IT Project Communication Techniques: a case study in the financial industry

Técnicas de Comunicação em Projetos de Tecnologia da Informação: um estudo de caso no setor financeiro

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Abstract

Communication plays an important role in project management. Many academic surveys, however, have highlighted communication problems as a cause for project failure. Therefore, this study aims to analyze communication techniques in information technology (IT) projects in a Brazilian financial institution with one of the largest investments in IT projects. We then conducted a literature review on the characteristics and techniques of communication. This is a qualitative and descriptive study. We interviewed 10 professionals who work with IT projects in a large financial institution during the year of 2019. The survey identified the most widely used communication techniques, and amongst them, the following stand out: electronic mail, text messages, and group meetings. We also identified several motivations for the adoption of such techniques, including communication with stakeholders, location issues, large amounts of data, and informality in communication.

Keywords: communication techniques; information technology projects; project management; financial industry.

Resumo

A comunicação desempenha papel importante no gerenciamento de projetos. Entretanto, muitos trabalhos acadêmicos têm destacado os problemas de comunicação como causa para insucesso de projetos. Neste contexto, esta pesquisa tem como objetivo analisar técnicas de comunicação em projetos de Tecnologia da Informação (TI) em uma instituição financeira brasileira, que é um dos setores da economia com maiores investimentos em projetos de TI. Para atingir esse objetivo, foi feita uma revisão sistemática da literatura sobre características e técnicas de comunicação. Esta pesquisa possui uma abordagem qualitativa e descritiva. Foram entrevistados 10 profissionais que atuam com projetos de TI, em uma instituição financeira de grande porte, em 2019. A pesquisa identificou as técnicas de comunicação mais usadas, entre as quais se destacam: correio eletrônico, mensagens de texto e reuniões em grupo. Diversas motivações para sua adoção foram identificadas: comunicação com stakeholder, questões de localização, grande quantidade de dados, e informalidade na comunicação.

Palavras-chave: técnicas de comunicação; projetos de tecnologia da informação. gestão de projetos. setor financeiro.

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1 Introduction

Failure rates of technology projects for software development have become a general problem, and several academic studies have investigated the causes of these problems with communication (LU; LIU; LIU, 2009). According to those authors, communication plays a crucial role not only among the members of project teams, but also between teams and clients. Likewise, Vasconcellos and Hemsley (2002) highlight that communication problems are one of the major structural weaknesses of traditional firms and that such problems worsen as the hierarchical level increases.

Communication is important for project management and human relations. Project managers spend approximately 90% of their time on communication management activities. Communicating is one of the critical factors for the success of a project (RUUSKA; VARTIAINEN, 2003). Accordingly, studying communication techniques in information technology (IT) takes on added importance. Also, few studies in the literature have looked into the strengths and weaknesses of communication techniques and their contribution to the success of IT projects. The ACM Digital Library, IEEE Xplore Digital Library, Science Direct, Scopus and Web of Science databases contain only 11 studies on this topic published between 2010 and 2019, and none of those studies address the Brazilian reality. Therefore, the present study seeks to help fill this gap by assessing Brazilian communication techniques for IT projects.

To answer our research question "How important are communication techniques for IT projects in a large Brazilian financial institution?", our main goal was to assess communication techniques for IT projects in a Brazilian financial institution. We chose the financial sector because, as Meirelles (2015) puts it, banks are one of the most computerized economic sectors and they spend relatively more on IT and also invest more heavily in it. The Brazilian Federation of Banks (FEBRABAN, 2020) supports this evidence, reporting investments in this sector on the order of R$ 8.6 billion in 2019.

The specific goals of our study were: (1) to identify the main communication techniques for IT projects by conducting a systematic literature review; (2) to confirm the used communication techniques by interviewing professionals with considerable experience in IT projects in a Brazilian financial institution; and (3) to assess the importance of communication techniques in terms of their frequency, reasons for adopting them, and their strengths and weaknesses.

This study is structured as follows: first, we present a literature review on the characteristics of communication and on the techniques used in communication. Afterwards, we describe the research method used, laying the foundations for the presentation and discussion of our findings. Finally, we present our conclusions.

2 LITERATURE REVIEW

This section describes the characteristics of communication and of project communication techniques. As a starting point, it is important to define communication. Communication can be defined as a process that consists of transmission and reception of messages between a sender and a receiver, whereby information is encoded by the sender and decoded by the receiver through established systems (CHAVES *et al*., 2008).

2.1 Characteristics of Communication for Project Management

Numerous studies in the literature have described the characteristics of

communication for project management, and several factors have been analyzed:

Verbalization. Dinsmore and Cavalieri (2003) classified communication into three categories. The first one is verbal communication. In this case, communication occurs via words and is subdivided into oral and written communication. Oral communication uses spoken words and usually occurs quickly and clearly, with simple and brief messages, and it also allows having feedback from the receiver at the moment of transmission of the message. Written communication has a higher level of detail and is used to explain issues that are more complex or that require formalization, and it also allows continuous understanding by the receiver, as the message remains available for review and apprehension. The second category deals with nonverbal communication. In this category, the message is sent without using words, vocal or paralinguistic signals and it is extremely useful for the transmission of signs. Examples of this category include emotions and feelings, such as pain, tiredness, and motivation. The third category concerns physiological or paralinguistic communication. This type of communication results from the relationship between different parts of our body and their external manifestation, including the voice itself. Some examples of this type of communication are pallor, sweating, body temperature, tone of voice, and quality of sounds.

Formality. Djajalaksana, Zekavat and Moon (2017) classified formality into two categories: formal and informal communication. Formal communication encompasses the channels and means of communication established consciously and deliberately. It refers to structured channels that are officially enforced by managers. Informal communication takes place in environments where interpersonal relationships are characterized by unstructured connections with selected partners. It is employed by members of an organization to tackle shortcomings and insecurity experienced in the formal communication system, to strengthen formal group aggregations, and to foster collective knowledge.

Physical location. Paasivaara and Lassenius (2001) classify communication into three categories. Traditional communication comprises projects of a firm carried out in a single physical location. Intraorganizational communication consists of projects undertaken by a single firm and distributed into several locations. And interorganizational communication comprehends projects carried out by several geographically distributed firms.

Organizational structure. In investigating distortions in communication within organizations, Larson and King (1996) focused mainly on the exchange of information between supervisors and employees. For those authors, while the level of noise in the system can be attenuated by reducing middle management or levelling hierarchy, distortion is not eliminated because managers still depend on their subordinates for critical information. This eventually leads to the classification of hierarchy in an organization into three categories: vertical, horizontal, and diagonal organizational structures. Vertical organizational structure is that in which people have different levels of hierarchy but belong to the same chain of command. Horizontal organizational structure is that in which people share the same level of hierarchy, thus, improving the coordination of work efforts. Efficient horizontal communication is supposed to shun organizational tunnel vision. In a diagonal organizational structure, people have different levels of hierarchy and belong to different organizational units. It is often designed to provide one party or both parties with information, coordination, or assistance.

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Purpose. Silveira (2008) categorized communication into three types, based on purpose: coordination, aimed at reducing the lack of information needed for tasks and activities; knowledge, aimed at reducing technical ambiguity and sharing knowledge so that members can learn and develop new skills and identify and solve problems; and creativity or inspiration, aimed at boosting technical or individual motivation.

Method. For PMI (2017), several are the communication methods used to share information between the parties interested in a project. But the interactive, active, and passive methods stand out. The interactive method is when two or more interested parties engage in a multidirectional and real-time exchange of information. Communication, in this case, occurs in meetings, via phone calls, instant messages, some types of social media, and videoconferences. In the active method, communication is directed at or distributed among specific receivers who need some information. The information is actually distributed, but that does not mean it has reached or been understood by the target public. Active communication tools include letters, memos, reports, e-mail messages, fax, voice mail, blogs, and press releases. The passive method, on the other hand, is used for large and complex sets of information or for a large audience. In this method, receivers have to access the contents at their discretion and in conformity with safeguarding procedures. The passive method comprises web portals, intranet sites, and e-learning, and databanks of learned lessons or knowledge repositories.

Approach. For PMI (2017), different approaches should be adopted to meet the needs of the major types of communications. Approaches vary according to the target group. In the interpersonal approach, individuals exchange information. The second approach is used by small groups (three to six people). The third approach is the public one. In this type of communication, a single lecturer speaks to a group of people. In the fourth approach, mass approach, communication takes place between senders of the message and larger groups, sometimes anonymous, at which information is targeted. In general, no relationship exists between the senders of the message and the receivers. Finally, the network approach is that in which communication occurs on social networks. There are several senders and several receivers, and communication is supported by social computing technology and media.

2.2 Communication Techniques for Project Management

2.2.1 Systematic Review Questions

To meet the first specific goal of our study, we formulated the following question: **What are the communication techniques described in the literature and applied to IT projects?**
We selected only scientific articles that were relevant and addressed communication techniques for IT projects. We included theses and texts published in conferences or journals. Only studies written in English were included, considering this is the international language of science, in addition to the fact that studies published in English were more relevant. Searches for studies written in Portuguese did not alter the results.

2.2.2 Databases

Search terms were built based on three relevant keywords: communication; projects; and techniques. Synonyms were considered for the technical keyword: characteristic, dimension, style, aspect, feature, element, attribute, quality, property, type, model, template, and pattern. The logical structure of the search terms is displayed in Appendix A.

The search terms were used in five databases: ACM Digital Library (https://dl.acm.org/); IEEE Xplore Digital Library (https://ieeexplore.ieee.org/); Science Direct (https://www.sciencedirect.com/); Scopus (https://www.scopus.com/); and Web of Science (https://apps.webofknowledge.com/). The term communication techniques was present in all of the selected studies.

2.2.3 Selection of Studies

Inclusion and exclusion criteria were used for selecting only those studies that met our goals. The SLR consisted of four inclusion criteria:

CI1 The title or abstract should address the characteristics of communication for projects.

CI2 The study should address the characteristics of communication for projects.

CI3 The study should belong to the IT area in the search engine classification.

CI4 The studies should have been written in English.

The following exclusion criteria were used:

CE1 Studies that did not address communication for IT projects.

CE2 Studies that contained only one or two of the selected keywords.

CE3 Studies that did not focus clearly and separately on the characteristics of communication and that did not allow obtaining information that answered the research question.

CE4 Studies published prior to 1999 (time span of the research: 2010 to 2019).

CE5 Studies that could not be accessed fully.

CE6 Duplicate studies (in the same database or in different ones).

The quality criteria used were based on the relevance of the studies. Relevance was determined on the basis of the research question. The studies were grouped into three categories: studies that did not address communication techniques; studies that indirectly addressed communication techniques; and studies that addressed communication techniques. Only those studies in the last two categories were selected.

The SLR resulted in 603 studies (Table 1). The number of studies included or excluded according to the selection criteria is also shown in Table 1. The StArt software and Microsoft® Excel were used for extraction of articles. A total of 37 articles were eventually selected (see Appendix B).

Table 1 - Number of results per search engine

Extraction results		Databases					Total
		ACM	**IEEE**	**Science Direct**	**Scopus**	**WoS**	
Initial extraction	Inclusion criteria	8	135	58	338	62	603
Rejected	Exclusion criteria	-4	-126	-56	-319	-56	-561
	Quality criteria	-1	-1	0	-2	-1	-5
Selected		**3**	**8**	**2**	**17**	**5**	**37**

Source: Data compiled by the author

2.2.4 SLR Results for IT Project Communication Techniques

The SLR identified IT project communication techniques and allowed categorizing them. These techniques represent the means and channels of communication used for the exchange of information between the parties interested in the project. Channels included oral, written, electronic, and digital communication. According to Gillard and

Johansen (2004), the decision about the means used for transmission of the message – telephone, videoconference, e-mail, conversation, face-to-face gestures, a table, a graph – is of utmost importance. Taking that into account, several authors have assessed communication techniques from different viewpoints:

Phases of the project. Bhalerao and Ingle (2010) investigated communication techniques during different interaction phases of the projects, and the results indicated face-to-face communication prevails between team members in all phases; however, regarding communication with clients, both e-mail and face-to-face communication are more effective. Other studies obtained similar findings (CHANG; EHRLICH, 2007; JOHANSEN; GILLARD, 2005).

Communication effectiveness. Melnik and Maurer (2004) analyzed the effectiveness of communication techniques according to the chosen channel: drawing board, telephone, e-mail, video recording, audio recording, and paper. They concluded face-to-face communication offers the possibility of more effective communication in that a lot of information can be provided (physical presence, tone of voice, and body language).

Synchronicity. Korkala and Maurer (2014) defined media synchronicity as the extent to which a communication technique allows individuals to achieve a shared and coordinated working pattern. They classified project communication techniques according to their level of support for synchronicity. Videoconferencing and face-to-face communication have a high level of support; conference calls and synchronous chats have an intermediate level; whereas e-mail, voice mail, and documents have a low level. Likewise, Hummel and Rosenkranz (2013) compared communication techniques with their synchronicity. The efficacy and efficiency of several techniques were measured by mathematical equations The study demonstrated that the quality of communication in urgent projects was lower than that observed in non-urgent projects.

The different communication techniques described by Chen *et al*. (2013), Avritzer *et al*. (2014), Kennedy, McComb and Vozdolska (2011), Bhalerao and Ingle (2010), Melnik and Maurer (2004), Korkala and Maurer (2014), and Tuomas *et al*. (2012) were grouped according to their common characteristics using semantic content analysis (BARDIN, 2011), as shown in table 2.

Table 2 – Communication techniques

| Technique	Description
T01	**Technical tools**. Asynchronous communication by means of comments, texts, or source code descriptions, development suites, versioners, and cataloging and other technical tools.
T02	**Official documents**. Official means available at the firm level for sharing and storing project information. They include predefined standards for specifications, reports, bulletins, or other relevant documents.
T03	**E-mail**. Exchange of e-mail messages or distribution lists directed at one or more groups of people.
T04	**Face-to-face communication**. Talks between two people compulsorily on a face-to-face basis.
T05	**Group meetings**. Talks between more than two people compulsorily on a face-to-face basis. As in the case of face-to-face communication (T04), they can be about different subjects, either technical or functional, for definitions, assessment of needs or discussions about improvements.
T06	**Telephone or voice mail**. Synchronous or asynchronous verbal communication. The former can be accomplished by means of phone calls, and the latter occurs through audio messages via instant apps (on the cell phone or computer) or via answering machine.
T07	**Instant text messages**. Synchronous and written communication via instant messaging applications, corporate programs, or other communication software programs.

Technique	Description
T08	**Conferences**. Verbal communication using audio conferences (via phone calls), video (via corporate systems), or face-to-face communication (in dedicated meeting rooms). They always involve more than two people, all of whom have the right to speak.
T09	**Presentations**. Verbal communication targeted at presenting specific topics or messages. They are not the same as conferences because there are one or more previously assigned speakers and listeners. Examples of presentations include workshops, plenary sessions, and lectures.
T10	**Collaborative environments**. They consist of systems for collaborative exchange of information, whereby participants interact as contributors or consumers of information. Examples: wiki systems, forums, and systems with predefined sandbox.

Source: Data compiled by the author

In addition to the SLR, the study by Chaves *et al*. (2008) is noteworthy. Those authors analyzed the communications techniques used for software project communication management (Figure 1). Their study addressed the importance and frequency of the use of the techniques, categorizing them according to their level of formality.

Figure 1 - Importance and frequency of use of communication techniques
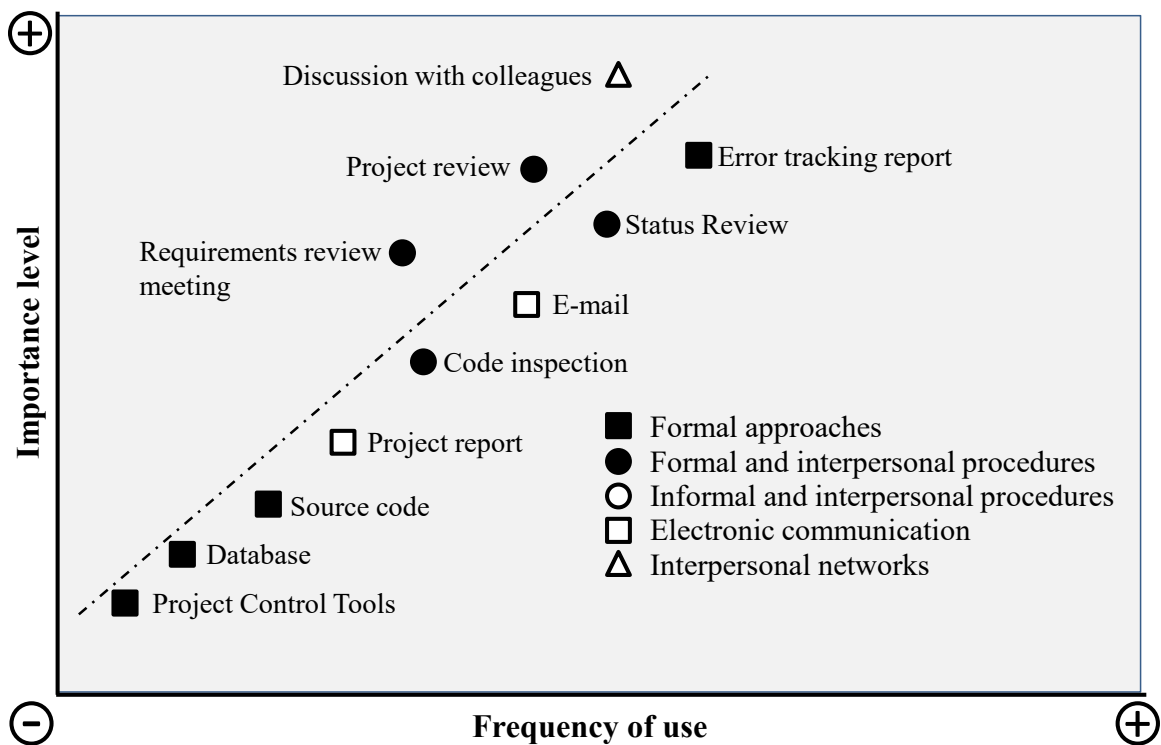
Source: Adapted from Chaves *et al*. (2008).

3 Research Method

The present study is based on a literature review and on interviews with project managers, and utilizes a qualitative approach. In the following subsection, we present the type of research, phases of the study, and the data collection and treatment procedures.

3.1 Characteristics of the Study

Based on the classification of scientific research studies developed by Gerhardt and Silveira (2009), our study has the following characteristics:
• **Nature**. This is an applied research study, given that its aim is to generate knowledge for practical application, targeted at the solution of specific problems.
• **Type**. This is a descriptive study. It precisely describes facts and phenomena of a given scenario.
• **Strategy**. This is an ex-post facto study because it seeks to investigate communication techniques retrospectively in an IT project.

• **Approach**. This is a qualitative and quantitative study (CRESWELL; CLARK, 2013), but the qualitative approach predominates.

3.2 Phases of the Study

This study was conducted in three phases as shown in Figure 2. The first phase consisted of a literature review that allowed identifying the characteristics of communication and its techniques. The second phase described the methods and procedures used (shown in the subsequent section). In this phase, data collection and treatment tools and procedures, as well as the subjects of the research, were described.

The third phase consists of the interviews conducted with IT project managers, which served as a basis for confirmation of the communication techniques used. The results and conclusions of the study were based on the interviews. The data obtained from the literature were collected in the second half of 2018

Figure 2 - Phases of the research
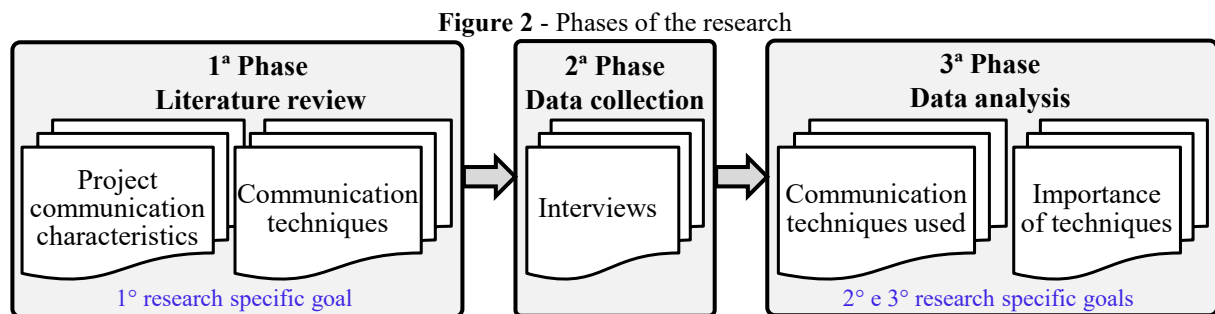
Source: Compiled by the author

3.3 Selected Financial Institution and Research Subjects

The financial institution selected for this study is the perfect case for analysis, suiting the goals established for the research (YIN, 2015). It is one of the largest and most important Brazilian financial institutions, and it stands out in the global economic scenario, in addition to a strong

presence in the retail and wholesale segments. This institution manages over 20,000 collaborators and it operates in more than 10 countries.

Its investments in IT surpass two billion reais per year and most of the investments are made via projects. Consequently, this institution has small and large IT projects, with different objectives, in all areas. Thus, it allows analyzing a

sample of IT projects with diverse characteristics.

As for the research subjects, the following criteria were adopted: experience in IT projects for the financial sector; participation in different phases of the projects, from discussions about the implementation of the project to the follow-up of the implementation and rollout phases; and graduate degree or complete undergraduate education with at least 5 years' experience. Also, professionals from all areas of the institution, e.g., software engineers, project developers, and project managers, could participate in the study. The minimum sample size was set at 10 IT professionals who had participated in at least one IT project for the financial sector.

The following criteria were used for the selection of IT projects: projects from different areas in order to have distinct contexts; projects completed or in the post-implementation phase; and projects with different-sized teams, given that size might interfere with the choice of communication techniques (PMI, 2017).

3.4 Data Tools, Collection and Treatment

Because of the applied and predominantly qualitative design of the study, interviews were adopted for data collection. The interviews were conducted with 10 professionals who participated in different IT projects. In each interview, a participant talked about one project he/she participated in. After each interview, the body of evidence was analyzed and converging evidence was gathered in the last interview.

Semi-structured interviews were used. According to Manzini (2012), this type of interview allows comparing the information obtained from the interviewees. Researchers follow a script, but they allow interviewees to speak freely about issues that come up as the main topic unfolds (GERHARDT; ILVEIRA, 2009).

The interview included open-ended and closed-ended questions, and consisted of three stages: introduction, with collection of data from the interviewees; contextualization, with detailed information about the project and understanding of what it addresses; and research propositions, with investigation of the communication techniques used.

Owing to the semi-structured method and the recommendations made by Manzini (2012), the first interview was used as a pretest. The interviews were conducted in the first half of 2019.

Semantic content analysis was employed in data treatment in order to categorize and interpret the collected data. According to Bardin (2011), semantic content analysis allows the qualitative assessment of messages and information. Moreover, a 3-point scale was adopted for measuring the frequency of use of the communication techniques. As pointed out by Rodriguez (2005), the 3-point scale is adequate and shortens data collection time.

4 Presentation and Discussion of the Findings

This section describes the profiles of the interviewees and the projects assessed in the interviews, corroborates the communication techniques used, and evaluates the importance of the techniques. The findings are based on 10 interviews (I01 to I10).

The first interview served as a pretest and, therefore, we chose an interviewee with a lot more experience in IT projects than that of the other interviewees. Interview items were validated based on the pretest. After the pretest, a final version of the interview was drafted.

The interviews were conducted individually, in a private and quiet room, with no interference from the external environment, and outside working hours. All interviewees were informed beforehand about the objective of the study and about the topics that would be addressed. Consent

was obtained from the participants so that the interviews could be recorded for later transcription and analysis. The transcriptions were performed and revised manually by the researcher. Each interview lasted on average 61 minutes (Table 3).

4.1 Profile of the Interviewees

The selected interviewees fitted the predicted profile. The interviewees have an average of eight years' experience in IT projects for the financial sector (Table 3). In addition, eight of them have a graduate degree and all of them have IT qualifications with at least five years of experience. In the selection process, the interviewees' level of experience in IT projects was checked. Only those with minimum experience requirements were selected.

Table 3 - Data on the interviewees

ID	Age (years)	Schooling	Occupation	Experience (years)	Interview (min)
E01	29	Graduate	SI	9	82
E02	25	Graduate	ENG	5	60
E03	26	Graduate	ENG	5	94
E04	28	Undergraduate	CC	7	76
E05	28	Graduate	CC	6	47
E06	28	Undergraduate	ENG	5	60
E07	31	Graduate	ENG	8	54
E08	29	Graduate	SI	9	38
E09	32	Graduate	ENG	5	51
E10	36	Graduate	ENG	18	52
Mean	29			8	61

Source: Research data

4.2 Description of the Projects

The 10 IT projects assessed included software development (partial or total) in their scope. The interviewees participated in the projects between 2016 and 2019. Table 4 displays the target projects of the study.

The characteristics of the projects meet the established requirements. Three projects were related to technology, another three to risks (3), and the remaining ones belonged to different areas. Most projects (9 out of 10) had been completed or were in the post-implementation phase, and so it is possible to clearly identify their success in the short and medium run. Team size varied, with an average of 49 members, with a standard deviation of 54.4, and the smallest team consisted of five members and the largest one had 175 members. Regarding the approach used in the project, projects were distributed almost evenly: seven used the agile method and five used the waterfall method (conventional).

To cover the different characteristics of the projects, the interviewees took on different roles – manager, systems engineer, and developer – at least in three different phases of the project. According to the interviewees, all projects had a good level of success, except for I05.

Table 4 - Project data

ID	Project area	Level of success	Project status*	Team	Approach	Functions**			Phases***					
						M	E	D	1	2	3	4	5	6
I01	Payments	Good	C	175	Agile	•	•		•	•		•	•	•
I02	Risks	Good	C	55	Waterfall		•	•		•	•	•	•	•
I03	Technology	Good	O	15	Agile	•				•	•	•		
I04	Technology	Regular	P	10	Agile and Waterfall			•		•	•	•	•	•
I05	Risks	Bad	C	5	Agile			•		•	•	•	•	•
I06	Technology	Regular	P	100	Agile	•					•	•	•	•
I07	External unit	Good	C	10	Waterfall		•	•	•	•	•	•	•	•
I08	Assistance	Excellent	C	70	Waterfall		•			•	•	•	•	•
I09	Risks	Good	C	11	Agile	•			•	•	•	•	•	•
I10	Human resources	Good	C	40	Agile and Waterfall		•		•	•	•			

* O. Ongoing. C. Complete; P Post-implementation
** M. Manager; E. Systems engineer; D. Developer
*** 1. planning; 2. setting of requirements; 3. development; 4. testing; 5. implementation 6. post-implementation
Source: Research data

4.3 Confirmability of Communication Techniques

At the beginning of the interview, the interviewees could see the list of communication techniques used in projects, based on the SLR. The interviewees analyzed the techniques and could suggest changes, if necessary. There was a suggestion for the improvement of the list of techniques based on the reality of the analyzed institution. Interviewee 1 (I01) commented on the existence of group meetings and discussions that promoted more interaction among participants. The interviewee mentioned writable walls, glass tables, and windows, digital panels, and visual materials. This is a recent technique and, for that reason, it was not contemplated in the literature review conducted in the present study; however, it is cited in commercial publications targeted at organizational innovation (NEVES, 2018). Thus, technique T11, known as interactive environments was included to represent a current reality of the assessed institution.

The interviews allow confirming these 11 communication techniques. Ereaut (2002) describes some suggestions for the validity of a qualitative study, such as confirmability. This criterion indicates to what extent inferences are supported by data and logic, free from prejudice and judgments. The procedures used for the interviews and the inferences obtained are supported by the collected data

4.4 The Most Widely Used Communication Techniques

The frequency of use of communication techniques was assessed. The study began with five interviews and a previous analysis of the results based on how frequent the techniques were used. After seven interviews, the indicators were recalculated. Between interviews 8 and 9, the values obtained were close to the existing ones. Finally, after 10 interviews, the evidence converged and, therefore, no more interviews were necessary. The answers were evaluated on a 3-point scale: 1 - not used; 2 - less frequently used; and 3 - widely used. The frequency of use of each technique is shown in Table 5.

Table 5 - Frequency of use of communication techniques for the projects

ID	Widely used					Less frequent					
	T03	T04	T07	T05	T02	T01	T06	T08	T10	T11	T09
I01	3	3	3	3	3	3	3	2	3	3	3
I02	3	3	2	3	3	3	3	3	1	2	1
I03	3	3	2	2	3	1	1	1	2	1	1
I04	3	3	3	2	2	3	2	1	2	2	1
I05	3	2	3	2	1	3	3	1	1	1	1
I06	3	3	3	3	2	2	1	1	3	3	2
I07	3	3	3	2	3	1	3	3	1	3	2
I08	3	3	3	2	3	2	3	2	1	1	1
I09	3	3	2	3	2	3	2	1	1	1	2
I10	3	3	3	3	3	3	2	3	3	1	2
Total	30	29	27	25	25	24	23	18	18	18	16

Source: Research data

The sum of the score for the techniques is shown in decreasing order. By calculating the median, it was possible to classify the techniques into two groups:

- Widely used: e-mail (T03), face-to-face communication (T04), text messages (T07), group meetings (T05), and official documents (T02).
- Less frequent: technical tools (T01), telephone or voice mail (T06), conferences (T08), collaborative environments (T10), interactive environments (T11), and presentations (T09).

Electronic mail (T03) was the most widely used technique in all projects, unlike T11, the least frequently used. Note that T11 is one of the most recent techniques and that it is used in specific situations. It was chiefly used for intrinsic project issues, e.g., technical settings, problem-solving, and discussions about ongoing activities. In addition, the institution has available rooms where collaborators can meet up at any time to deal with project issues and they can also use the writable tables and walls and share their ideas about the projects.

4.5 Reasons for the Use of Communication Techniques

The interviewees were asked about the reasons for the use of each communication technique. Their answers were grouped according to semantic content analysis and classified into seven categories:

- **Project activities**: Techniques used in everyday activities, related, for instance, to lists of pending items, doubts, alignments, technical solution design, discussion lists, and problem-solving.
- **Stakeholder**. Communication technique used with the parties interested in the project: client, user, executive, and project and department managers, among others. This type of communication includes requirements specifications, follow-up reports, status reports.

- **Processes**. Communication technique related to the adoption of methodologies, internal project and organizational processes, and agile ceremonies. It is a mandatory or extremely relevant communication technique.
- **Storage**. Communication technique related to the storage of information that can be retrieved for future projects and to the formalization of milestones achieved by the project.
- **Location**. Communication technique required as a function of the physical proximity or distance between teams.
- **Massive data**. Communication technique used to handle a large amount of messages, phone calls, and documents. The messages can be broadcast. An example of this type of communication is the war room, which allows sending information at scale in case of critical and momentary issues.
- **Informality**. Techniques used for informal communication. Used by the project team, in discussion groups, or for communication with managers.

Figure 3 shows the techniques according to their reasons for use. The figure is split into four quadrants, exhibiting the medians for the frequency of techniques and reasons for their use. Thus, it is possible to identify the techniques that present very different reasons, as well as the reasons that have the largest number of techniques associated with them.

Figure 3 - Frequency of use of communication techniques for the projects

Reasons	Techniques											Total
	T03	**T06**	**T07**	**T09**	**T05**	**T08**	**T01**	**T02**	**T04**	**T10**	**T11**	
Project activities	•	•	•	•	•	•			•	•	•	9
Informality	•	•	•			•			•			5
Stakeholder	•	•		•				•				4
Location		•	•		•	•						4
Massive data			•	•	•					•		4
Processes				•			•	•				3
Storage	•						•					2
Total	4	4	4	4	3	3	2	2	2	2	1	31

Source: Research data

Six communication techniques stood out: e-mail (T03), phone calls or voice mail (T06), instant text messages (T07), presentations (T09), group meetings (T05), and conferences (T08). Of these six techniques, most (four) are based on IT. Only presentations (T09) and group meetings (T05) can use IT, but they are not necessarily based on it. On the other hand, the techniques with the fewest reasons for their adoption are based on IT – technical tools (T01), official documents (T02), and face-to-face communication (T04). This shows the relevance of digital

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communication for projects, as corroborated by Chang and Ehrlich (2007) and Herbsleb and Grinter (1999).

4.6 Strengths and Weaknesses of Communication Techniques

The strengths and weaknesses of the most widely used communication techniques were analyzed. The strengths are characteristics pointed out by the interviewees that contribute to the success of the project, whereas the weaknesses have the opposite effect. The answers given by the interviewees were grouped according to semantic content analysis, resulting in 10 categories (Figure 4).

The communication techniques with the largest number of strengths were e-mail (T03), face-to-face communication (T04), and group meetings (T05). Conversely, T03 was the technique with more weaknesses and T05 did not have any weaknesses. The importance of formalization in communication should be highlighted. It was a strength in some techniques and a weakness in others. The strengths of the communication techniques are described next.

- Formalization. Related to job formality, either for disclosure to stakeholders or requirements log and project decisions.
- Agility. It has to do with how fast the technique disseminates information to an individual or to a group of people.

Figure 4 - Strengths and weaknesses of the most widely used techniques

Strengths and weaknesses		Techniques				
		T05	**T04**	**T02**	**T03**	**T07**
Strengths	• Formalization			(+)	(+)	
	• Agility				(+)	
	• Alignment	(+)	(+)			
	• Clarification	(+)	(+)			
	• Communication support					(+)
Weaknesses	• Does not detect failure			(-)	(-)	
	• Does not control content				(-)	
	• Overcharge		(-)			
	• Excess information				(-)	(-)
	• Lack of formality					(-)
Classification		2	1	0	-1	-2

Source: Research data

- Alignment. Solution to discrepancies in requirements and alignment of projects. Indispensable for equating what is requested by the client with what the project is supposed to offer.

- Clarification. It clarifies conflicting issues, promotes discussions, prevents failures, and sends clear mass information about the project.
- Communication support. Tools developed within a

firm or market solutions to support communication between teams that work far away from each other.

The weaknesses of communication techniques are described next.

- Do not detect failures. Failures in internal processes (e.g., solution errors and redundant procedures) are not detected by these techniques.
- Does not control content. No control over the content of communication by the technique. For example, what is requested vs. what is delivered.
- Overcharge. They enable project follow-up and allow bringing deliveries forward. As a result, they can put more pressure on the project team.
- Excess information. If there is no restriction on the amount of sent data, there will be an excessive amount of requests or messages to the project team.
- Lack of formality. Techniques allow formal negotiation through informal channels. For instance, lists of pending items and technical solutions controlled by informal techniques.

The results obtained in this study were compared with those in the literature. The literature review in the present study classified communication into seven categories: verbalization, formality, physical location, organizational structure, purpose, method, and approach. These categories were mentioned directly or indirectly in the analyses of reasons, strengths, and weaknesses of communication techniques. For example, the low level of formality described by

Djajalaksana, Zekavat and Moon (2017) was one of the reasons for the use of e-mail (T03), face-to-face communication (T04), phone calls or voice mail (T06), instant text messages (T07), and conferences (T08). The level of formality showed strengths in the case of official documents (T02) and e-mail (T03), and lack of formality was a weakness in the case of instant text messages (T07).

The results were also in line with those obtained by Chaves *et al*. (2008). Group meetings (T05) stood out in this study. This was one of the most widely used techniques, had more reasons for use, and showed the greatest strengths. Likewise, group meetings and requirements review meetings were among the most important techniques in a study conducted by Chaves *et al*. (2008). According to those authors, these two techniques are known for their interpersonal features, either through formal or informal procedures.

5 Conclusions

The aim of this study was to assess communication techniques for IT projects of a Brazilian financial institution. To do that, a qualitative and descriptive study was performed using semantic content analysis, conducted at a Brazilian financial institution by 10 professionals experienced in project management. The answer to the research question and the conclusions of this study are grouped according to specific goals:

- To identify the major communication techniques: 10 communication techniques were identified in the literature using an SLR spanning the 2010-2019 period.
- To confirm communication techniques: the techniques were confirmed by professionals with experience in IT projects. The interactive

environments technique was not contemplated in the SLR, thus totalling 11 communication techniques for IT projects.

- To assess the importance of the techniques: this analysis considered the frequency of use, the reasons for their adoption, and both strengths and weaknesses.

The main theoretical contribution of this study was the improvement of the project management framework. In the Project Management Body of Knowledge (PMI, 2017) framework, for instance, contribution occurred in the area of communications management. Special attention should be given to the communication between project team members, especially with regard to communication techniques. In this case, the use of IT-based innovative techniques stood out, mainly e-mail (T03), instant text messages (T07), and group meetings (T05). This indicates improvement in the use of IT-based techniques.

This finding is consistent with the expansion of the internet and adoption of collaborative IT in organizations and in the society. Social isolation triggered by the Covid-19 pandemic, which broke out in early 2020, hastened digital transformation

processes. In this new scenario, the use of IT-based communication techniques tends to grow and is expected to play a more central role in communication management frameworks.

The study also contributed to management practices. Knowledge about the most important communication techniques for IT projects has expanded in Brazil, thereby increasing the performance of IT projects. A new technique known as interactive environments was mentioned in the interviews. This technique consists of interaction between participants via writable walls, glass tables, and windows, digital panels, and visual materials. This technique allows the use of verbal and informal characteristics of communication in projects and aligns itself with the maker culture, which is based on collaborative environments for transmission of information between groups and people. In addition, it aligns itself with a new management model, dubbed Management 2.0 by McDonald (2011), which indicates a new paradigm in the IT era.

The contributions of this study seem to open the path for future research. Quantitative studies using random samples will permit verifying the relationships suggested herein and generalizing the results to other firms and contexts.

References

AVRITZER, A. *et al*. Survivability models for global software engineering. In: **IEEE 9th International Conference on Global Software Engineering**. p. 100–109, 2014.

BARDIN, L. **Análise de Conteúdo.** 5. ed. Brasil: Edições 70, 2011, 280p.

BHALERAO, S.; INGLE, M. Analyzing the modes of communication in agile practices. In: **3rd International Conference on Computer Science and Information Technology**. p. 391–395, 2010.

BUCHANAN, J. Measuring up. PM Network, **Project Management Institute**, v. 22, n. 9, p. 50-55, 2008.

CHANG, K.; EHRLICH, K. Out of sight but not out of mind?: Informal networks, communication and media use in global software teams. In: **Proceedings of the 2007 conference of the center for advanced studies on Collaborative research**. p. 86–97, 2007.

CHAVES, L. E.; NETO, F. H. S.; PECH, G.; CARNEIRO, M. F. S. **Gerenciamento**

da comunicação em projetos. 3. ed. Rio de Janeiro: FGV Editora, 2008.

CHEN, Q. L. *et al*. A model for project communication medium evaluation and selection. **Concurrent Engineering**, v. 21, n. 4, p. 237–251, 2013.

CRESWELL, J. W.; CLARK, V. L. P. **Pesquisa de Métodos Mistos: Métodos de Pesquisa**. São Paulo: Penso Editora, 2013.

DINSMORE, C.; CAVALIERI, A. **Como se Tornar um Profissional em Gerenciamento de Projetos**. Project Management Professional. QualityMark, 2003.

DJAJALAKSANA, M. L.; ZEKAVAT, P. R.; MOON, S. Effectiveness of on-site communication in residential housing projects. ISARC. **Proceedings of the International Symposium on Automation and Robotics in Construction**, 34, p. 1-6, 2017.

EREAUT, G. **Analysis and Interpretation in Qualitative Market Research, Sage Publications, London**, 2002.

FEBRABAN. **Investimentos de bancos com tecnologia aumentam 48%**. 2021. Disponível em: https://febraban.org.br/?idioma=pt-br. Acesso em: 04 maio 2021.

GERHARDT, T. E.; SILVEIRA, D. T. **Métodos de Pesquisa**. Porto Alegre: UFRGS, 2009.

GILLARD, S.; JOHANSEN, J. Project management communication: a systems approach. **Journal of Information Science**, v. 30, n. 1, p. 23–29, 2004.

HARTMAN, F.; ASHRAFI, R. Project management in the information systems and information technologies industries. **Project Management Journal**, v. 33, n. 3, p. 5–15, 2002.

HERBSLEB, J. D.; GRINTER, R. E. Splitting the organization and integrating the code: Conway's law revisited. **21st International Conference on Software Engineering**. ACM, New York, NY, USA, p. 85-95, 1999.

HUMMEL, M.; ROSENKRANZ, C. Measuring the impact of communication in agile development: A research model and pilot test. *In*: **American Conference on Information Systems**, 2013.

JOHANSEN, J.; GILLARD, S. Information resources project management communication: personal and environmental barriers. **Journal of Information Science**, v. 31, n. 2, p. 91–98, 2005.

KENNEDY, D. M.; MCCOMB, S. A.; VOZDOLSKA, R. R. An investigation of project complexity's influence on team communication using Monte Carlo simulation. **Journal of Engineering and Technology Management**, v. 28, n. 3, p. 109–127, 2011.

KITCHENHAM, B. *et al*. Systematic literature reviews in software engineering– a systematic literature review. **Information and software technology**, v. 51, n. 1, p. 7-15, 2009.

KORKALA, M.; MAURER, F. Waste identification as the means for improving communication in globally distributed agile software development. **Journal of Systems and Software**, n. 95, p. 122–140, 2014.

LARSON, E. W.; KING, J. B. The systemic distortion of information: An ongoing challenge to management. **Organizational Dynamics**, v. 24, n. 3, p. 49-61, 1996.

LU, X.; LIU, L.; LIU, L. Relationship research between communication activities and success indexes in small and medium software projects. In: **1st International Conference on Information Science and Engineering**, ICISE 2009, IEEE, p. 5022-5025, 2009.

MANZINI, E. J. Uso da entrevista em dissertações e teses produzidas em um programa de pós-graduação em educação. **Revista Percurso - NEMO**, v. 4, n. 2, p. 149–171, 2012.

MCDONALD, P. It's time for management version 2.0: Six forces redefining the future of modern management. **Futures**, v. 43, n. 8, p. 797-808, 2011.

MEIRELLES, F. S. **Estudo dos Gastos e Investimentos em TI nos Bancos**. 2015. Disponível em: https://pesquisa-eaesp.fgv.br/institucional. Acesso em: 04 maio 2021.

MELNIK, G.; MAURER, F. Direct verbal communication as a catalyst of agile knowledge sharing. *In*: **Agile Development Conference**, p. 21-31, 2004.

NEVES, H. **Por que algumas empresas estão implementando laboratórios de inovação maker internos?** 2018, outubro. Disponível em: https://www.revistadigital.com.br/2018/10/por-que-algumas-empresas-estao-implementando-laboratorios-de-inovacao-maker-internos/. Acesso em: 24 abr. 2019.

PAASIVAARA, M.; LASSENIUS, C. Communication in new product development networks - a case study. In: **8th International Product Development Management Conference**, Enschede Netherlands, p. 711–725, 2001.

PMI. **Um Guia do Conhecimento em Gerenciamento de Projetos (Guia PMBOK)**. 6. ed.: Project Management Institute, 2017.

RODRIGUEZ, M. C. Three options are optimal for multiple-choice items: a metanalysis of 80 years of research. **Educational Measurement: Issues and Practice**. v. 24, n. 2, p 3-13, 2005.

RUUSKA, I.; VARTIAINEN, M. Critical project competence: a case study. **Journal of Workplace Learning**, v. 15, n. 7/8, p. 307-312, 2003.

SILVEIRA, F. F. **As Práticas de Comunicação em Projetos Globais de Desenvolvimento de Produtos em Empresas Multinacionais Brasileiras**. Dissertação (Mestrado) - Universidade de São Paulo, 2008.

TUOMAS, N. *et al*. Reflecting the choice and usage of communication tools in global software development projects with media synchronicity theory. **Journal of Software: Evolution and Process**, v. 24, n. 6, p. 677–692, 2012.

VASCONCELLOS E.; HEMSLEY, J. R. **Estruturas das Organizações - estruturas tradicionais, estruturas para inovação, estruturas matriciais.** 4. ed. São Paulo: Pioneira, 2002.

VOLLGER, W. **Comunicação - fator crítico de sucesso em projetos**. [S.l.], 2012. Disponível em: https://www.tiespecialistas.com.br/comunicacao-fator-critico-de-sucesso-em-projetos/. Acesso em: 24 abr. 2019.

YIN, R. K. **Estudo de Caso: Planejamento e Métodos.** 5. ed. Porto Alegre: Bookman, 2015.

Appendix A - SLR search terms

The logic structure of the search term used in each of the five search engines of the surveyed databases is shown in what follows. Specific syntaxes of each database were translated for the sake of their use, but only the logic structure of the search term is presented.

> *(TITLE-ABSTRACT-KEYWORDS (communication*)*
>
> *AND TITLE-ABSTRACT-KEYWORDS (project*)*
>
> *AND TITLE-ABSTRACT-KEYWORDS ("dimension*" OR "style*" OR "aspect*" OR "feature*" OR "element*" OR "attribute*" OR "quality" OR "property" OR "characteristic*" OR "type*" OR "model*" OR "template*" OR "pattern*")*
>
> *AND ALL-WORDS ("verbal communication*" OR "nonverbal communication*" OR "formal communication*" OR "informal communication*" OR "passive communication*" OR "active communication*" OR "interactive communication*" OR "internal communication*" OR "external communication*" OR "vertical communication*" OR "horizontal communication*" OR "unofficial communication*" OR "official communication*")*
>
> *AND (PUBYEAR >1997)*
>
> *AND (SUBAREA, "COMP")*
>
> *AND (LANGUAGE, "English"))*

Appendix B - Studies extracted using the SLR

The list of articles retrieved from the SLR is shown in Table 6 in chronological order of their publication.

Table 6 - Articles retrieved from the SLR

Title	Author	Year
Changing interpersonal communication through groupware use	Mark and Wulf	1999
How to implement a successful communication program: A case study	Carr *et al*.	1999
Splitting the organization and integrating the code: Conway's law revisited	Herbsleb and Grinter	1999
Direct verbal communication as a catalyst of agile knowledge sharing	Melnik and Maurer	2004
Project management communication: A systems approach	Gillard and Johansen	2004
Information Resources Project Management Communication: Personal and Environmental Barriers	Johansen and Gillard	2005
Communication in Distributed Agile Development: A Case Study	Korkala, Pikkarainen and Conboy	2007
Out of sight but not out of mind? Informal networks, communication and media use in global software teams	Chang and Ehrlich	2007
Internal and external boundary spanning in outsourced IS development projects: Opening the black box	Vilvovsky	2009
Analyzing the Modes of Communication in Agile Practices	Bhalerao and Ingle	2010
What Information Would You Like to Know about Your Co-worker? A Case Study	Aranda *et al*.	2010
An Investigation of Project Complexity's Influence on Team Communication Using Monte Carlo Simulation	Kennedy, McComb and Vozdolska	2011

Title	Author	Year
How interaction between roles shapes the communication structure in requirements-driven collaboration	Marczak and Damian	2011
Projects as Communicating Systems: Creating a Culture of Innovation and Performance	Johannessen and Olsen	2011
Team communications and academic R&D performance: A case of National Telecommunication Program of Taiwan	Hung, Chou and Kuo	2011
Elicitation of Communication Inherent Risks in Distributed Software Development	Junior *et al.*	2012
Reflecting the choice and usage of communication tools in global software development projects with media synchronicity theory	Tuomas *et al.*	2012
The impact of communication structure on new product development outcomes	Cataldo and Ehrlich	2012
A model for project communication medium evaluation and selection	Chen *et al.*	2013
Measuring the impact of communication in agile development: A research model and pilot test	Hummel and Rosenkranz	2013
The Role of Communication in Agile Systems Development an Analysis of the State of the Art	Hummel, Rosenkranz and Holten	2013
Communication: The Foundation of Project Management	Zulch	2014
Survivability models for global software engineering	Avritzer *et al.*	2014
Waste identification as the means for improving communication in globally distributed agile software development	Korkala and Maurer	2014
A conceptual framework to study the role of communication through social software for coordination in globally-distributed software teams	Giuffrida and Dittrich	2015
Exploring FLOW distance in project communication	Schneider and Liskin	2015
The SOCIAL Project Approaching Spontaneous Communication in Distributed Work Groups	Ven *et al.*	2015
Use of social media for internal communication: A case study in a government organization	Fabre	2015
Communication and reputation as essentials for the positioning of an organization	Karnaukhova and Polyanskaya	2016
Managing sub-group interactions and communication in group collaboration activities	Musa, Abidin and Omar	2016
Project communication management patterns	Muszynska	2016
Communication and Coordination Using Facebook: A Case Study of Distributed Software Development	Ferdous and Ikram	2017
Effectiveness of on-site communication in residential housing projects	Djajalaksana, Zekavat and Moon	2017
Exploring horizontal communication of matrix-structured organization with social penetration theory	Lee and Lin	2017
Patterns of communication management in project teams	Muszynska	2017
A survey of soft computing applications in global software development	Iftikhar *et al.*	2018
Analysis of the online interactions of students in the project management learning process	Olarte-Valentín *et al.*	2018

Source: Research data

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