presents the project sample classified by the approach. The project approach was used as a moderating variable, and the analysis is made by research question as follows.

Table 5: IC and project approach.

Approach	Inter-viewee	Project success		
		PS1	PS2	PS3
Agile	E01		Positive	Positive
	E03	Positive		
	E06			
	E09	Positive		Positive
% positive answers		50	25	50
Waterfall	E02	Positive	Positive	Positive
	E07	Positive	Positive	Positive
	E08	Positive		Positive
% positive answers		100	67	100
Hybrid	E04	Positive		Positive
	E10			Positive
% positive answers		50	0	100

(1) Agile Projects Approach.

Most respondents did not agree that informal communication has a positive impact on the agile approach. Therefore, we did not confirm IC influence on agile approach projects. However, we could confirm that this communication line highly influences waterfall projects, as well it has an influence on team members of hybrid approaches.

(2) Waterfall Projects Approach.

According to respondents, IC had a positive influenced on all the waterfall projects. At first glance, the results contradict common sense because this approach promotes less communication with the customer, given this communication occurs usually at the end of each phase. On the other hand, in the agile approach, due to the emphasis on communication, it is possible to modify the functionalities during project development.

The researched Bank has large experience on waterfall projects, and it is widely well-known by its employees. The use of the agile approach started only recently. This is reasonable to infer that the low experience of its employees with the agile approach and all the IC it carries on had made the employees understand the informal line as part of the process, while on waterfall projects IC is an advantage.

5.5 Research Limitations

This section presents the limitations of the research and its validity. They are mostly related to the data analysis technique and the generalization of the results:

(1) Data analysis technique. The data collected in the interviews were analysed using the content analysis technique. The interpretation of this data was made by the author, which attributes subjectivity to the results.

(2) Results generalization. All respondents belong to a single company and constitute a small sample, which does not allow generalization of the research results to other companies, based on 10 people that worked for software development projects.

6 CONCLUSIONS

The objective of this paper was to analyse the influence of informal communication on the software project success from both short and medium terms perspectives within the context of one large Brazilian banking. To achieve this goal, qualitative/descriptive research was carried out using the content analysis technique. This research was carried out with 10

experienced professionals. The answers to the research questions and the contributions of this paper are presented below.

Two of the three research questions had affirmative answers. Thus, it was confirmed a positive relation between informal communication and software project success when considerate both efficiency and project staff aspects. This result is in line with the literature which emphasizes the importance of informal communication in projects.

On the other hand, unlike the literature, the benefits were achieved in waterfall projects only, not on agile projects. This is reasonable to infer that on agile projects, in which the informal communication is quite common, people might not see additional benefits on "additional" informal communication. These results also point out to the fact we should perform deeper research on hybrid approaches, given its not conclusive results.

This research points out on informal communication positive influence on customer satisfaction. Despite being cited positively in some interviews, most respondents highlighted that *formal communication* (i.e., the reverse of informal) is the most important one when dealing with the customer. Recovering that this result applies to software development projects, it is possible to infer that part of this formal communication tendency/preference to overcome the challenges related requirements definition through a less flexible process at all. Maybe team members expected the benefit is to avoid software specification and validation conflicts for instance.

The contributions of this research are to overcome the issues and increase the benefits of making the projects more successfully at larger organizations, such as the researched Bank. As future works, we suggest: to conduct quantitative research to inquire the relationships suggested by this research, aiming to the generalization of the results; to investigate the other communication patterns in addition to the formality line; to deep understand the specific cases where informal communication benefits different project approaches such as agile, waterfall, and hybrid approaches.

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