Stakeholder Management Strategies in Information Systems Projects

A Case Study at BRISA

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"A goal without a plan is just a wish."
Antoine de Saint-Exupéry

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Abstract

The Information Systems (IS) projects conducted in companies such as Brisa are increasingly important to the fulfillment of their business objectives. This results in more relevant stakeholders, who have certain interests in these projects and their outcomes.

In this scenario, project managers face major challenges concerning how to engage those stakeholders. While there are existing software solutions that assist project managers, none were identified that assist in identifying and managing the involvement and expectations of project stakeholders. Due to inadequate processes and methods for stakeholder management, stakeholders may not be properly involved in projects.

Applying the Design Science Research Methodology, it is proposed to develop a solution to address this identified problem by introducing a framework through which project managers may identify, plan, and document engagement with project stakeholders. Based on a body of the knowledge collected from PMBOK, ISO 21500, PM^2, and ICB, an information system solution was modeled and implemented through three development iterations.

The proposed solution was demonstrated in an ongoing project of the Department of Technology and Systems of Brisa. The solution was evaluated through interviews with IS practitioners to assess the solution's validity.

Keywords

Resumo

Os projectos de sistemas de informação conduzidos em empresas como a Brisa são cada vez mais importantes para a concretização dos seus objectivos de negócio. Isto resulta em mais *stakeholders* relevantes, que têm certos interesses nesses projectos e nos seus resultados.

Neste cenário, os gestores de projectos têm de enfrentar desafios relativamente a como envolver esses *stakeholders*. Existem soluções de software destinadas a assistir o trabalho de gestores de projectos, mas não foi identificada nenhuma que assistisse na identificação e gestão de envolvimento e expectativas de *stakeholders* de projecto. Devido a processos e métodos inadequados para Gestão de *Stakeholders*, estes podem não ser adequadamente envolvidos em projectos.

Aplicando a Metodologia *Design Science Research*, propõe-se o desenvolvimento de uma solução que enderece este problema identificado ao introduzir uma *framework* através da qual gestores de projectos possam identificar *stakeholders* de projecto, bem como planear e documentar o seu envolvimento. Baseando-se no conhecimento adquirido a partir do *PMBOK*, *ISO 21500*, *PM²* e *ICB*, foi modelada e implementada uma solução sob a forma de um sistema de informação, através de três iterações de desenvolvimento.

A solução proposta foi demonstrada através da sua aplicação num projecto em curso do Departamento de Tecnologia e Sistemas da Brisa. Esta solução foi avaliada através de entrevistas a um conjunto de profissionais da área de Sistemas de Informação de forma a avaliar a validade desta solução.

Palavras Chave

Sistemas de Informação, Projectos, *Stakeholders*, Gestão, Envolvimento

Contents

List of Figures

List of Tables

Glossary

Activity
Identified component of work within a schedule that is required to be undertaken to complete a project.

Architecture
Conceptual model that defines a system, represented and organized in a way that supports reasoning about the structures, properties and behaviours.

Change Request
Documentation that defines a proposed alteration to a project.

Control
Comparison of actual performance with planned performance, analysing variances and taking appropriate preventive and corrective actions as needed.

Constraint
Anything that limits or restricts a system (or project) from reaching its goal. Could be physical (equipment, facilities, material, people), or they could be policies (laws, regulations, etc.).

Corrective Action
Directions and activities meant to modify the performance of work to bring it in line with the project plan.

Guideline
Conceptual structure that allows homogeneous handling of different business processes grouped together and pre-defines common deliverables to and from each business process. Provides a model with a well-defined tactic to master the complex environment of an organization, acting as a map of the entire body of project management knowledge. Can also be referred to as a descriptive (or informative) standard.

Method
Procedure for accomplishing or approaching something, especially a systematic or established one. A method not only mentions the process, but also describes how its tasks are completed.

Methodology
Strictly defined combination of logically related practices, methods and processes that determine how best to plan, develop, control and deliver a project, in order for it to achieve its objective. Outlines a systematic and disciplined approach to project design, execution and completion.

Operation
Permanent initiatives that produce repetitive results, performed by relatively stable teams through ongoing and repetitive processes to do the same set of tasks and produce a standard output.

Process Administrative flow that determines the way activities are performed during the course of a project.

Project Temporary organizational structure which is set-up to create a unique output product or service within certain constraints such as time, cost, and quality.

Project Governance Stakeholder group that is part of the organizational governance that deals with directing, overseeing and controlling projects from an organizational perspective and establishes the proper environment to run projects. Provides the framework within which decisions are made for project development, aligned with the organization's governance model.

Project Life Cycle Defined set of phases that a project passes through from its initiation to its closure, that are determined by governance and control needs.

Project Management The application of methods, tools, techniques and competencies to a project, including the integration of the various phases of the project life cycle.

Project Organization Stakeholder group that performs the work to realize the project objective, composed of a temporary structure that includes project roles, responsibilities and levels of authority and boundaries that need to be defined and communicated to all stakeholders of the project.

Project Phase Collection of logically related project activities, with a start and an end, that culminates in the completion of one or more deliverables that are either moved into the next phase or project closure. Phases are divided by decision points.

Responsibility Something which one is required to do as part of a job, role, or legal obligation. The project responsibilities are the clear description of what each person working in role should do, including the person's authorities and accountabilities.

Risk An uncertain event or condition that, if it occurs, has a positive or negative effect on the objectives of a project.

Role Function assumed or part played by a person or thing in a particular situation. The project role is the function/title of a person in the project, e.g. project manager.

Stakeholder Person, group and/or organization that is actively involved in the project, or that has interests in, can affect, or perceive itself to be affected positively or negatively by the execution or completion of a project.

Standard A collection of terms and definitions, functional and performance related requirements, processes, measuring methods and other best practices regarded within a specific industry. Those of normative nature are referred as prescriptive standards, those of descriptive nature can be referred as guidelines. Standards are established, highly regarded and well-known. They have been thoroughly tested and implemented.

Acronyms

ANSI American National Standards Institute

APM Association for Project Management

BI Business Intelligence

CE Competence Element

CRM Customer Relationship Management

DTS Departamento de Tecnologias e Sistemas (Department of Technology and Systems)

DSRM Design Science Research Methodology

EC European Commission

EU European Union

ERP Enterprise Resource Planning

ISO International Organization for Standardization

IST Instituto Superior Tecnico

ICB Individual Competence Baseline

IPMA International Project Management Association

IS Information Systems

IT Information Technology

MSc Master of Science

PM Project Management

PMBOK Project Management Body of Knowledge

PMI Project Management Institute

PMO Project Management Office

PMP Project Management Professional

PMS   Project Management Software

PRINCE2 PRojects IN Controlled Environments

RAM   Responsibility Assignment Matrix

RPA   Robotic Process Automation

SaaS   Software-as-a-Service

1

Introduction

Contents

The Information Systems (IS) projects conducted by the software development teams in long-established companies, such as Brisa, are becoming increasingly important to the fulfillment of their business objectives. This results in more relevant stakeholders who have certain interests in these projects and their outcomes. In these scenarios, project managers face major challenges: to identify and implement better management processes and methodologies that are suited for these IS projects and engage those stakeholders so that the entire organization supports a more digital-friendly approach.

Project Management (PM) is defined in the Project Management Body of Knowledge (PMBOK) guide as the practice of initiating, planning, executing, controlling, and closing the work of a project team to achieve specific goals and meeting specified success criteria at a certain time [1]. The Project Management Institute (PMI) also defines stakeholders as any person, group and/or organization that is actively involved in the project, or that has interests in, can affect or perceive itself to be affected positively or negatively by the execution or completion of a project [1]. A subset of PM is the concept that refers to the necessity of identifying and managing the relationships with specific stakeholders in action-oriented ways - called stakeholder management [2, 3].

In this first chapter, the topic of project management in information systems is introduced, focusing on the topic of project stakeholders' expectations, as a foundation for the reasons why this research is conducted and its relevancy will be explained. The problem and its scope are introduced, contextualized and its relevancy to Brisa will be explained, as the subject in this research. Its objectives are outlined, seeking to properly assess its efficacy and applicability in this particular enterprise setting, as well as the research questions that guide it.

1.1 Personal Motivation

Organizations are typically function-centric and focus on ongoing day-to-day operations, making many of them resistant to major changes. On the other hand, projects - temporary endeavors undertaken under certain constraints to create a unique product, service, or result [1] (see figure 1.1) - implement the necessary changes that maintain or improve their business operations, which can disrupt existing activities. In the last few decades, companies have been steadily conducting projects seeking to change their operations and/or venture into new business opportunities due to possibilities created by the adoption of IS. This process of using digital technologies to create new or modify existing business processes, culture, and customer experiences to meet changing business requirements is often called digital transformation [4].

IS plays an extremely important role in modern organizations to achieve strategic objectives. They are present in almost every aspect of business and have become core assets, essential to improve

Temporary ⏱	**Unique** ①	**Output** ⮕	**Constraints** ⤋
Start & End	Non routine	Product or Service	Time, Cost, Quality...

Figure 1.1: Key project characteristics according to PM[2] [5]

productivity and managerial decision making, reduce operational costs, and achieve operational excellence [6]. They are also prevalent in the development of new business opportunities that were not possible nor imaginable without the widespread of computers, smartphones, and the internet.

BRISA – Auto-Estradas de Portugal, S.A. is a Portugal-based international transportation company that specializes in highway management which has been operating since 1972. The company is no stranger to technological innovation, demonstrated by its development and introduction of the Via Verde electronic toll collection system - in operation since 1991, and the first to be universally applied to all of the highway tolls in a country. While the core business of Brisa is unrelated to IS, like many other organizations worldwide, its ongoing digital transformation has a toll of its own for the company: to adapt and transform its business to the digital world. This process has had a substantial impact at Brisa, resulting in a regularly increasing number of requested IS projects. These projects are progressively more complex and also involve a growing number of stakeholders, who have a certain power and invested interests in them and their outcomes. Like many other companies, Brisa requires well-tailored applications. Its implementation processes may vary from engaging in customized in-house software development, hiring IS consultancy, and/or acquiring packaged off-the-shelf applications that must then be installed and customized. In every one of these scenarios, a Brisa IS project manager is assigned to each project.

Working as a IS project manager at Digital Transformation team of Brisa's Departamento de Tecnologias e Sistemas (Department of Technology and Systems) (DTS) application development team is a challenge that requires multiple skills. Communication and negotiation are especially important to understand, negotiate and fulfill business demands, solve problems raised by stakeholders and deal with reported issues, conduct meetings and report project status to senior management and steering committees. This role should provide the project leadership that aligns the technical know-how of IS projects with the strategic goals of the business. This involves, for example, negotiating reasonable and achievable deadlines and milestones across stakeholders, project team(s), and with upper management, assuring proper expectations are set about what can be delivered, by when, and for how much.

After joining Brisa, I realized that myself and other fellow project managers had no clear and well-established methodologies or processes to follow and implement across the multiple projects we were managing. As someone new to the role and responsibilities of a project manager in a professional setting, with previous work experience only as a software developer, this represented a significant chal-

lenge. The methods applied across multiple projects by me and each of my colleagues depended on several constraints: project scope, size, type (directed towards external customers, or for internal use in the organization), who performs the implementation (in-house software development team, or a consulting firm), among others factors. To assist in PM activities, some software tools are in place - such as Jira for issue management and tracking. However, no tool is in place that can to assist any of us overcome one of the main challenges identified by myself and my colleagues when managing IS projects: identifying and managing the involvement and expectations of existing project stakeholders.

In face of these difficulties, I proposed that Brisa could benefit from a new solution that could be used by myself and my peers for identifying and tracking existing project stakeholders, assisting in the task of managing the engagement between IS project managers and the existing stakeholders. This dissertation proposal seeks to complement and improve existing practices of Brisa project managers, assisting them through the aforementioned difficulties I experienced performing at this role. I also took it as an opportunity to link my professional role to my college education, presenting said research as the following dissertation, enabling me to achieve the degree of Master of Science (MSc) in Information Systems and Computer Engineering at the Instituto Superior Tecnico (IST).

1.2 Problem Statement

Regardless of how well project deliverables are defined and achieved, scholars, practitioners, and professional institutes share a common view that failure to manage the needs of clients, users and other stakeholders is one of the most common causes of project failure [7–10], and that effective stakeholder management is a key factor for project success [10, 11]. A project cannot be considered successful when it fails to achieve its objectives, but also when it fails to meet (or exceed) the expectations of its stakeholders.

As mentioned in the motivation behind this work, DTS project managers face a problematic endeavor when managing IS projects. Some of them fail to live up to the expectations of existing stakeholders, who can end up disappointed by projects results, whether regarding the deliverables themselves, the milestones and/or deadlines. Others end up dissatisfied with the lack of involvement they had in various phases of these projects or attempt to set requirements that are not in coherence with the perceived needs of the organization, becoming discontent when these are rejected. Modern organizational leaders may be aware of the issue and recognize the importance of addressing stakeholders' needs, but require effective strategies and methods to manage it [12, 13].

Stakeholder management is a topic that has been increasingly discussed in the broader literature of project management, which is relevant concerning how best to satisfy and involve stakeholders prop-

4

erly in projects. The literature suggests that project success depends greatly on the perceptions and expectations of the stakeholders and that managing and engaging them during all phases of the project adds value for everyone involved [14], while poor communication with one or more stakeholders can negatively affect project deadlines [15]. This is not to say that project managers should disregard the need to comply with the objectives and time/cost/performance constraints defined for their projects, but rather they should strive to achieve these objectives while also ensuring stakeholder satisfaction with the project and its outcomes.

The identified problem can be summarized as that due to inadequate processes and methods for management and control of stakeholder engagement, in many projects and companies (such as Brisa), stakeholders are not properly involved in projects, and their expectations are not properly managed, ending up dissatisfied about IS project results.

1.3 Objectives and Scope

The objectives of this dissertation are to analyze the problems and existing methods through which project managers plan and control stakeholder engagement in Brisa's IS projects and implement an alternative solution - aligned with some of the best practices on stakeholder management. This solution is validated through the feedback of an inquiry fellow project managers and other IS practitioners, as well as the results of its use on an ongoing Brisa IS project.

These objectives require conducting a literature study of standard PM methodologies and concepts of stakeholder engagement and management theory. Understanding the current issues involving this topic can provide fundamental insight to understand how they relate to Information Technology (IT) projects. Based on the acquired knowledge, I'll be implementing a stakeholder management framework, in the form of a software application, that aims to improve practices for Brisa IS project managers, facilitating management of stakeholders' expectations and engagement.

This proposed solution shall be tested by myself and fellow project managers to assess their effectiveness and applicability in this enterprise setting. Ideally, the final objective is that these reference management processes are adopted successfully to Brisa's IS projects in the future and help improve stakeholders' engagement and perceptions of project results.

This dissertation will ultimately attempt to contribute to exploring the requirements in order to make the application of stakeholder management processes successful in IS projects. Comparing the perceived best practices on the topic (understanding how to manage stakeholders successfully) along with the identified practical experiences (how stakeholders are currently managed) should lead to added academic and practical value in this field of study. The proposed solution should be developed in such a way

so that it can be used in practice by Brisa's project teams to better manage and control the stakeholder engagement, but also implemented in a generic way that is adaptable to a set of other organizations that may share the same problem.

Having set the context for this dissertation, one can define the following research question that will help guide the work carried out: *can an established stakeholder management framework assist IS project managers improve their engagement of stakeholders during the project life-cycle?* In order to find an answer to this main research question, three relevant sub-questions are formulated. By answering these sub-questions, the main research question can be answered:

1. What are the problems with stakeholder engagement in Brisa's IS projects?

2. What are the some of the best practices for a project manager to effectively manage and control the engagement of a variety of stakeholders in projects, and especially in IS projects?

3. What is the proposed solution to improve the management and engagement of existing stakeholders in IS projects?

1.4   Research Methodology and Document Organization

In order to answer the identified research problem, this dissertation is conducted according to *Design Science Research Methodology (DSRM)* [16], an outcome-based research methodology with notable application in Engineering and Computer Science disciplines and widely used in this field of study. DSRM has three objectives: to introduce a method that can be followed to carry out scientific research, define a body of knowledge based on a set of literary references that support the conducted research, and to define a mental model of the researchers and results of the investigation. Its use in IS research seeks to utilize gained knowledge to solve problems, create change, or improve existing solutions and generate new knowledge, insights, and theoretical explanations for those problems. DSRM always outputs a purposeful artifact which "can be a product or a process; it can be a technology, a tool, a methodology, a technique, a procedure, a combination of any of these, or any other means for achieving some purpose" [17].

In this case, the inefficient/inconsistent methods that support the management and control of stakeholder engagement in Brisa's IS projects is the entry point for the research process (problem-centered initiation). DSRM is conducted as an iterative process with six steps - as shown in figure 1.2.

To address those steps, this document is organized as follows:

- Chapter 1 presents the motivation behind this dissertation, contextualizes the problem we're looking to solve and introduces the topic of stakeholder management. It also states the scope and objectives of this research, as well as the methodology followed to achieve them.
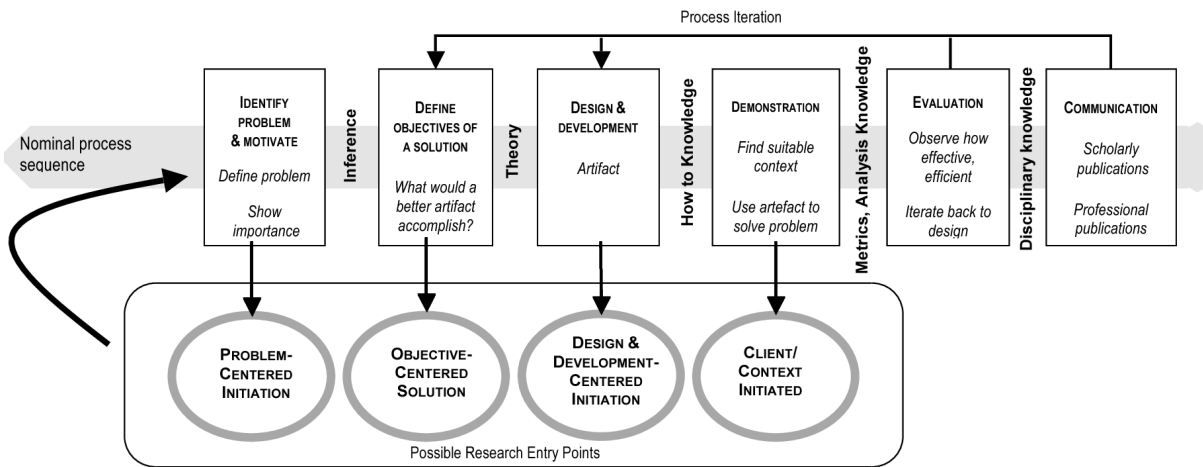
Figure 1.2: Illustration of DSRM key phases.

- Chapter 2 presents an analysis of the problem, focusing on the difficulties of Brisa's DTS project managers to plan and implement their stakeholder engagement strategies in IS projects. It is sought to contextualize this problem in a broader scope through a background analysis of IS projects in general, in similar enterprise settings. Brisa project managers were consulted to understand how stakeholder management and engagement is conducted in practice, establishing the prevalence of the problem and appoint possible causes for it. This chapter should answer the first research sub-question. This chapter addresses the **identify problem and motivate** step (identification of the problem and its importance, defining the research hypothesis and motivation behind it and justifying the added value of a potential solution).

- Chapter 3 introduces a literature study that features the topics of stakeholder theory and its relation to IS projects. It also includes a study of some of the best practices for managing and controlling stakeholder engagement, seeking to establish how project managers can effectively manage their relationship with project stakeholders. Lastly, it includes an analysis into existing commercially widespread project management software and potential features they possess that support stakeholder management activities. This chapter should answer the second research sub-question. It also addresses the **identify problem and motivate** step, as it adds additional context for the motivation for this work.

- Chapter 4 describes the objectives and the performed implementation of the solution that aims to solve the issues introduced in the problem analysis. This chapter should answer the third research sub-question. It also addresses the **define objectives of a solution** (definition of objectives for a solution and the requirements it should meet to fulfill them) and **design and development** steps (main development phase, in which the artifacts (constructs, models, methods, etc.) are designed

7

and implemented to meet the set requirements - this phase is performed in iterations, as artifacts are reviewed and improved based on feedback from the previous iteration(s));

- Chapter 5 presents the performed demonstration of of the proposed solution, applied to a Brisa IS project and an assessment of the results. This is followed by an inquiry performed to a set of practitioners in the IS project sector concerning the implemented solution and registering the received feedback. Based on these, an evaluation is performed, of the solution as an IS artifact and of the performed work according to Research Principles. This chapter addresses the **demonstration** (by using the artifact to solve the requirements of the problem) and **evaluation** steps (review of the proposed solution, by comparing the set objectives and the actual observed results from the use of the artifact);

- Chapter 6 details the conclusions achieved by this dissertation and its solution on how it may help resolve the identified problem. It also assesses if the a viable answer was produced by this work to the main research question, by detailing the identified limitations of the proposed solution. Recommendations for future work concerning this research topic are identified. Additionally, this chapter addresses the **communication** step, detailing what will be done to disseminate the elaborated work. (documentation of the problem, the artifact, its utility and its effectiveness, and dissemination of that knowledge to other researchers as a possible solution to the raised problem).

2

Problem Analysis

Contents

In the following chapter, the problem introduced in Chapter 1, regarding the difficulties of Brisa's DTS project managers plan to implement their stakeholder engagement strategies in IS projects is analyzed in detail. The context is introduced by a background analysis on IS projects in similar enterprise settings so that the problems arising from the lack of well-defined stakeholder management processes and methods are properly understood.

The main constraints of the problem are defined, directly connected to Brisa, but also companies that share similar problems, for which a proposed solution can be derived. The case of Brisa is presented and correlated as a particularization of a wider identified problem. Understanding the problem in detail is vital so that any viable proposed solution is appropriately tailored to the organizations' needs.

This chapter documents the "Identify problem and motivate" step of the followed DSRM methodology, by clearly identifying of the problem and its importance, defining the research hypothesis and motivation behind it and justifying the added value of a potential solution and should answer the second proposed sub-question: '*What are the problems with stakeholder engagement in Brisa's IS projects?*'

2.1   Problem Background

Historically, IS projects have very high failure rates. By 2014, the Chaos Report, elaborated by the Standish Group by surveying IS executive managers, found that only 16.2% of software projects in American companies were completed on-time and on-budget, while 63% of IS projects failed, resulting in cost and time overruns. Even when completed, many lacked several of the original specification requirements - projects completed by some of the largest inquired companies have only approximately 42% of the originally-proposed features and functions. Even worse, 31,1% of projects were canceled before they were ever completed [18].

This report identifies user involvement and executive management support as the top two project success factors. On the other hand, lack of user input and involvement was the top identified factor that caused projects to be impaired and/or canceled, followed closely by unrealistic expectations of stakeholders [18]. Several other researchers assert that the lack of effective stakeholder management is one of the major factors for project failure [6, 12].

Many project managers associate failures in the timely delivery of projects to scope problems and poorly defined requirements. However, it is interesting to highlight that these problems may be associated with failure in the stakeholders' management. For example:

- A relevant stakeholder that was not identified early on project initiation has a chance of raising a new requirement when finally engaged,

- A stakeholder who has the management of his expectations neglected has a greater chance of

introduces change requests even after project delivery,

- A neglected stakeholder (for example, one with perceived low power/influence) that was not properly engaged during the identification of requirements, that will be a recurrent user of the project result after a transition to operation, may end up requesting a substantial amount of changes due to the delivered project not fulfilling his needs/expectations.

The stages of project scope definition and requirement identification involve intense communication with stakeholders. Therefore, inefficient communication while carrying out these work packages may lead to failures in the identification of project requirements, which in turn may generate late requests for new requirements and, consequently, affect the punctual delivery of the project. In the case of IS projects, this lack of adequate involvement may, in extreme cases, lead to an unsuccessful project result with components which are hard to maintain, have higher maintenance costs, assets with components having lower than expected life cycle and/or stakeholders refusing to accept the project [19]. Similar problems may involve stakeholders who impose deadlines and milestones with disregard for the project managers' estimates, potentially compromising quality (to be able to meet these milestones), affecting the end result, and causing future problems in the operations and maintenance phase. Another common difficulty where key internal stakeholders of an organization have been set certain performance targets (often related to bonus payments), which may conflict with the outcomes or priorities of a project and may intentionally try to negatively influence the perceptions of other stakeholders concerning the project and its results.

However, as previously stated, in many projects and companies, stakeholders may not be properly involved by IS project managers, and their expectations properly managed, ending up dissatisfied with IS project results. The more comprehensive problem behind it may be that when a project manager's main focus is set solely on the traditional 'iron triangle' success criteria of cost, schedule, and quality, it is possible to neglect broader stakeholder expectations. The more specific problem, however, is that project managers may lack adequate processes and methods to implement their management strategies for stakeholder engagement. This is not to say that project managers should disregard the need to comply with the objectives and time/cost/performance constraints defined for their projects, but rather they should strive to achieve these objectives while also ensuring stakeholder satisfaction with the project and its outcomes.

2.2   Context Setting in Brisa

The continuous digital transformation of businesses has resulted in companies conducting an increasing number of requested IS projects. Even though its core business is transportation and highway manage-

ment, Brisa, like many other organizations worldwide, has also been affected by digital transformation, currently carrying out more IS projects than ever before, which are increasingly important to the development of its business.

These projects are also progressively more complex and involve a growing number of stakeholders, who have a certain power and invested interests in them and their outcomes. Brisa currently uses multiple IS solutions to support its many business activities, so its IS projects can assume many sizes and forms, including implementations for Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Business Intelligence (BI) and other custom systems (such as client-facing websites and mobile applications), business process improvements through Robotic Process Automation (RPA), systems migrations, infrastructure enhancements, and others. Brisa requires well-tailored solutions, so its implementation processes may vary from engaging in customized in-house software development, hiring IS consultancy, and/or acquiring packaged (or customized) off-the-shelf applications. In every one of these scenarios, a Brisa IS project manager is assigned to oversee each project.

IS project managers in Brisa belong to the DTS, the organizational department responsible for providing technological services within the company. Its primary functions are to manage the development, acquisition, and maintenance of hardware and communication networks, as well as data warehousing and development of its software systems. It is headed by a Director of IS that leads the strategic management of the department, followed by three deputy directors. Each of the deputy directors is in charge of one of the three main department divisions: Applicational Development (software-focused), Networks and Infrastructure (hardware-focused), and Toll Technologies. The department pyramid unravels into a broader base, with several units and segregation of competences. The department is composed of professionals with expertise in the field of IS, ranging from systems analysts and Database Administrators to project and senior managers. The Applicational Development division is composed of several work teams, each focused on the development, operation and/or maintenance of a specific type of software application (such as Data Analysis, Customer Care, Digital Transformation, among others). These teams do not employ software engineers/programmers, instead working fundamentally as a Project Management Office (PMO) that provides support project management services to each of its members, with its responsibilities ranging from managing several different (but related) projects and assisting in linking projects to the businesses strategic goals. Systems development/implementation is subcontracted and managed by one of the team's members.

Every new IS project that is requested by one of the business departments (such as Finance, Human Resources, Commercial, and/or Product Management) is assigned to one of the existing DTS work teams, according to the project's nature and complexity. All project roles, responsibilities, and authorities are subsequently attributed. One of the members of the appointed leading unit is placed in charge of the management of the project. The project teams constitute a temporary organization composed of el-

ements of several different organizational departments, where members are rarely allocated exclusively in the execution of a single project. The same applies to the development (programming) teams, which are composed of outsourced programmers and software engineers (who may be working within Brisa or on their respective consulting company), and who may be allocated to one or more projects simultaneously.

Most of the company's project managers follow the 'traditional' waterfall model described by Winston Royce [20], that is, there is a breakdown of project activities into linear sequential phases - a phase of initiation and collection of requirements, system analysis resulting in models, schema, and business rules, architecture design, implementation, testing, acceptance, deployment, and maintenance. These steps are followed by operations, in which occurs the installation, migration, support, and corrective or evolutionary maintenance of the created system. The implementation phase can often be oriented through Agile methodologies. A project result may only be moved to the Production environment after it has been accepted by a project delegate of the requesting business department/unit.

2.2.1 Stakeholders in Brisa's IS projects

There are elements of several departments who are relevant stakeholders to many existing IS projects - and all of these departments have their own different agendas and priorities that may differ from the projects themselves. These agendas justify and motivate the political nature of the work the project manager must perform concerning its stakeholders, such as building and maintaining alliances with functional areas leaders.

The project manager may also have to recognize danger signs, especially those connected to stakeholders that can exert more power over the project. Some of these signals include:

- Stakeholder interference in the project without consulting the project manager;

- Stakeholders not providing support when needed;

- Stakeholders making groundless promises or promises without support.

Only a project manager who builds credibility and knows how to insert himself in the power structures of his company (through thorough knowledge of the stakeholders and their potential for influence) can recognize these warning signs and defuse the risks before a worse scenario takes place [21].

2.2.2   Stakeholder Management Problems in Brisa IS Projects

To assess the impact of the aforementioned problem while assessing the theme for this dissertation, preliminary analysis on the topic was performed through my own, personal experience as a project manager in Brisa and by inquiring some of my project manager peers, as well as a few stakeholders of existing projects. This was performed by asking unstructured questions to assess how stakeholders were engaged by my fellow DTS project managers during a project life-cycle and what problems were identified in this process. To establish a measure of the relevancy of this problem at Brisa, some possible causes of this issue were identified by myself and my peers, such as:

- Failure to identify all of the relevant stakeholder and their expectations, needs, and concerns, as well as their power and interest levels in project outcomes;

- Difficult relationships between project managers and some stakeholders, who may try to impose unfeasible delivery dates before consulting and including the DTS in project initiation, or require changes in scope during the implementation phase.

- Different hierarchical levels between the project manager and the stakeholder, causing a poor communication link;

- Due to existing project constraints (especially delivery dates, often due to underestimates), the attention of the project manager is focused on how to realize the project and less on stakeholder engagement and management;

- A perception that several internal and external stakeholders do not add value to the project and/or to its design, and therefore don't have to be thoroughly involved;

- Lack of effort to get additional details from stakeholders who do not have the knowledge, capacity and/or ability to specify functional requirements during the project planning phase - resulting in an incomplete requirement specification;

- Ineffective, unclear and limited communication and involvement between the project team and its stakeholders after the project analysis and design phase;

One of the problems in this role lies in the fact that the DTS does not institute any well-established standards or methodologies that orient the management of stakeholder involvement and engagement, that could be followed and implemented across multiple projects. To assist in PM activities, some software tools are in place - a good example is the use of Jira for issue management and tracking during the implementation phase of projects. However, there is no tool in place that can assist in the identification and management of the involvement, engagement, and expectations of existing project stakeholders.

2.3 Conclusions

The perceived successful completion of IS projects in a company such as Brisa will greatly depend on how its stakeholders view it. Thus, successful stakeholder engagement must be seen as a vital prerequisite.

Considering the presented case study of Brisa's DTS department, that allowed the identification of the raised problems, taking into account valuable interviews that allowed to better understand the problem, and the remaining investigation performed into the problem, the main causes identified for improper stakeholder engagement were:

- Lack of effort in the consistent identification of all relevant project stakeholders and the key stakeholders among them;

- Lack of creation and implementation of a structured stakeholder management plan and/or methods to manage the stakeholder engagement during the project;

- No evaluation of the stakeholder engagement and satisfaction during the remaining project lifecycle, after the analysis and design phase.

The proposed hypothesis is that the identified problems can be attributed to the lack of specific tools that assist in performing effective stakeholder management. A prevalent example is that of stakeholder identification, in which valuable information about project stakeholders is scattered between countless spreadsheets, emails, and other tools, requiring substantial effort on collecting information from multiple sources. Addressing this hypothesis with a solution proposal could potentially add substantial value to the organization and the management of its IS projects.

3

Literature Study

Contents

In this chapter, references from the literature review pertaining to stakeholders and their involvement in IS projects are analyzed. The topic of project management is also presented, focusing on the best practices set by these standards in the topic of stakeholder management, elaborating on the essential knowledge to understand the problems addressed in this work, focusing on the state-of-the-art literature on project stakeholders and their engagement. This is followed by a comparison of two existing commercially widespread project management software and their stakeholder management features.

These findings are to be used as a body of knowledge so that an adequate solution can be proposed and so that a possible answer is given to the first proposed sub-question: '*What are some of the best practices for a project manager to effectively manage and control the engagement of a variety of stakeholders in projects, and especially in IS projects?*'

3.1 Stakeholders

3.1.1 Definition

The term 'Stakeholder' is derived from stakeholder theory, an approach to organizational management and business ethics that addresses morals and values in managing an organization. This approach was proposed by Edward Freeman in his book *Strategic Management: a Stakeholder Approach* (1984) [2] and revisited by the same author in *Stakeholder Theory: The State of the Art* (2010) [3]. In them, Freeman opposes the traditionalist view of a company, in which only the owners or shareholders of the company are considered important, questioning if business leaders should make decisions about their conduct without considering their impact on those who will be affected by them? [2].

Freeman is considered to be one of the early proponents of this wider view of organizational stakeholders, defining them as *"any group or individual who can affect or is affected by the achievement of the organization's objectives"*, a high-level definition that addresses organizational stakeholders, rather than project stakeholders. Another key definition used in the subsequent scientific literature on the topic was that of David Cleland: *"stakeholders are those whom have a vested interest in the outcome of the project"* [22]. Another well-accepted definition that is used in recent literature [23] is that of the PMBOK: *"an individual, group or organization who may affect, be affected by, or perceive itself to be affected by a decision, activity or outcome of the project"* [1]. Some of the most common project stakeholders are [8, 11]:

- Customers (internal and external)

- Suppliers (internal and external)

- Employees

- Senior Management

- Neighbours (physical and/or within the supply chain)

- Resource providers (people, time, finance, consents, investors)

- Government and Regulators (local, national, European Union (EU))

- Opinion formers (media, commentators, unions, internal departments)

- Competitors

Several scholars have proposed reducing the complexity of analyzing stakeholders by grouping them into different categories based on their perspective of how they are viewed [2, 24, 25]. Project managers may have to deal with people both inside and external to the organization, which is more complex than what a manager in an internal environment faces. For example, suppliers who are late in delivering crucial parts may compromise a project schedule. To compound the problem, project managers generally have little or no direct control over any of these individuals. Freeman originally provided the stakeholder model which distinguished between internal and external stakeholders [2]. Internal stakeholders include those that are situated within the company and affect the daily routine of the project, such as managers and employees. External stakeholders are those who are not directly linked to the project and/or organization but can influence the activities of the project in various ways [1]. Of those two, the type most usually recognized is the external stakeholder - the customer is often seen as the main stakeholder -, however, the management of expectations of internal stakeholders is often considered more problematic in the literature (as they may have the most to lose from the firm's actions when changes are implemented [26]). Nonetheless, project managers should not relegate external stakeholders to an inferior position, because they could gain sufficient power to influence managerial decisions [13].

The aforementioned definitions are broad and can potentially identify many persons and groups. In fact, scholars note that project managers may experience difficulties identifying which stakeholder groups should be consulted [28], while others found that project managers who had difficulty identifying their projects' stakeholders would exceed allocated budgets and schedules [29]. Since project managers have limited resources and time to allocate to their stakeholders, they are compelled to make decisions based on prioritization, by identifying which stakeholders can contribute the most to the fulfillment of project activities and commit to meeting their expectations [30]. This introduces a challenge to determine and focus on those stakeholders who are interested and/or influential enough to prevent or help them deliver a successful outcome for the project - key stakeholders [31].

Stakeholders have a dual relationship with project performance because their actions can influence it and its results may affect their interests [10]. From a stakeholders' point of view, a project is an opportunity to influence the end-result for their own objectives, goals, or mission as an individual or organization.
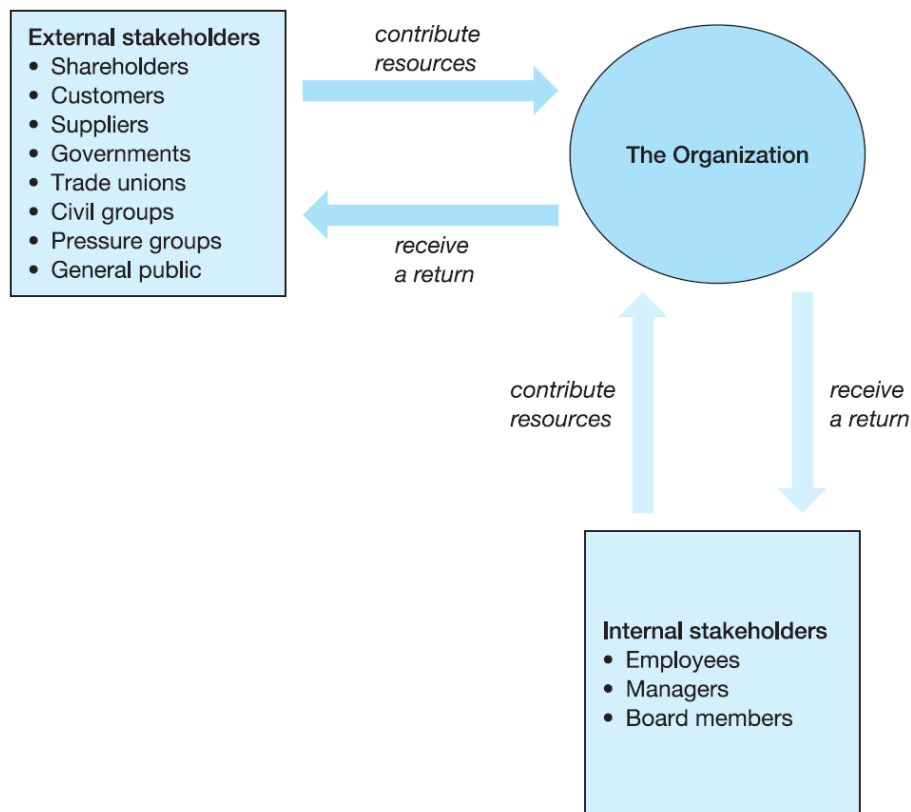
18

Figure 3.1: Stakeholders and the exchange relationship - stakeholders provide resources of one kind or another in exchange for a return from the organization [27].

Stakeholder relationships with project managers should be reciprocal in nature, where both parties provide inputs and expect to receive outputs - so it should be an early objective for a project manager to get a clear set of success criteria for the project from stakeholders.

However, stakeholder interests may not always be aligned (as different stakeholders may have conflicting interests and success criteria), or even their interest be a positive one (as some could be interested in seeing the project fail rather than succeed). Since stakeholders' objectives are not always aligned with company objectives, in order to effectively target and manage the influence of key stakeholders, the project manager must understand the drivers behind their vested interests. Stakeholders can, therefore, be additionally classified in terms of their project interests as follows:

- **Beneficiary Stakeholders**: motivated by the project because they will benefit in some way when it achieves its objectives. Can be used as promoters for the project - their support should not be taken for granted: if they don't know or understand the benefits they will gain, they will at best be non-committal, and at worst be misguided opposers to the project. The project manager must ensure that communications with such stakeholders set out the specific benefits to them.

- **Loss Stakeholders**: projects are designed to cause changes, meaning the gains generated in

19

one area might implicate losses in others. For the losers, this may be a tangible loss (for example, a competitor may lose market share), or an intangible loss of powerful personal value (such as the loss of status or influence). Since project managers are often only focused on achieving the benefits to be derived by their project, identifying loss stakeholders may be particularly difficult, as well as developing strategies to manage their expectations. An individual's desire to retain the status quo is often more powerful and strongly defended than a desire for beneficial change for the majority, so it may prove impossible to move loss stakeholders to a point of support for the project, but they must either be moved to a position of neutrality or their influence be suppressed.

- **Regulatory Stakeholders**: charged with ensuring that a project execution complies with defined regulations and standards and/or that the resulting outputs from the project will not breach defined regulations and standards. These will not be active supporters, but if led to believe their requirements are not being met they can become active and powerful opposers. The project manager must ensure that any regulatory requirements are clearly defined and understood and, through communication with these stakeholders, clearly show they are being met [8].

While the adoption of stakeholder theory in business practices has been the cause of some debate, researchers appear to agree on some of its basic premises: that organizations generate relationships with individuals or groups that influence or are influenced by the company's actions [2], that it focuses management decision-making [24] and that organizational leaders and managers should attempt to understand and balance the interests of their various stakeholders [32].

3.1.2   Stakeholder Management

Stakeholder management is an important (and sometimes underestimated) activity when developing a project that is considered, from both a professional and an academic standpoint, to be extremely important for achieving success in projects. A project can be considered successful when it achieves its objectives and meets or exceeds the expectations of its stakeholders [33].

It is difficult to identify a common and widely used definition for stakeholder management, as there are multiple ones by different authors. The Association for Project Management (APM) Body of Knowledge (5th Edition) proposes that it *"is the systematic identification, analysis, and planning of actions to communicate with, negotiate with and influence stakeholders"* [34]. In the PMBOK, it is described as *"including the processes required to identify people, groups or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution"* [1]. These definitions can be further refined as the continuous development of relationships with stakeholders which evaluates their needs and expectations to achieve successful project outcomes.

There are three key features of this definition: first, this is not a 'one-time' activity (it is performed continuously throughout the project life cycle). Second, it is a two-way process (a relationship), not just communicating stakeholders what is going to be done – the project manager must listen and negotiate as well. Third, stakeholders make subjective assessments of what constitutes project success, which will be remembered by them long after compliance with the more objective success criteria of time, cost and performance have been forgotten - and for recurring stakeholders across several projects, it is essential to safeguard support for future projects (ensuring the success of the current project but also the future ones as well).

According to Jergeas et al. (2000) [35], the following negative effects can occur when stakeholders are not properly managed:

- relevant stakeholders dissatisfied with the project outcome;

- interruptions or delays in the project that end up affecting the budget and the deadline;

- insufficient endorsement for the project, even to start it;

- problems that may impact the relationship with stakeholders and the project team, which may impair working together on future projects;

- conflicting stakeholder needs;

- new inputs that show up later in time, and/or requirement ambiguity;

Through stakeholder management, a project manager implements processes and activities that result in effective participation of relevant project stakeholders and consequently in opportunities to benefit a project from their engagement, resources, and influence [36]. However, there is little consensus on what constitutes effective stakeholder management strategies [11], as there are multiple proposed approaches.

Many similar practices exist across industries, much due to organizations offering standardized project management certifications. Formal training programs and methodologies, such as PM^2 or Project Management Professional (PMP), provide project managers with the knowledge to identify and manage a range of project performance criteria. These criteria have evolved to be broader than the traditional 'iron triangle' (cost, schedule, quality), now including a range of core competencies required by individuals working in the field of project management. Part of these competencies, as proposed by the International Project Management Association (IPMA) Individual Competence Baseline (ICB), includes the ability to realize the agreed tasks successfully to the satisfaction of the stakeholders [37].

3.1.3   Stakeholder Theory in Information Systems Projects

While Freeman proposed stakeholder theory as an aid to strategic decision making [2], Cleland proposed its application to develop stakeholder management strategies for IS project management [22]. IS projects are complex in terms of technological innovation, may differ greatly in size, number of interfaces between the stakeholders involved, and can have internal or external facing characteristics that should be taken into account in their management. A major example is that organizations seek to reduce costs by outsourcing or offshoring IT services [12], requiring project managers to develop a wider range of technical and analytical (soft) skills [38] to cope with a wider range of demands and/or geographical spread of important stakeholders. Another unique feature is that, very often, the cost of an IS project is tangible, while many of its benefits are intangible. Although they share the same conceptual basis of traditional project management, much due to this domain-specific nature of IT systems, the application of stakeholder theory to IS projects may be differentiable [25].

IS project managers work in an environment that is under serious and fast change, due to organizations adapting to the challenges and business opportunities brought by globalization and the widespread of the internet. In this context, stakeholders are usually numerous and have interdependent relationships, are sometimes difficult to identify and their involvement largely depends on the context of the project. Project managers whose projects introduce new technologies to organizations may end up engaged for several years throughout the project life cycle. During that time, they will face a range of challenges managing a diverse range of stakeholders - who may enter and/or leave the organization during the life cycle, or may change priorities in response to dynamic market conditions. As an IS project progresses along its life cycle, managers may have to switch attention from one group of stakeholders to a different one. For example, in an initiation phase, a project manager of an IS project may be working closely with senior management, finance, and/or product managers to define technical and business requirements. In later stages, the focus may switch to subject matter experts, technical staff, and/or outsourced partners.

Stakeholder interest and commitment may also change during the project, so understanding that the intensity and engagement of stakeholders might change during the life cycle requires project managers to continually identify which stakeholders are relevant to their projects and at which point in time. These changes of interest and commitment over time may cause misalignments between an IS project managers' perception of stakeholder expectations and their actual expectations, which may present a substantial challenge since they should maintain support from this broad stakeholder community [10]. To mitigate this problem, it is proposed that project managers encourage stakeholder involvement and dialogue starting in the project's planning phase, and continue to promote that involvement throughout the remainder of the project life cycle [39].

Even though the importance of managing stakeholders during the full duration of projects is recog-

nized by multiple scholars, the research in the field is limited regarding how stakeholders' expectations change during an IS project life cycle [11]. For example, Badewi (2016) found that stakeholders are influenced by their perceptions of new technologies and maybe conditioned *a priori* to display positive or negative attitudes that may promote or resist changes introduced by certain technological projects. It also found that IS project managers may end up ignoring stakeholder needs and focus on the iron triangle criteria if they lack maturity, experience, and/or managerial support [6]. Keil et al. (2014), on the other hand, identified a misalignment between IS project managers and business managers' perspectives on IT projects, who are often focused on bringing solutions to market without constraints and as fast as possible to enable a possible competitive advantage, while the project managers are focused on other aspects, such as costs, quality (especially regarding the needs for future maintenance in operations), development, delivery processes and functionality [40].

As stakeholders may disagree on several project aspects, negotiation is only possible if stakeholders' expectations are clearly identified and constantly verified. Project managers have limited power to resolve differences between stakeholders who are opposed, so there may be times when managerial support will be required to rectify issues, requiring senior management to have a facilitation role to attenuate stakeholder demands and find appropriate solutions [1].

The commitment of stakeholders is one of the most significant IS project success criteria, but the level of differences between IS projects renders an application of a universal set of measurement criteria for stakeholder engagement and satisfaction unpractical and unrealistic [12]. For example, a situation where some stakeholders (e.g. customers) may qualify a project to be successful, despite other stakeholders (e.g. business managers) qualifying it as a failure if the project did not meet their expectations (e.g. perceived product adoption). Another possible example is that of a marketing manager that may require additional functionality of a software system to satisfy a new organizational campaign, but the finance manager may disagree with increasing the budget to accommodate the changes. These situations present an additional project management challenge: how to define and appraise project success criteria, since stakeholders often disagree on what constitutes success, given their broad (and sometimes conflicting) range of demands.

3.1.4 Conclusions

In conclusion, the conducted research suggests that the project success depends greatly on the perceptions and expectations of the stakeholders, and that managing and engaging them during all phases of the project can add value for everyone involved - as their requirements, expectations, perceptions, personal agendas and concerns will influence the project, shape what its perceived success looks like, and impact the outcomes that can be achieved. Hence, IS project managers can increase an organi-

zation's value by understanding their stakeholders' interests and integrating their knowledge, skills, and experience by involving them actively in IT projects. They can take advantage of a multidimensional stakeholder approach encompassing a broader view on their expectations, covering wider ranges of project benefits and enabling long-term strategic perspective [28].

For an effective application of stakeholder theory in IS projects, organizations require management strategies that are adapted to this specific industry [25]. It is essential to have a formal process to identify, manage, and understand how project stakeholders may be impacted by project decisions and react to them, interact with each other and with the project manager - in short, how these stakeholders can affect the chances of project success [22]. It is recommended that IS project managers follow a framework that includes stakeholder management processes [1], of which some of the best practices and standards will be analyzed in the following section.

3.2   Stakeholder Management Body of Knowledge

In the following subsections, four international standards and frameworks selected due to being considered by professionals and academics alike as some of the best practices in the field of project management are introduced and reviewed. Each of these state relevant processes and methods that can be applied to better engage with stakeholders and manage their requests and expectations. This compilation of standards and their comparison constitutes an effective strategy to help define a viable solution for the identified problem.

3.2.1   Project Management Body of Knowledge (PMBOK)

The PMBOK is a set of standard terminology and guidelines for managing individual projects that define PM as the application of knowledge, skills, tools, and techniques to meet project requirements. It defines project-related concepts, describes the project management life cycle and its related processes, as well as the life cycle itself. It is based on the most relevant research and best practices collected by practitioners in the field of project management, compiled and systematized as a body of knowledge of what is required to effectively manage projects. This notion is based on the underlying assumption that there are identifiable patterns and generalizations, from which rules, controls, and guidelines for best practices can be established, that are replicable, even if not on absolutely every circumstance [41]. The PMBOK is compiled and published by the PMI as *A Guide to the Project Management Body of Knowledge (PMBOK Guide)* [1, 42].

The PMBOK recognizes 47 typical project management processes, which can be organized into five

main process groups - Initiating, Planning, Executing, Controlling, and Closing. The same management processes can also be organized into ten project knowledge areas: Communication, Cost, Human Resources, Integration, Procurement, Quality, Risk, Scope, Time, and Stakeholder Management. Despite the increasingly common view that remarks on the importance of project stakeholder management and its positive correlation to successful project outcomes, it was only in 2013 that the PMI introduced a specific chapter in the PMBOK dedicated to stakeholder management.

The PMI defines project success as projects which were completed within the constraints of scope,
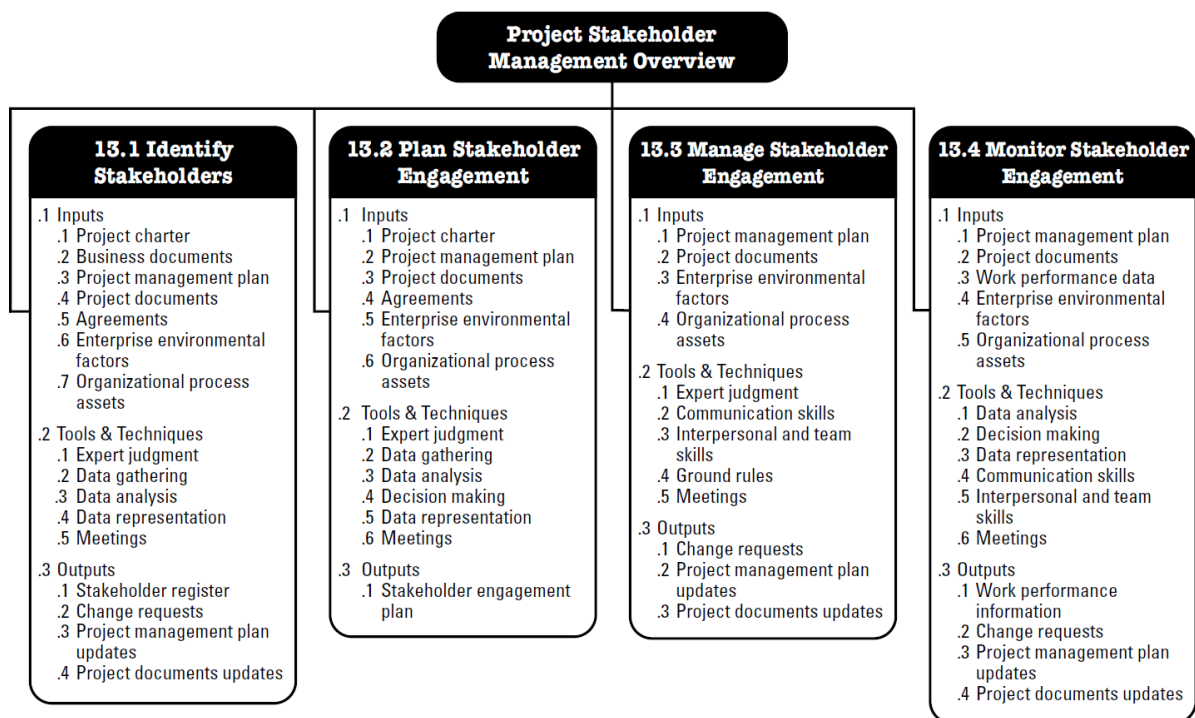
Figure 3.2: The four main Stakeholder Management processes, according to the PMBOK [1].

time, cost, quality, resources, and risk. However, this definition fails to explain which success criteria should be used by project managers to measure and appraise how the project outcomes and/or the conduct of stakeholder management met the stakeholders' expectations. Additionally, the PMIs definition fails to account for a broader stakeholder community other than internal staff and management.

There are four main stakeholder management processes recognized by the PMBOK, as seen in figure 3.2. Although these processes are described only once, it is noted that the activities to implement them should be reviewed and updated routinely especially when the project moves through different phases, if some stakeholder is no longer involved, if a new one joined, or if there are significant changes in the organization.

3.2.1.A   Identify Stakeholders

The process of identifying the people, groups, or organizations that could impact or be impacted by decisions, activities, or outcomes of a project. Implementing this process involves analyzing and documenting any relevant information about every pertinent stakeholder, their interest, involvement, influence, and potential impact on project success. The key benefit of this process is that it enables the project manager to identify each stakeholder and define the appropriate focus for engagement with them. The process of stakeholder identification is part of the initial phase in the development of a stakeholder management strategy and should commence as soon as possible after the project charter has been approved, the project manager has been assigned and the team begins to form. Deficiencies in this process to define key stakeholders can have a detrimental effect on projects [1].

Some questions that can help understand and identify relevant project stakeholders include:

- What financial or emotional interest do they have in the outcome of the project? Is it positive or negative?

- What motivates them most of all?

- What information do they want from the PM, and what is the best way of communicating with them?

- Who influences their opinions generally, and who influences their opinion of the project? Do some of these influencers, therefore, become important stakeholders in their own right?

- If they aren't likely to be positive, what will win them around to support the project? If unsupportive, how to manage their opposition?

Stakeholder identification does not prevent the interests of some stakeholders overriding the interests of others affected, but it ensures that all affected will be considered [43], and that project managers can subsequently allocate time and effort towards higher priority stakeholders.

This process should output a Stakeholder Register that contains several details about the identified stakeholders - identification information (name, organizational position, project role, contact info), stakeholder category (external/internal, supporting/neutral/resistant) and assessment information (major project requirements, main expectations, potential influence). The Stakeholder Register should be elaborated through appropriate techniques, such as project meetings (used to exchange and analyze information about roles, interest, knowledge, and the overall position of each stakeholder), consulting with expert judgment (such as senior management) and by performing proper stakeholder analysis. There are multiple classification models used for stakeholder analysis, such as:

- *Salience Model:* Describing stakeholders' level of salience by calculating if they possess one or a combination of power (ability to impose their will and/or capacity to influence other stakeholders'
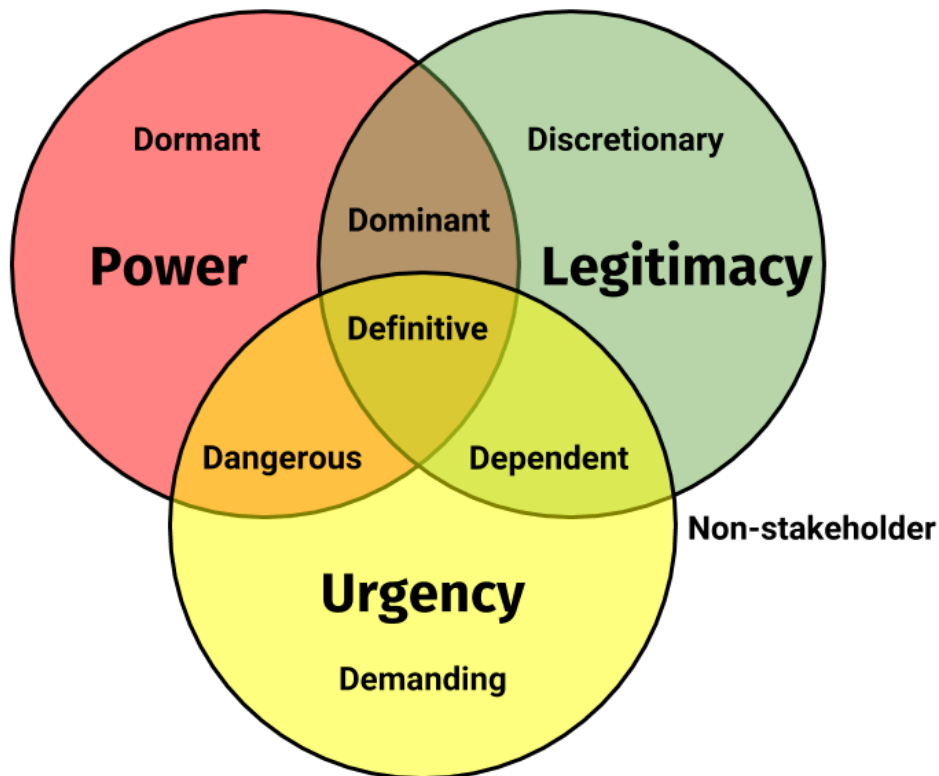
Figure 3.3: Salience Model intersections according to PMI [1].

decisions), urgency (need for immediate attention based on a stakeholders perception of time and criticality for management to undertake a predefined activity), and legitimacy (appropriate involvement through a responsible and desirable manner, and abiding by societal rules and norms). The salience model is dynamic and accommodates stakeholders' attributes which may change over time. [44] - See figure 3.3.

- *Power/Interest Grid:* Grouping stakeholders based on their level of authority ("power") and their level of concern ("interest") regarding the project outcomes (also known as Mendelow's Matrix [45]) - see figure 3.4. This matrix divides four different types of stakeholders that need to be managed and communicated with differently:

  – **Players:** stakeholders who have a big interest in the project status and a lot of power. They are generally senior management and alike. Should be managed closely with regular status updates and be kept satisfied at all times. These may not just want to be informed, but also always be involved in relevant discussions and decisions to get early buy-in and feedback.

  – **Context setters:** stakeholders who have a lot of power, but not much interest. These can be, for example, shareholders and government regulators. It is relevant to keep them satisfied
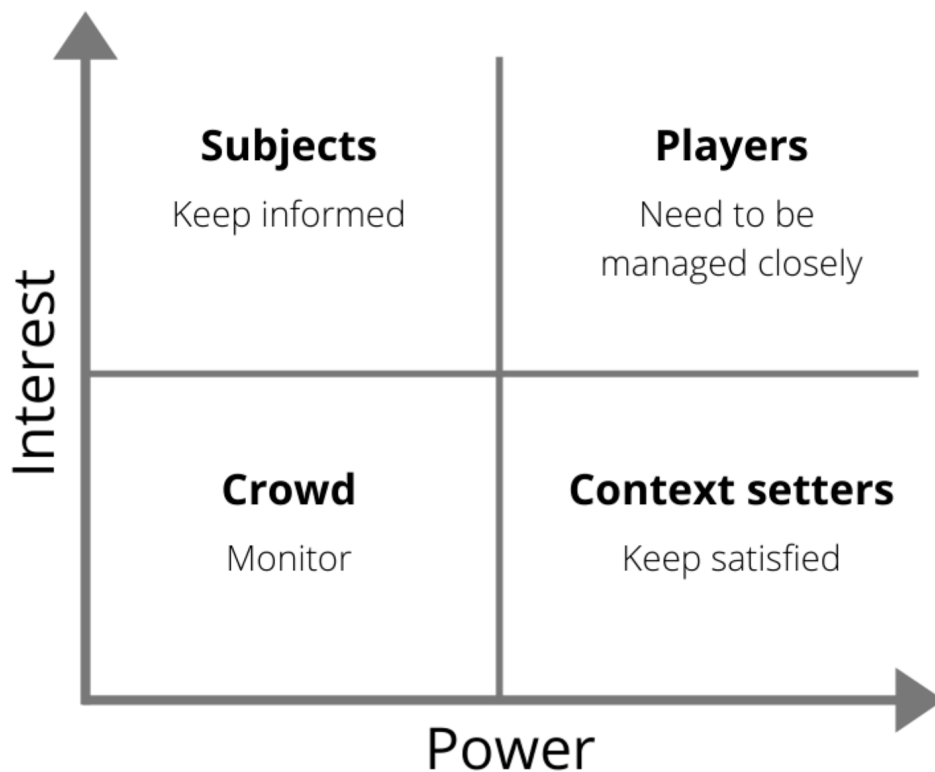
Figure 3.4: Power vs. Interest Grid as proposed by Mendelow [45].

with updates and visibility into the project and anything else that may be meaningful to them. It is important to follow up on their feedback on project-related topics.

– **Subjects:** stakeholders with a lot of interest and not much power. Should be informed through regular project updates if considered relevant enough.

– **Crowd:** all the people and departments which have low interest and low power. Should still be monitored.

• *Power/Influence Grid:* Grouping stakeholders based on their level of authority ("power") and their active involvement ("influence") in the project, a different but similar approach to the original power/interest matrix.

When identifying stakeholders in broad projects (such as those involving IS), there is a necessity to choose between a broader view, where a high number of stakeholders will be identified, or a narrower view, where a low number of key individuals and/or stakeholder groups are identified. The problem with a choice of a narrower view is that it may unknowingly exclude important individuals, who may take objection to their exclusion. The problem with a broader view, on the other hand, is that it includes a large group of people, which will be infeasible to manage. Project managers should be aware that some stakeholders may have to be included in the stakeholder analysis based on their political or social ties

with the organization, or a person in the organization holding a position of power.

There are also cases where a group of stakeholders may have a nominated single point of contact, but this person is not really the 'client', just a representative. Very often it is the case that this person has the responsibility of juggling a whole range of different requirements that originate from within the client organization/department and as a result, they will be subject to many influences that may well affect the project.

3.2.1.B   Plan Stakeholder Management

The process of developing appropriate strategies to involve the identified project stakeholders, based on their needs, expectations, interests, and potential impact on the project, throughout the project life cycle. The key benefit of this process is providing an actionable plan to interact effectively with stakeholders. This process is performed periodically throughout the project, starting right after the project stakeholders have been identified by the Identify Stakeholders process.

This process should output a Stakeholder Management Plan that details the management strategies required to effectively engage stakeholders. In addition to the data gathered in the stakeholder register, it provides identified interrelationships and potential overlap between stakeholders, scope, and impact of changes to stakeholders, communication requirements for each project phase and what information should be distributed to stakeholders, the reasons for it and the time frames and frequency for the distribution. Implementation of this process can be assisted by methods such as meetings (held to define the required engagements levels for stakeholders), consulting with expert judgment (that have insight into the relationships within or outside the organization) and analytical techniques (such as a stakeholders engagement assessment matrix, portraying a comparison of the current engagement level of stakeholders to the planned engagement levels required for successful project completion - see figure 3.5). The engagement levels of stakeholders can be classified as:

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Stakeholder 1	C			D	
Stakeholder 2			C	D	
Stakeholder 3				D C	

Figure 3.5: A stakeholders engagement assessment matrix as described by the PMBOK (C=current level of engagement; D=desired level).

- **Unaware:** Unaware of the project and its potential impacts.

- **Resistant:** Aware of the project and its potential impacts and is resistant to change.

- **Supportive:** Aware of the project and its potential impacts and is supportive to change.

- **Leading:** Aware of the project and its potential impacts and is actively engaged in ensuring the project is a success.

3.2.1.C Manage Stakeholder Engagement

The process of acting on the elaborated Stakeholder Management Plan by communicating and working with stakeholders to meet their needs and expectations, address issues as they occur and foster appropriate stakeholder involvement in project activities during the project life cycle. The key benefit of this process is that it allows the project manager to increase support and minimize resistance from stakeholders through a focus on continuous communication with them. This process is performed continuously throughout the project, making sure stakeholders clearly understand the project goals, objectives, benefits, and risks for the project, as well as how their contribution will enhance project success.

Unlike the two previous processes, this process outputs updates to the existing stakeholder register, stakeholder management plan, issue log (a part of the issue log should be dedicated to managing stakeholder issues), and may possibly raise change requests. The techniques used for the process are centred on communication methods (namely the raised information about the stakeholders' communication requirements) and interpersonal and management skills (such as negotiation, facilitation, ability to influence people, and the ability to overcome resistance to change).

Stakeholder engagement has two main levels: involvement and participation. In this instance, involvement means giving information to increase a stakeholder's knowledge of the project and receiving that stakeholders' expectations. Participation meaning a higher level of engagement by working together with stakeholders of a specific project. Junior et al. (2015) further break down these two main levels into the existing five sub-levels for managing the engagement of stakeholders [36]:

Stakeholder Involvement:

- **Inform:** provide the stakeholder with balanced and objective information to assist them in understanding choices and/or dilemmas (by elaborating a good introduction, background, and a clear problem statement);

- **Consult**: obtain the stakeholder's feedback on choices and/or dilemmas (by asking for data, experience and sharing a timeframe or deadline).

Stakeholder Participation:

- **Involve:** work directly with the stakeholder during the project life cycle to ensure that their concerns and aspirations are consistently understood and considered;

- **Collaborate:** to partner with the stakeholder and get assistance for the project activities;

- **Empower:** to place a certain degree of decision making in the hands of the stakeholder.

3.2.1.D   Monitor Stakeholder Engagement

The process of monitoring project stakeholder relationships and held communications. This process involves the tailoring of more appropriate strategies for engaging stakeholders through modification of the previously defined engagement strategies and plans. The key benefit of this process is that it maintains or increases the efficiency and effectiveness of stakeholder engagement activities as the project evolves and its environment changes. This process should be executed at regular intervals throughout the project to re-assess the effectiveness of the Stakeholder Management Plan.

3.2.2   ISO 21500: Guidance on Project Management

ISO 21500:2012 is an international standard developed by the International Organization for Standardization (ISO) that provides a high level description of the core concepts, principles, and processes that are considered to form good practices in project management for the successful realization of projects. It intends to provide generic guidance that can be used by any type of organization (including public, private, or community organizations) and for any type of project (regardless of complexity, size, or duration) [46–48]. ISO 21500 is a comprehensive reference in the field of PM, covering the whole project life cycle - according to the Pareto rule, 80% of this guideline is likely to be generally applicable to most projects.

This standard states that projects are conceived as an organizational strategy that identifies opportunities, that are evaluated and documented. The selected opportunities are further developed in a business case (or another similar document) and can result in one or more projects. This leads to the project governance phase of the project life cycle, in which the policies, processes, and methodologies to be used, the project management structure, the stakeholder responsibilities, and accountabilities are all defined, and implementation is performed. In the end, the project provides deliverables that can be used to realize benefits that can be an input to realizing and/or further developing the organizational strategy (as illustrated in figure 3.6).

The project organization may include some the following roles and responsibilities, such as the project manager (leads and manages project activities and is accountable for project completion), the project management team (which supports the project manager), the project team (which performs project activities) and a project support office (support project management functions and helping link
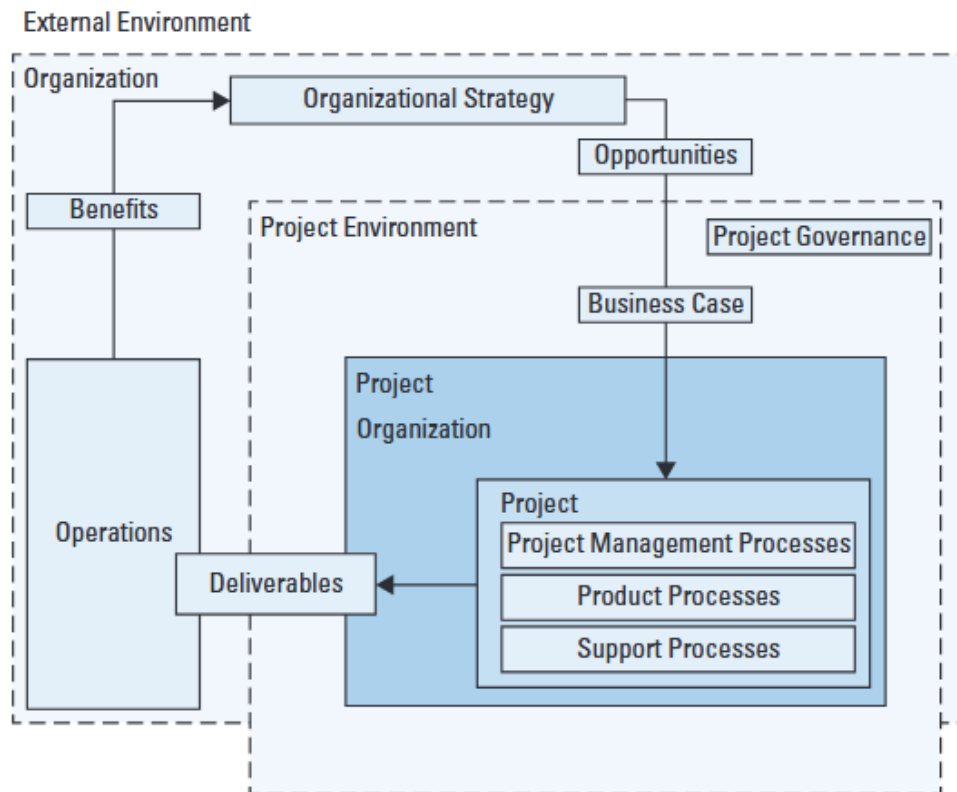
Figure 3.6: The PM context concepts and their relationships identified by ISO 21500 [48].

projects to strategic goals). On the other hand, the project governance may involve a project sponsor (who authorizes the project, makes executive decisions and solves conflicts beyond the project manager's authority), and a project steering committee (providing senior-level guidance to the project).

ISO 21500 is structured in four clauses (plus annexes): scope, a group of project management terms and definitions (streamlining communication through a shared vocabulary), concepts that play an important role during the execution of most projects and the relationships among them and the recommended processes that should be applied when managing a project.

Processes applied to projects are categorized into three major types - project management processes, delivery processes, and support processes. ISO 21500 addresses only the PM processes, that are categorized in two different perspectives - process groups (Initiating, Planning, Implementing, Controlling, Closing) and subject groups (Integration, Stakeholder, Scope, Resource, Time, Cost, Risk, Quality, Procurement, Communication). By implementing these processes, all activities are performed that are relevant for managing a certain aspect or phase in a project.

All of the processes transfer inputs into useful outputs, which can, in turn, be inputs to other processes. Typical inputs/outputs are project management documents (such as a project plan, a schedule, a contract, or a progress report) or project deliverables. Interactions between process groups (including

the main inputs and outputs of their processes) illustrate the project life cycle - as seen in 3.7).
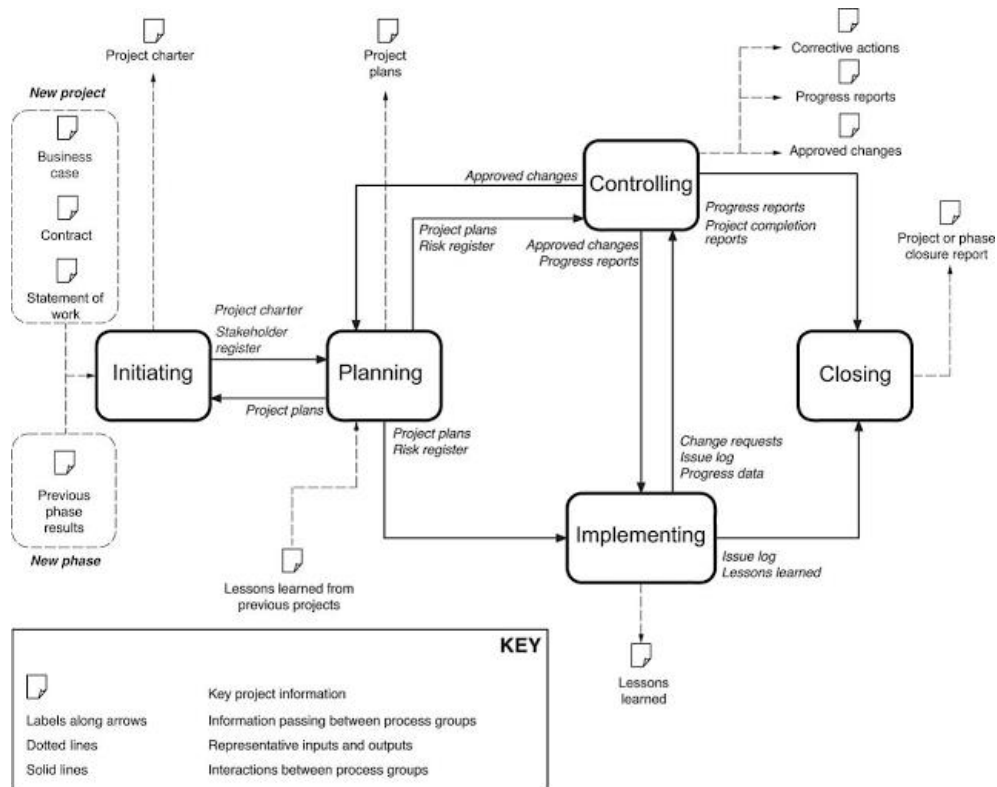
Figure 3.7: Process groups' interactions showing main inputs and outputs identified by ISO 21500 [48].

3.2.2.A Stakeholder Processes

ISO 21500 specifies only two processes concerning project stakeholders: Identify Stakeholders and Manage Stakeholders.

The Identify Stakeholders process should determine any individuals, groups or organizations affected by, or affecting, the project and document them with sufficient detail in a Stakeholder Register, along with relevant information regarding their interest and involvement. It is stated that stakeholders may or may not be actively involved in the project, may be internal or external to the organization, and possibly at varying authority levels, so their roles and responsibilities should be defined and communicated. This process takes as inputs the Project Charter and Project Organization Chart and should output a Stakeholder Register.

Afterward, this standard also prescripts a Manage Stakeholders process, that states stakeholders should be given appropriate understanding and attention to their needs and expectations. This process includes activities such as identifying their concerns and resolving issues. When the project manager
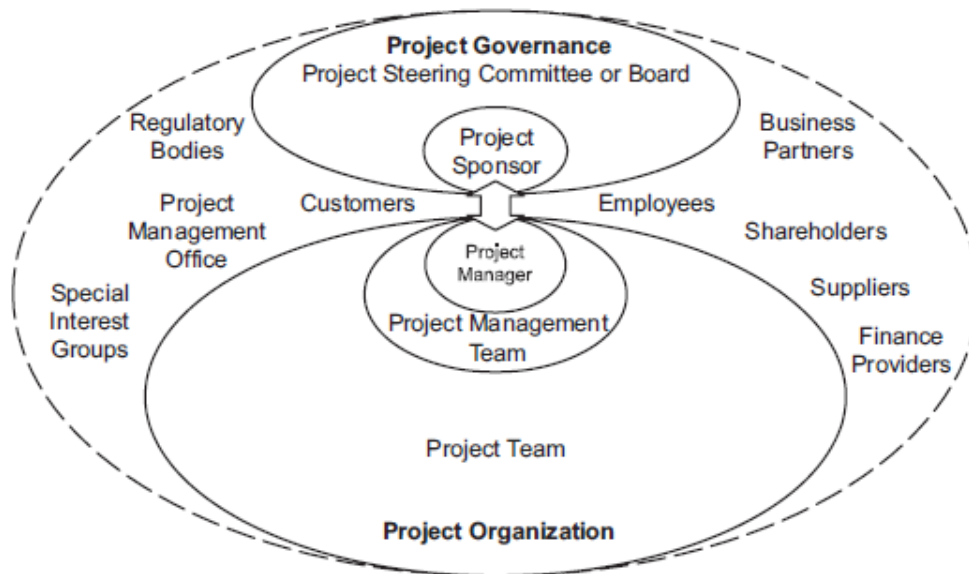
Figure 3.8: Internal and external stakeholders identified by ISO 21500 [48].

can't resolve stakeholder issues, it may be necessary to escalate the issues to a higher authority. A detailed analysis should be made of the impacts they might have on the project so that the project manager can take maximum advantage of their contribution to the project. This process takes as inputs the Project Plans and Stakeholder Register and outputs Change Requests.

3.2.2.B   Communication Processes

The ongoing, steady communication with stakeholders that prevents the occurrence of project issues falls under the Project Communication subject group. ISO 21500 specifies three processes concerning communications:

- **Plan Communications:** to determine the information and communication needs of the stakeholders. Factors such as geographically dispersed personnel and organizational factors may significantly affect communication requirements, so this process should determine the communicated project information to stakeholders, any of their particular information needs (e.g. regulatory or oversight), and the chosen methods of distribution (e.g. meetings, emails).

- **Distribute Information:** to make required information available to project stakeholders, as defined by the Plan Communications process, and to respond to unexpected, specific requests for information.

- **Manage Communications:** to ensure that the communication needs of the project stakeholders are satisfied and to resolve communication issues if and when they arise, including creating, dis-

tributing, and storing the carried out communications. This process should focus on increasing the understanding and cooperation among the various stakeholders through good communications, providing timely, accurate, and unbiased information and resolving communication issues to minimize the risk that the project is negatively affected by unknown or unresolved stakeholder issues or misunderstandings.

3.2.3 PM^2

Project Management Methodology (PM^2) is an official EU project management methodology, developed and endorsed by the European Commission (EC). Its purpose is to enable project managers to deliver solutions and benefits to their organizations by effectively managing project work. PM^2 has been created considering the environment and needs of EU Institutions and projects, in order to facilitate the management of projects' complete life cycle [5].

PM^2 is structured in 4 pillars: a defined project life cycle; a governance model (roles and responsibilities); a set of recommended processes that should be applied when managing a project and a set of project artifacts (such as templates and documentation).

The PM^2 project life cycle identifies four phases - Initiating, Planning, Executing, and Closing - as well as Monitor & Control, which is performed throughout the project's duration. Projects depend on people to define, plan, execute and generally drive them throughout their life cycle: the project drivers differ from phase to phase within a PM^2 project - the project owner is the main driver during the initiation of the project, the project manager drives the Planning Phase and is the center of Monitor and Control, the project team drives the execution of the project plan and the creation of the project deliverables while the project stakeholders are the main drivers of the Closing Phase as they evaluate the project deliverables and overall performance.

3.2.3.A   Project Organisation, Roles and Responsibilities

PM^2 identifies several layers with different levels of authority and responsibility, called business layers, as can be seen in figure 3.9. The project team is composed of the people assuming the roles defined in the Performing, Managing, and Directing Layers. The project manager operates at the managing layer, which focuses on day-to-day project operations by organizing, monitoring, and controlling work to produce the intended deliverables and implement them in the business organization.

Stakeholders should be reminded of their roles and responsibilities during the project. To represent and clarify the roles and responsibilities in each activity, PM^2 utilizes, for each artifact, a Responsibility Assignment Matrix (RAM) that documents the project's roles and responsibilities for the project, using a notation known as RASCI - See Figure 3.10.
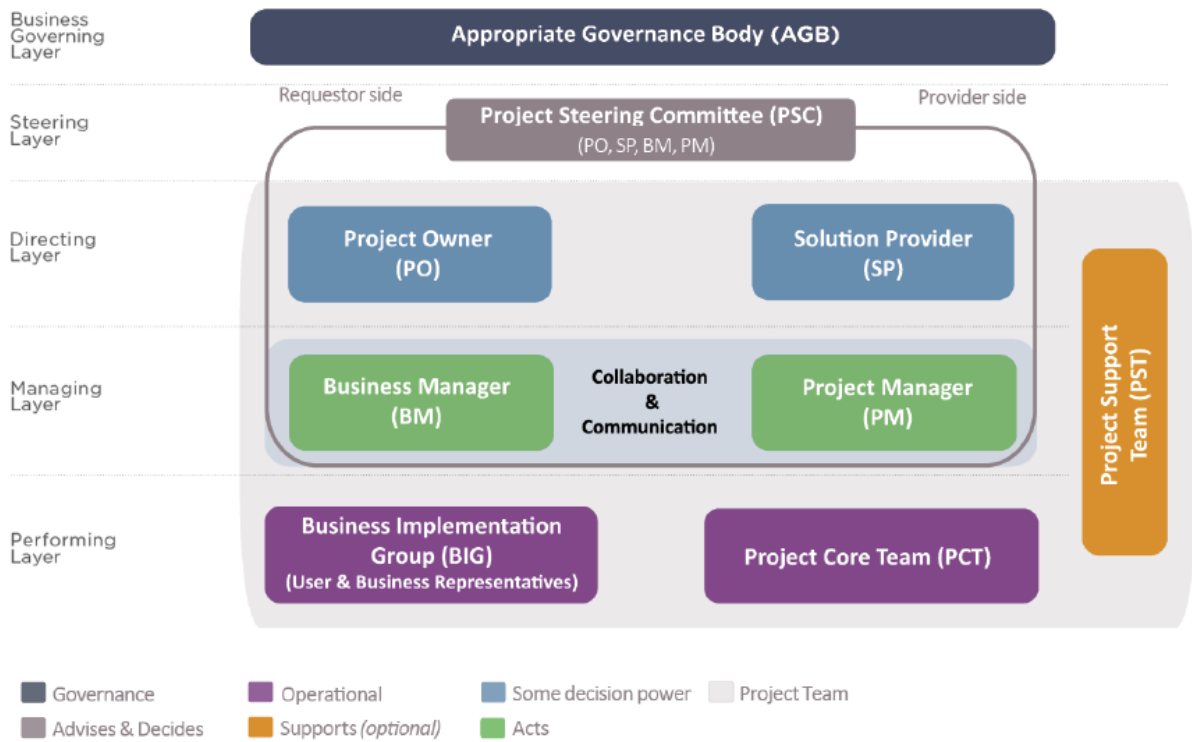
Figure 3.9: Main roles in the project organisation according to PM[2].

RASCI		Description
R	**R**esponsible	Does the work. Others can be asked to assist in a supporting role.
A	**A**ccountable	Ultimately answerable for the correct and thorough completion of the work. There is just **one** accountable person.
S	**S**upports	As part of a team, they work with the person responsible. Unlike the consulted role, the support role helps complete the task.
C	**C**onsulted	Those whose opinions are requested and with whom there is two-way communication.
I	**I**nformed	Those who are informed (kept up-to-date).

Figure 3.10: Main roles in the project organisation according to PM[2].

3.2.3.B Project Stakeholders in PM[2]

Concerning stakeholders, PM[2] identifies two activities, the elaboration of a Project Stakeholder Matrix and Managing Stakeholders. The Stakeholder Matrix should list all key project stakeholders and clarifying their roles in the project. To do so, a template is provided that includes relevant information about each stakeholder, such as contact information and influence on the project. It may also include the classification or categorization of each stakeholder. This is a critical document in case of a change of the project manager since it allows the new PM to quickly know the relevant stakeholders from his predecessor.

36

In this project methodology, Managing Stakeholders is defined as a critical activity that begins early in the project lifecycle when expectations and requirements are identified (in the Initiating Phase) and ends with recording stakeholders' overall project experience and satisfaction (in the Closing Phase). This activity involves analyzing the expectations, attitudes, levels of interest, and influence of key stakeholders, devising appropriate communication and management strategies to achieve their involvement and/or contribution, while monitoring changes.

Both activities should be seen as a personal approach to stakeholders, from the perspective of the project manager. Stakeholder documents should remain confidential and not appear in public repositories, except in case of a PMO that shares that information, especially in cases of shared projects and common stakeholders.

3.2.4   IPMA ICB4

The International Project Management Association (IPMA) Individual Competence Baseline (ICB)4 is a global standard that defines a set of 29 Competence Element (CE), each including a set of key competence indicators, required by individuals working in the field of project, programme, and portfolio management. These competence elements are organized in three major competence areas: people (defining personal and interpersonal competences required to participate or lead a project), practice (technical aspects of managing projects), and perspective (contextual competences through which individuals interact with the environment) [37].

In the area of Practice competences, Stakeholders are included as a CE, to be assessed and engaged with. This CE includes identifying, analyzing, engaging, and managing the attitudes and expectations of all relevant stakeholders. It also sets an engagement strategy as essential, of which the execution should be constantly monitored for changes, to ensure continuous alignment and improvement. The following key competence indicators are defined for this CE:

1. *Identify stakeholders and analyze their interest and influence* - while maintaining an active analysis to identify new stakeholders, changed interests or changed influences during the project life cycle,

2. *Develop and maintain a stakeholder strategy and communication plan* - how to engage, keep informed, involve and commit each of the various stakeholders, by setting the why, what, when (and how often), how, and the level of detail for the communication,

3. *Engage with executives, sponsors and higher management to gain commitment and to manage interests and expectations*,

4. *Engage with users, partners, suppliers and other stakeholders to gain their cooperation and commitment*,

5. *Organize and maintain networks and alliances*.

3.2.5 Body of Knowledge Comparison

ISO 21500 is aligned with the PMBOK, both regarding PM through a process approach, in which the project consists of a unique set of structured processes, with coordinated and controlled activities with start and finish dates, performed in order for the project to achieve its objectives. The differences between ISO 21500 and the PMBOK 6th edition are minimal concerning the process groups and subjects/knowledge areas. The processes in ISO 21500 are well described (the 'what'), however, they do not prescribe the exact way of doing (the 'how') - the main difference is in the description of tools and techniques, that unlike ISO 21500, the PMBOK provides.

Unlike the PMBOK (which is an American National Standards Institute (ANSI) standard) or ISO 21500 (which is an international standard), PM^2 is a methodology, which means it builds upon existing standards to outline the core processes and procedures to follow to effectively deliver completed projects. PM^2 incorporates elements from a wide range of globally accepted project management best practices, building heavily on the PMBOK, PRojects IN Controlled Environments (PRINCE2), and others [5]. Methodologies set the path and provide the required steps, design, order and timeframe of tasks to undertake to complete the project, and establish what should be done by whom, when, and how:

- What processes should be applied in a certain organization, to what extent and with how much rigor - knowing precisely what is to be done.

- Who is responsible for the implementation of the processes, including generic roles and responsibilities, project organization structures and governance committees, as well as the deadlines to do so - clarifying who implements the processes and when.

- Presenting templates, guidelines, and workflows, with precise input, output and performance criteria, and guidance documents to implement the processes consistently - stating how will the processes be applied.

All three of the aforementioned frameworks identify five similar project phases - Initiating, Planning, Executing and Closing - as well as Monitor & Control (also named Controlling), which is performed throughout the project's duration.

The ICB standard is unlike the other three (which focus on processes and/or methods) in its structure, focusing instead on individual competences, which are the application of knowledge (the collection of information and experience that an individual possesses), skills (technical capabilities that enable an individual to perform a task) and abilities (effective delivery of knowledge and skills in a context) in order to achieve the desired results.

3.2.5.A Stakeholders

All four of these standards include mentions on the subject of Stakeholders, each with its own approach, but with clear similarities as well- see Table 3.1.

PMBOK	ISO 21500	PM^2	ICB
Identify Stakeholders	Identify Stakeholders	Elaboration of a Project Stakeholder Matrix	Identify stakeholders and analyze their interest and influence
Plan Stakeholder Management			Develop and maintain a stakeholder strategy and communication plan
Manage Stakeholder Engagement	Manage Stakeholders	Managing Stakeholders	Engage with executives, sponsors and higher management to gain commitment and to manage interests and expectations
			Engage with users, partners, suppliers and other stakeholders to gain their cooperation and commitment
Monitor Stakeholder Engagement			Organize and maintain networks and alliances

Table 3.1: The Processes/Activities/Competence Indicators of each of the four reviewed standards - PMBOK, ISO 21500, PM^2 and ICB.

The Identify Stakeholders step is consensual among each framework, each stating the importance of determining any individuals, groups, or organizations affected by, or affecting, the project and documenting them as stakeholders (in a Stakeholder Register or Matrix) with sufficient detail. This step should include a thorough analysis of these stakeholders, knowing their power/influence, involvement, support, interests, main expectations, and major project requirements.

The following steps are not so well-aligned, even though they share many of the same ideas. The PMBOK prescribes a Plan Stakeholder Management process, involving the development of appropriate strategies to involve the identified project stakeholders, based on the raised stakeholder information and their perceived engagement. This is approximately aligned with the proposition of the ICB of planning how to engage, keep informed, involve, and commit each of the various stakeholders.

Meanwhile, the ISO 21500 Manage Stakeholders process is mostly focused on acting upon the identified stakeholders by identifying their concerns and resolving issues, which can be considered more in

line with the PMBOK's following process, Manage Stakeholder Engagement, which involves acting on the elaborated plan by communicating and working with stakeholders to meet their needs and expectations, address issues as they occur and foster their stakeholder involvement. Both of these are aligned with two of the key competence indicators of ICB, which splits the engagement of stakeholders between executives, sponsors and higher management (to gain commitment and to manage interests and expectations) and users, partners, suppliers and others (to gain their cooperation and commitment).

PM^2 bundles several of the mentioned processes/competences in a single Manage Stakeholders activity, including the analysis, planning of communications, engagement of stakeholders, as well as monitoring the reactions and attitudes of stakeholders. The PMBOK also includes a Monitor Stakeholder Engagement process, meant to analyze the established stakeholder relationships and communications and use that feedback to review and modify the implemented engagement strategies and plans.

Lastly, the ICB includes a competence indicator to organize and maintain networks and alliances, both formal and informal, a concept that is not referred in the remaining standards.

3.2.6 Conclusions

The conclusions drawn from the reviewed project management body of knowledge prescribe the implementation of stakeholder management processes and strategies, such as:

- Identify and document stakeholders, and in particular key stakeholders;

- Analyze their power, influence, main expectations, and requirements;

- Assess their current engagement and plan to act on it if a different level is desired;

- Engage with them to ensure their commitment and/or participation;

- Monitor the effect of these actions;

- Be prepared to implement corrections to the plan and consequent actions if the desired outcome isn't being achieved.

Stakeholder management plans should be defined and regularly reviewed, ensuring the relevancy and currency of those plans, a process performed cyclically. Poorly implemented strategies have an adverse effect on stakeholder satisfaction and project outcomes [38], so these plans should be oriented to engage with stakeholders to create and maintain positive relationships, as they play an important role in IS projects with their ability to influence project outcomes [10]. Effective management requires project managers to identify and understand how to correctly engage with stakeholders and have the requisite knowledge, skills, and ability in order to do so [37]. One of the principles of project stakeholder

management is rooted in communication and collaboration - where communication refers to the multidirectional exchanges made by the project manager, and collaboration refers to the development of mutually beneficial relationships and win-win scenarios.

3.3 Project Management Software

Project Management Software (PMS) encompasses a range of software used by many industries to help project managers and teams collaborate to meet goals on time while managing resources, costs and maximize the teams efficiency. This software usually includes features that assist in project planning and scheduling, analyze workloads, team collaboration, issue management, develop resource estimates and project budgeting, among others. There are currently numerous desktop and browser-based project management applications.

The following section will introduce two commonplace project management applications, Scoro and Jira, in regards to their capabilities, focusing on their ability to assist in the previously mentioned processes for the management of stakeholder engagement. Jira was selected to be reviewed since it is the used PMS in Brisa. Scoro was selected due to being the only PMS found, when researching the topic, that had a free trial and that included features relating to the topic of stakeholder management.

3.3.1 Scoro

Scoro is a collaborative business management Software-as-a-Service (SaaS) that enables users to manage and track projects. It combines several project management capabilities and assists on the completion of those work packages, helping plan, organize, and manage resource tools.

This tool can manage estimation and planning, scheduling, cost control and budget management and resource allocation. It's intended as a collaboration software that allows for team management, even when working remotely, by providing clear communication between team members regarding their progress, also aiding in management decision-making, by allowing different levels of access to be granted to employees so that only users with permissions are working on a particular project. This tool also includes time management, tracking project finances and budgets, managing a client base, compiling and sending quotes, invoices and obtaining several reports and data dashboards that visually track, analyze and display key performance indicators (KPI). It also includes several possible integrations with other existing enterprise software, such as Microsoft Exchange, Google and Apple Calendar and cloud file-hosting websites such as Dropbox and Google Drive, as well as regular FTP/SFTP.
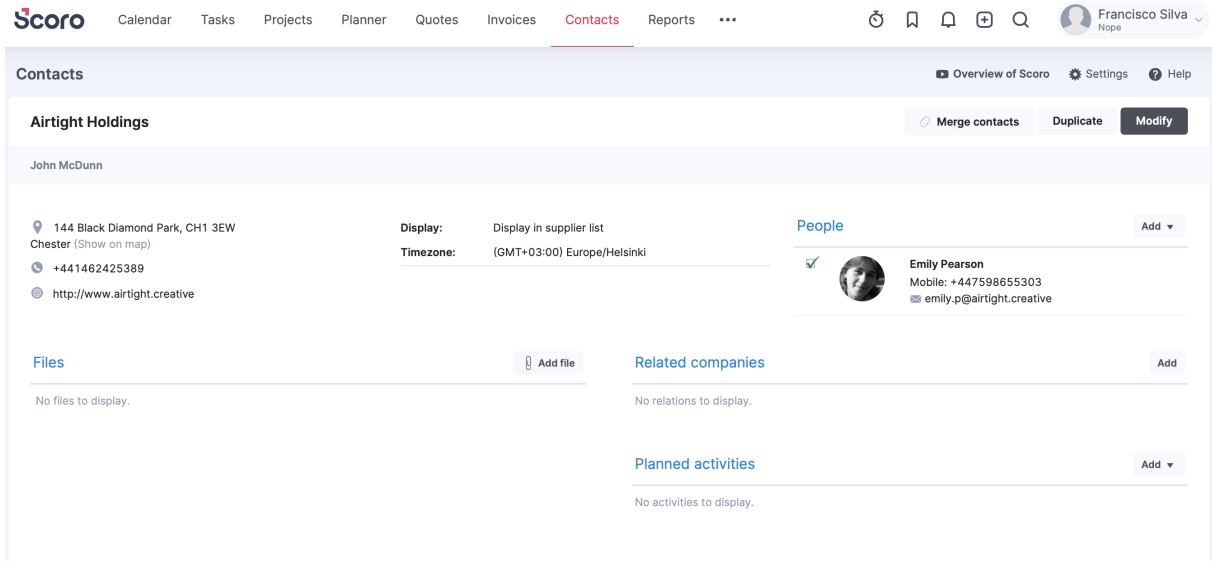
Figure 3.11: Contacts page in Scoro.

Regarding its capabilities on identifying organizational and project stakeholders, Scoro has a 'Contacts' page companies can be registered and the people who work in them, divided between clients, suppliers and representatives. Contacts have some relevant information (contacts, address, timezone and preferred language (in case of foreign clients/providers) and can be assigned to ongoing projects, activities and invoices. Previous involvements are also detailed, as well as the possibility of leaving comments regarding this contact.

3.3.2   Jira

Jira is a proprietary issue tracking product developed by Atlassian that facilitates bug/issue tracking and agile project management. Originally aimed exclusively to sofware developers upon its launch, Jira grew as a more generic project management tool.

Three products are built on the Jira platform: Jira Core is intended as generic project management software tool aimed at business users with requirements on task management on non-technical team projects, such as business projects (marketing campaigns, HR onboarding and others). Jira Service Desk is intended for use by IT or business service desks, and is mainly focused on tasks pertaining to customer support, ticketing, incident and change management. Lastly, Jira Software is aimed at technical project teams (including Product and Project Managers/SCRUM Masters and Software Developers) developing projects using Agile Methodologies (mainly SCRUM and Kanban). Its focus is to help project teams plan, assign, track, report and manage work.

A relevant addition of Jira is the Atlassian Marketplace, a page that allows third-party developers to

offer additions/plugins for Atlassian toos, including Jira. A relevant addition in the marketplace is named BigPicture, a major project management plugin meant for project planning, serving both agile and waterfall projects. This tool delivers tools for project managers that Jira lacks, i.e. roadmap, a Gantt chart, scope (work breakdown structure), risks, resources and teams modules, in line with more 'traditional' project management activities. However, this plugin lacks stakeholder management increments.

3.3.3 Conclusions

Both Scoro and Jira have several pros when it comes to their ability to assist project management activities, with Jira having a strong prominence regarding issue boards that are prevalent on Agile methodologies, while Scoro seems a more business-oriented tool that assists with invoicing and maintaining a client list.

However, coming down to the use case at hand, which is regarding the management of project stakeholders' expectations and engagement, both are quite limited in this aspect:

- Scoro's 'contacts', which would be its closest entity to project/organizational stakeholders are solely focused on detailing company clients (already a subsection of possible external stakeholders), lacking features to detail internal stakeholders altogether. 'Contacts' can be assigned to projects, but appear to only appear as a reminder for a means of contact, since their role, power, interests and/or involvement in project activities can not be detailed. In sum, Scoro may be considered limited if we appraise it under the aforementioned stakeholder management processes, as it is incomplete in its assistance for Stakeholder Identification, and with no features to assist in Stakeholder Analysis.

- Jira features are mainly focused on issue tracking and reporting, lacking in tools to assist with stakeholder involvement. The feature most relevant in this scope is the reporting features that allow for the generation of automatic reports that may be showed or retrieved and forwarded to relevant stakeholders that want to follow the project progress. But other than that, no features in Jira seem relevant in implementing stakeholder management processes. Searching the Atlassian Marketplace did also not return relevant results for plugins meant for stakeholder management activities, as most existing plugins related with stakeholder keywords are centered on charts and analytics reports.

This feature review found that, when it comes to PMS, there appears to be a lack of commercially available options that help fulfill the studied stakeholder management processes and/or activities.

4

Solution Proposal

Contents

In this chapter, the findings in chapters 2 and 3 are combined so that an effective solution, based on the performed research, is proposed for the identified problem concerning the issues of successfully engaging stakeholders in IS projects.

Following the chosen DSRM methodology, this chapter documents the second and third steps of the DSRM process, "Define objectives of a solution", as the objectives proposed for the solution are introduced, followed by "Design and Development", detailing the implementation of a solution proposal to the research problem addressed in Chapters 1 and 2.

This chapter should give a possible answer to the final proposed sub-question: '*What is the proposed solution to improve the management and engagement of existing stakeholders in IS projects?*'.

4.1   Solution Objectives

There were several reached conclusions as a result of the problems identified in Chapter 2, derived from ineffective stakeholder management strategies and methods, but also the knowledge acquired from studied literature introduced in chapter 3.

IS project managers should document and follow a formal plan that details their activities for managing particular projects' stakeholders' engagement. Like any good PM practices, their methods should be built upon robust PM standards and processes. While the project manager should remain ultimately responsible for deciding what good practices shall be applied to the specific project at hand, the implementation of such a plan should stop being 'just another step' in the management of a project. It should instead be seen as a vital management activity in IS projects that is put in motion immediately at the project initiation phase. However, this plan should not be static and instead be adjusted and followed throughout the project. It is through its implementation that the project manager can organize and document his engagement with stakeholders and their expectations since the beginning of a project.

As such, building upon the gathered knowledge, the proposed solution has the objective of establishing a framework that orients the project managers' identification and engagement of project stakeholders and all of the activities that it entails. This framework is meant to materialize the processes of stakeholder identification, analysis, plan the strategies for stakeholder engagement that will be used followed during the project lifecycle, as well as registering the monitored results and adapt those plans if necessary.

To meet this objective, the solution proposed by this dissertation is implemented in the form of an Information System, structured in such a way that it can document all of the relevant information, as all of this insight is invaluable as long as it can be tracked and accessed properly. This can also facilitate information flow in projects involving more than one project manager or in cases of a change of project manager during the project life cycle. This IS is to be implemented so that it can be used to assist in

the identification and registration of all this information (for example spreadsheet records, visual maps, etc.). The fields specified by this support tool should also help orient the project manager by specifying which relevant information about each stakeholder should be obtained, if possible. All of the gathered information should be treated as a personal approach to stakeholders, from the perspective of the project manager. These stakeholder documents should remain confidential and not appear in public repositories, except in case of a PMO that shares that information, such as in cases of shared projects and common stakeholders.

This proposal is developed with an emphasis on potentially solving the problems previously detailed in the management of IS projects of Brisa's DTS department, but is to be designed and implemented in such a way that it could be adopted in other IS departments of companies that share the same difficulties. This proposal is demonstrated by having it applied to an IS project of Brisa (detailed in Section 5.1). Ideally, the final objective is that the devised solution be adopted successfully to other IS projects in the future, with the aim of improving the management of stakeholder engagement.

4.2   Solution Development

As DSRM states in its "Design and development" phase, the methodology used in the development of this IS solution is that of evolutionary prototyping. These prototypes are intentionally incomplete systems, that capture the essential features of a later system. They were developed in several iterations where additional functionalities are developed and valuable feedback is acquired to identify the necessary requirements that can improve the prototype in the following iteration. This allowed the software development process to be flexible, progressing while adapting the prototypes to new requirements. There was no attempt to capture (extensive) requirements in advance of the first iteration. The focus was developing a first prototype with the intent of gaining feedback and identify requirements for the following iterations. Evidently, an initial version of the solution cannot be interpreted as the target solution.

The proposed solution is the result of 3 iterations of development and re-assessment.These iterations were instantiated and used in an ongoing IS project in Brisa's enterprise environment (results are presented in Section 5.1). This resulted in a demonstration that provided valuable feedback during the development phase, allowing to detect each iterations' limitations and other conclusions, setting the baseline for the following iteration. The following 3 subsections detail the performed iterations:

4.2.1   Iteration n.1

The first iteration for a solution proposal involved defining methods that implement the steps identified on the reached conclusions regarding the Stakeholder Management Body of Knowledge in Chapter 3,

namely, to identify and document stakeholders and in particular key stakeholders, analyze their power, influence, main expectations, and requirements, as well as assessing their current engagement.

4.2.1.A Implementation

Taking into account the templates proposed by PM[2], as well as the descriptions of a Stakeholder Register from the PMBOK, ISO 21500, and the remaining references analyzed in chapter 3, a model of the relevant information that should be retrieved and recorded was established. This model was then implemented in the form of template Excel spreadsheets.

The two defined spreadsheets constituted a template for a Stakeholder Register and Stakeholder Analysis, facilitating the implementation of the proposed steps. Both documents are editable at any moment after they have been filed out based on the proposed template, which facilitates changes as the project manager monitors stakeholder engagement. An example of each spreadsheet is represented in Figures 4.1 and 4.2, respectively.

The first template spreadsheet, the Stakeholder Register, documents who the stakeholder is, his/her title/role in the organization, what company (internal vs. external) along with contact information. Preferred communication vehicles and frequency should also be filed, as well as the stakeholders' stake in the project.

The Stakeholder Analysis template spreadsheet is built upon the identified stakeholders, documenting again who the stakeholder is, followed by his/her role in the project, along with their anticipated involvement/participation, milestones in which the stakeholder may be involved, potential motivations and concerns. Lastly, the stakeholders' perceived engagement (predisposition towards the project) and based on the performed analysis, the activities that should involve (or impact) the stakeholder, along with their due dates.

To make these spreadsheets accessible in collaborative work (more than one involved project manager - as is the case with Brisa's segmented PMO's), the defined document templates were placed on a shared network drive.

STAKEHOLDER REGISTER

				BEGIN DATE	01/01/2020	VERSION NUMBER	1.0
PROJECT NAME	Project Example A						
CLIENT	Mr. Client			END DATE	15/09/2020		
						AUTHOR	Francisco Silva
PROJECT DESCRIPTION	A Project Example that fills out this Stakeholder Register						

STAKEHOLDER REGISTER

	OVERVIEW						CONTACT		
ID	STAKEHOLDER	TITLE / ROLE IN THE ORGANIZATION	COMMUNICATION FREQUENCY	COMMUNICATION VEHICLES	STAKE IN PROJECT	ADDITIONAL NOTES	COMPANY	EMAIL	PHONE
1	Mr. Stakeholder A	Director of IT	Weekly	Meetings	Responsible for project oversight within the IT Department		Example Company	StakeholderA@example.com	910001122
2	Mrs. Stakeholder B	Director of Finance	Weekly	Email	Project Client		Example Company	StakeholderB@example.com	920001122

Figure 4.1: Iteration n.1's Stakeholder Register document example.

STAKEHOLDER ANALYSIS

PROJECT NAME:	Project Example A			PROJECT MANAGER:	Francisco Silva		DATE:01/01/2020			VERSION: 1.0
NAME OR GROUP	ROLE	ANTICIPATED INVOLVEMENT	ANTICIPATED ISSUES	MOTIVATION / DRIVERS	EXPECTATIONS OF EXCHANGE	MILESTONES	ENGAGEMENT PROFILE			ACTIVITIES	DATE DUE
							Current commitment profile: resistant, neutral, supportive, leading				
							-	0	+	++		
Sponsors, managers, users, etc.	Role in the project	What level of involvement is expected?	Known or potential issues	Why is the stakeholder invested in the project's success?	What is the stakeholder's predicted input?	At what point in the change effort is this stakeholder's involvement required?					What activities directly involve or impact the stakeholder?	Task/involvement needs to be met by
Mr. Stakeholder A	Project Sponsor	Coordinates the IT team in charge of the project, Steering Meetings	None	Maintain good political support within the organization	May influence technology choices	Approve Project Plan			X		Steering Committee, Project Team Meetings	Monthly, Weekly
Mrs. Stakeholder B	Project Owner	Regular Oversight on project Status, Steering Meetings	Appointed team that will collaborate with the project team may be insufficient for raising requirements	Achieve the project benefits	Might interfere with the raised requirements and request additional features	Approve Requirement Specification, Approve Project Result, Steering Meetings				X	Steering Committee	Monthly
...	...	...	...	...	...	...					...	...

Figure 4.2: Iteration n.1's Stakeholder Analysis document example.

4.2.1.B Conclusions

While the early results with this iteration were encouraging for future work (as it was intended to be the first step for a proper solution) - it provided a first sample on what information could be relevant enough to be gathered, in the context of implementing a Stakeholder Management framework -, the solution proposed in this iteration was overly simple and quite limited.

To be used on a new project, this solution should be copied from the template folder to the Project folder containing the remaining project documentation. Only then could the documents be filed with the relevant information, which proved to be inefficient. PM's would have to memorize the process, as otherwise the templates would be filed, leading to the templates ending up filed on the templates folder. Folder organization may also end up being chaotic, especially if managing file versions.

Excel spreadsheets were also found to be not particularly user-friendly, especially compared with other project information that already exists in standalone applications instead of files in shared folders. Another identified disadvantage is a lack of security/access control for the files. Typically, spreadsheets are at greater risk for data corruption or mismanagement of information, and could potentially be consulted by other users with access to the organization's shared folders, both inside and outside the department - a considerable problem, since the gathered information is sensible. This problem could be circumvented by password protection, but it is not an elegant solution, since it would rely on password sharing if this information had to be shared with someone from the project team.

Another identified limitation was that of recurrent stakeholders, of which the contact and non-project related assessments and information could potentially be reused between projects, but not trivially using this solution, requiring the project manager to go through previously filed out documents (of other projects) and finding the same stakeholder to copy and paste the row to a new document, another unrefined attempt to circumvent what is fundamentally a design problem of this proposal.

One possible improvement for this solution could be to link the register and analysis spreadsheets, facilitating data entry, as filling one stakeholder in the register would create the equivalent entry on the analysis document, but due to the already mentioned limitations, it was decided to move on to a new solution iteration, moving away from Excel spreadsheets and investing in different technology to build the IS.

4.2.2 Iteration n.2

This second iteration's goal was to build upon the insightful conclusions gathered from the first iteration, but implement the system with a more robust approach and technological choice that could help improve user experience and resolve the identified limitations of the first solution iteration. As was decided based on the conclusions of the previous iteration, this iteration will be implemented as a web application, which

will be called ProjectStakeholders.

To choose the technology used to construct this second iteration, the focus was on two factors. The first was accessibility - having files spread across a shared drive was shown to be inefficient -, and the second was improving the user experience. The method of copying the files from a template folder to a project folder, along with the deficiencies with access-control led to the assumption that the second iteration should build the IS as a web application, giving access to data but access-control based on the user login and improved user experience depending on the chosen implementation.

Having made the decision of building this second iteration as a web application, OutSystems was the technology chosen to implement it. OutSystems is a low-code single integrated development platform that is used to develop, deploy, and manage application software, based on the principles of model-driven design, automatic code generation, and visual programming. Along with the possibility of using it to develop a viable solution iteration - including the database, backend, frontend user interface, and several integrations with existing systems or services - OutSystems has made available a free version of the platform that provides developers with personal cloud environments to create and deploy web and mobile applications without charges. Even though its development environment builds software through graphical user interfaces and configuration instead of traditional hand-coded computer programming, it still supports the use of custom code in SQL (for the database), C#, and Java (for the backend), as well as HTML/CSS/JavaScript (for the frontend). This platform is developed with an emphasis on rapid development, which allowed for the possibility of future changes to this second iteration in the time allotted for this dissertation, if necessary.

OutSystems natively includes a Users platform for end user management, differentiating between anonymous users and registered users. Additionally, this platform supports the creation of customized user roles associated with each application developed on the platform. This platform is accessible to the developed applications via a Users API , facilitating the process of implementing the necessary user authentication for the solution. It can also be connected to an external authentication method (such as Active Directory).

4.2.2.A   Use Cases

Use cases represent a set of actions that one or more actors request from a system in order to obtain a tangible result. For this solution iteration, seven use cases were identified, listed in Table 4.1. For each of them, there is a use case identifier (ID), a name, and a description of the use case. Use case tables that identify the main actor, the main scenario and, in some cases, alternative or exceptional scenarios of each of these use cases are introduced in greater detail in Appendix A.

ID	Use Case Name	Description
01	Perform Login	When a Project Manager wants to access the application, he must enter his email and password pair to access the system. The system will authenticate the user based on those credentials.
02	Create Project Manager	The Administrator accesses the Users application to create a new platform User. This Administrator gives the User the role of Project Manager and attributes him to a Project Team.
03	Manage Project Manager data	The Administrator accesses the Project Managers page on the ProjectStakeholders application to edit the data of a Project Manager.
04	Manage Company data	The Project Manager can consult, edit and/or add a new Company to the system. When editing a Company, the Project Manager may add Company Departments.
05	Manage Stakeholder data	The Project Manager can consult, edit and add new Stakeholders to the system, and assign them to a Company and Deparment.
06	Manage Project data	The Project Manager can consult, edit and add new Projects to the system.
07	Manage Project Stakeholder data	The Project Manager can consult, edit and add new Project Stakeholders to one of the existing Projects.

Table 4.1: Use Cases Summary
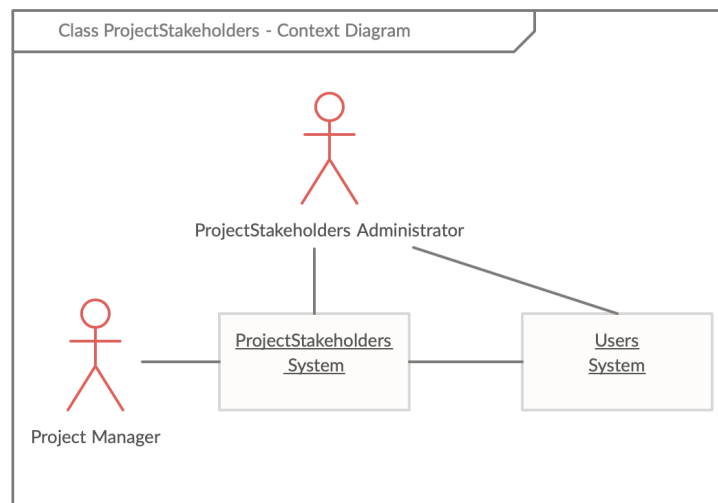
Figure 4.3: The Context Diagram for the ProjectStakeholders application.

4.2.2.B Database Schema

As a result of the proposed Use Cases, a database schema diagram was developed that represents all of the entities and attributes that must be represented or stored by the system. This schema represents the main entities of an IS project and of their stakeholders, as well as the attributes considered relevant to characterize them, based on the conclusions of the literature study - see Figure 4.4.

Concerning this schema:
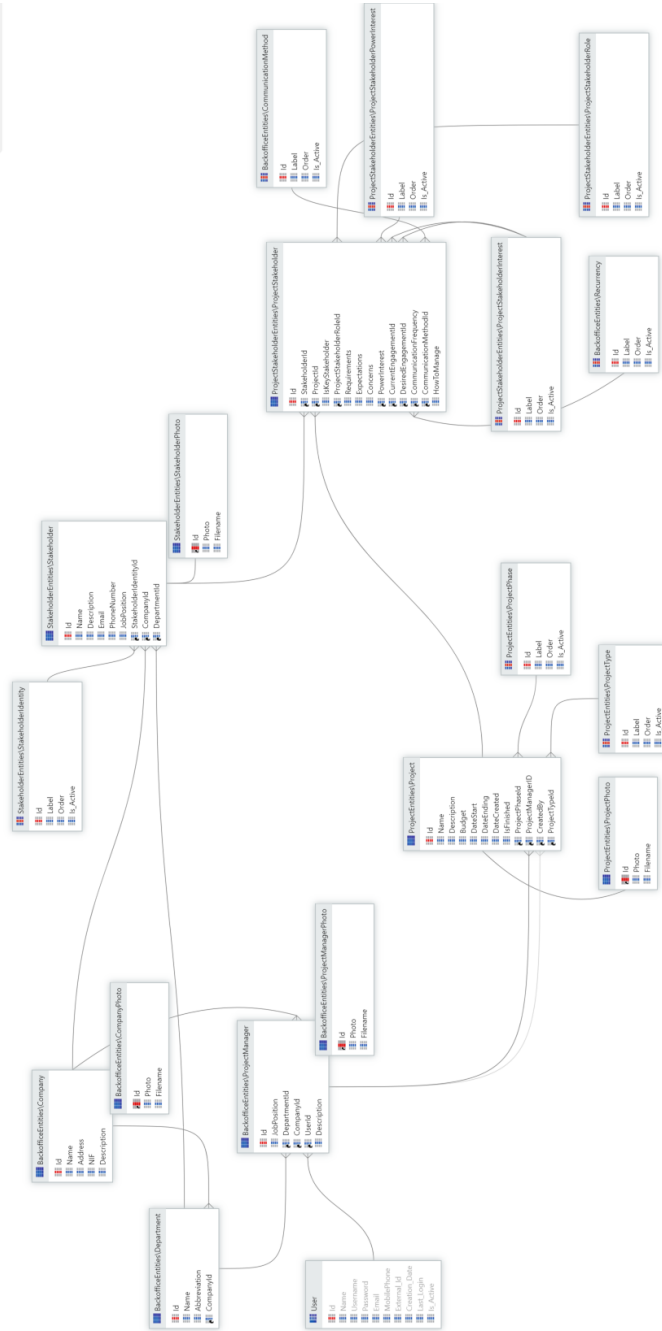
Figure 4.4: The database schema that supports the ProjectStakeholders application.

- Project Managers are an 1-to-1 extension of the default OutSystems User entity.

- The StakeholderIdentity lookup table includes: Customer, Supplier, Employee, Senior Management, Resource Provider, Consultant, Government Entity, or Opinion Former.

- The ProjectPhase lookup table includes: Initiation, Planning, Execution, and Closure. It is assumed that Control is performed throughout the entire project life-cycle.

- The ProjectType lookup table includes: Unique, Corrective Maintenance, Evolutionary Mainte-nance.

- The ProjectStakeholderRole lookup table includes: Project Sponsor, Project Team, Steering Com-mittee, Project Client, Resource Manager, Business Analyst, Regulator.

- The CommunicationMethod lookup table includes: Email, Phone calls, Scheduled Meetings, Steer-ing Committee.

- The ProjectStakeholderPowerInterest lookup table includes: Player, Context Setter, Subject, Crowd.

- The ProjectStakeholderInterest lookup table includes: Unaware, Resistant, Neutral, Supportive, Leading.

- The Recurrency lookup table includes: Daily, Weekly, Monthly.

All of these lookup tables were implemented instead of enumerations so that, in case there was a need to change the values that represent attributes of some of the other entities (add a recurrency or communication method, change the existing stakeholder roles), this could be changed without having to make code changes, recompile and redeploy.

4.2.2.C Implementation
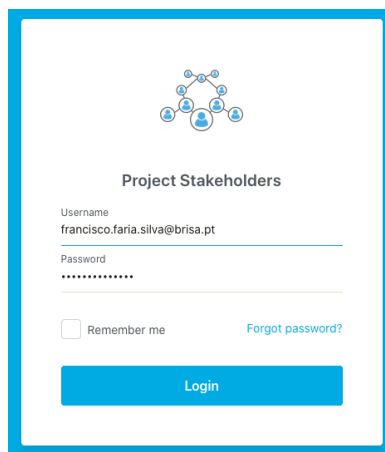
Figure 4.5: Login page of the ProjectStakeholders application.

The implemented application supports identity management, defining two user groups associated with the user login: Project Managers and Administrators. Project Managers are the users of the appli-cation, having full use of the features of the Application, except for the creation of new Project Managers, which is an exclusive power for an Administrator user. Project Managers may belong to a Project Team, meaning that their Project and Stakeholder information can be shared with other Project Managers of

the same Project Team. Otherwise, all inputted information is only accessible to the respective Project Manager.

Figure 4.6: Company detail page.

Backoffice pages were created to define the applications' Project Managers, Companies, and Departments. The existing organizations and departments should be defined *a priori* to any other entities, as they are reused by most. This is performed in the Companies page, that lists the defined Companies, as well as their existing Departments in its detail page (along with company information, such as Name, Address, Logo, Fiscal Number and Description) (see Figure 4.6).

The other existing backoffice is the Project Managers page, listing all Project Managers, with the corresponding detail pages containing their contact information (email, phone number, company, department) (see Figure 4.7). Only registered users with the Administrator role may create new Project Managers. Lastly, a hidden backoffice page is only accessible to Administrators, containing buttons that
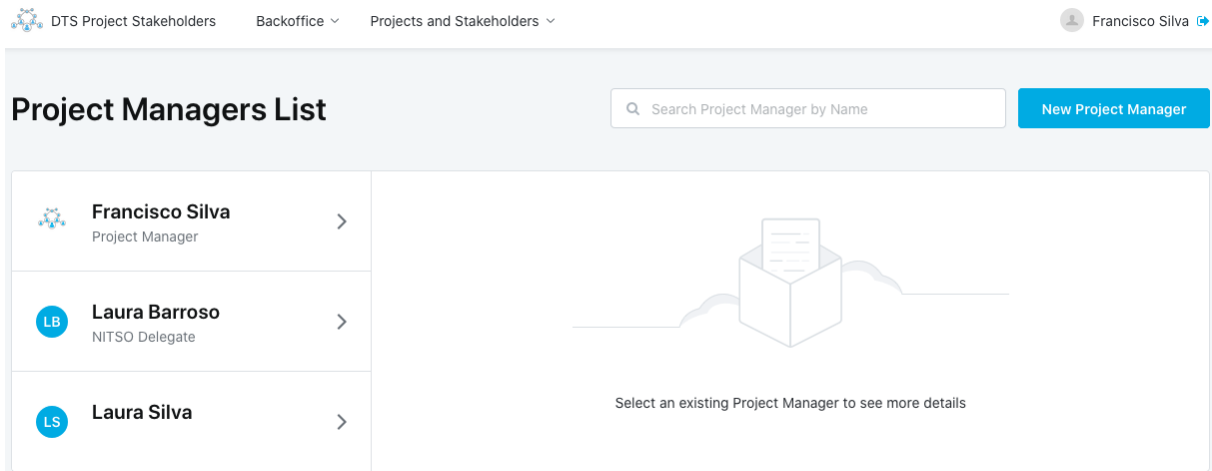
Figure 4.7: Project Managers list page.
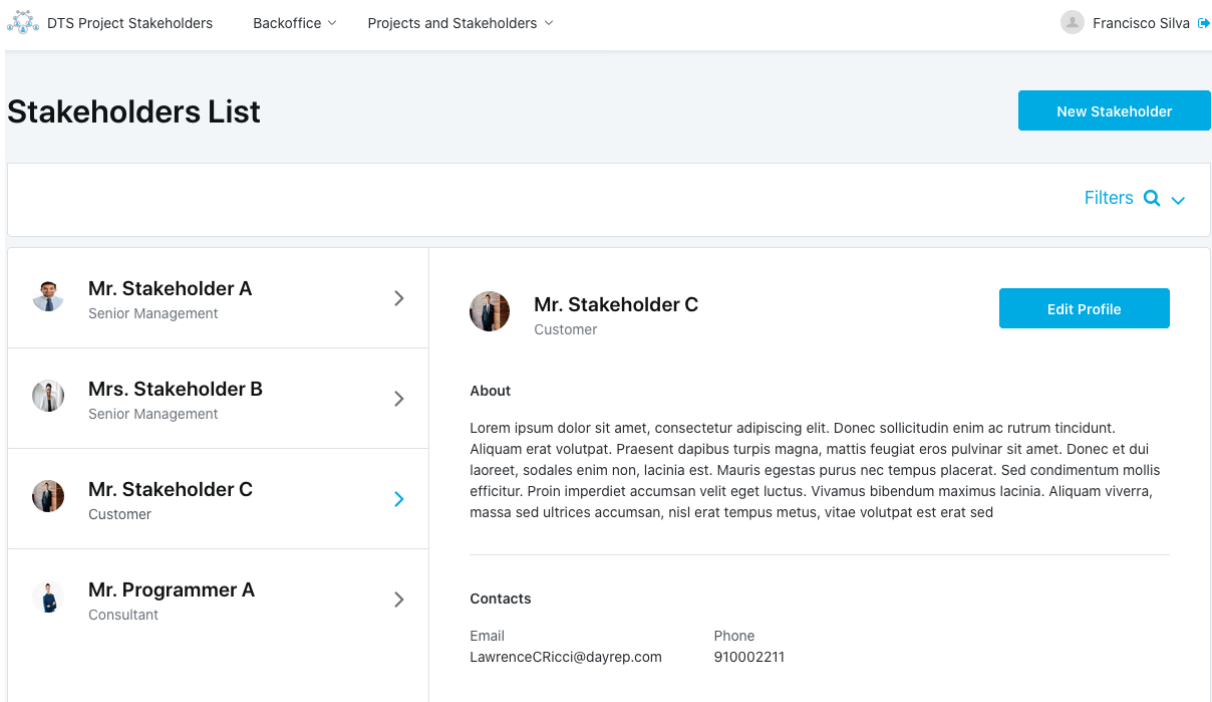
Figure 4.8: Stakeholders List page.

launch auxiliary scripts that supported the development process, as well as maintenance, such as clearing the existing Project and Stakeholder information created by a specified Project Manager, as it could be intended to clear his existing data in a scenario such as him leaving the company.

The Stakeholder Detail page is to be filed out with the more 'generic' information that identifies and documents the Stakeholder, such as a description, job position, contact information, photo, company,

Figure 4.9: Stakeholders Detail page.

and department (see Figure 4.9). Additionally, the Stakeholder can be categorized as part of one of the categories defined in the Stakeholder Identity enumerate. This same Stakeholder entity can be reutilized in any Project, a design choice made to facilitate reusability since the same person can be a Stakeholder in multiple projects. The Stakeholders page lists all existing Stakeholders, across Projects (see Figure 4.8). This list may be filtered by the Stakeholders name, email, and by the its category.

The Projects page is the application's defined landing page, listing the Projects created by the corresponding Project Manager, and the ones shared among the Project Team (see Figure 4.10). Projects on this page can be searched/filtered by name, project type, and project phase.

Project detail pages include a set of relevant information to characterize the project, including the project's description, budget, project phase, type, and a image/logo. Additionally, the Project is allocated to a Project Manager, as well as registering the Project Manager who created the project entry (as a read-only field), who may not be the same person. The project's detail also includes input fields for the start and end dates, as well as a checkbox field that indicates the project's conclusion. Although this
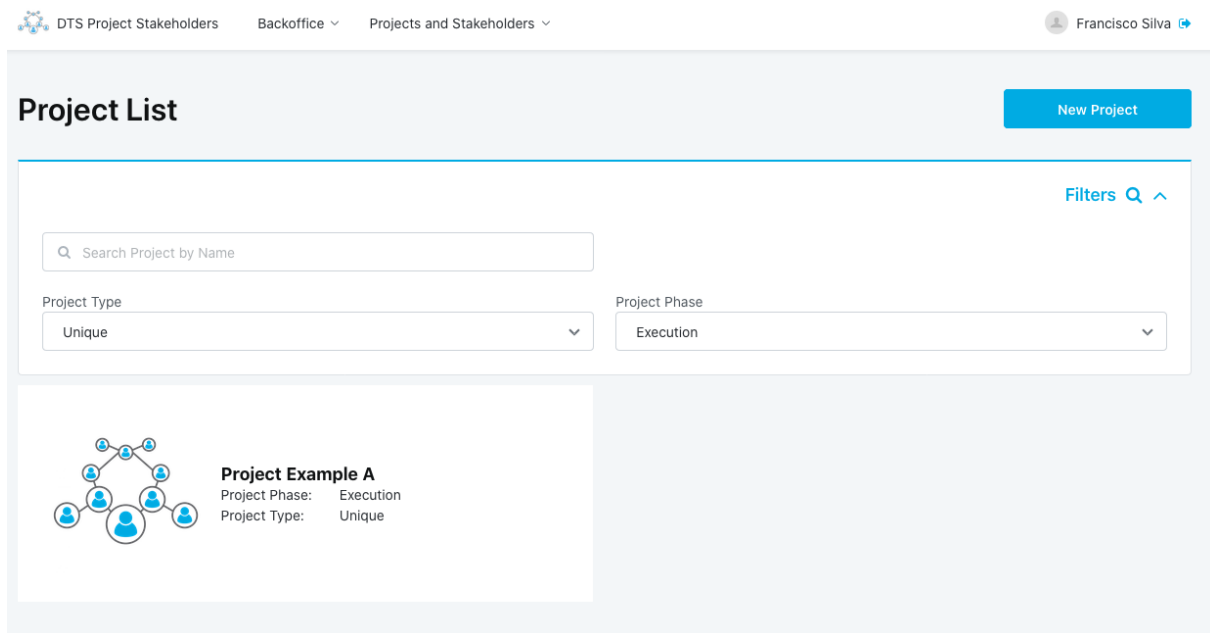
Figure 4.10: Projects List page.

project information is not part of the relevant dataset for the theme of this dissertation, concerning the project's stakeholders, it was decided to add it to create a more complete solution whose only purpose was to register the stakeholders and nothing else. This information also allows for the use of filters on the Project List page. Lastly, the Project Detail lists the identified Project Stakeholders with their name, role, if they are considered a Key Stakeholder, as well as the result of their Power/Interest assessment. The list includes the possibility of adding a new Project Stakeholder entity, as well as editing the data of the existing ones. Clicking the name of an existing Project Stakeholder will link to its Stakeholder page.

The Project Stakeholder page, as previously mentioned, builds upon the generic information of the Stakeholder and frames the project manager's assessment of him/her towards the project. To characterize the project stakeholder, 3 main areas are defined: Role, Analysis and Classification, and Engagement Strategy.

Project stakeholders may assume one of multiple roles. Regarding the Analysis and Classification, text fields exist to specify the stakeholders' main project requirements and expectations, as well as potential concerns. It should also be classified using the Power/Interest model, for which there is an example matrix and tooltip explaining its four different quadrants, and the communication and management needs for each class of project stakeholder. The tooltip and matrix assist the project manager to understand how this classification translates to plan the engagement. The performed analysis and classification is concluded with the indication if this is or not a Key Stakeholder.

Having characterized this project stakeholder, the gathered information can be used to plan the Engagement Strategy. This area defines 5 levels for engagement. The assessment of the project stake-

Figure 4.11: Project Detail Page.

holder should identify its current engagement level, as well as set the desired target level. Having defined the starting and intended ending levels, the project manager may then define the preferred Communication Method, as well as the intended Frequency. An additional field is present for notes on how best to

Figure 4.12: Project Stakeholder Detail Page.

manage the expectations of this Project Stakeholder.

4.2.2.D Conclusions

The implemented second iteration was a major step forward towards a viable solution for the problem. However, the simpler first iteration played an important role, since the limitations identified in it defined an important amount of requirements that were much more than tweaking the relevant fields for identifying and classifying stakeholders.

  This second iteration, built as a more complex application with an underlying database resolves the identified problems concerning the organization of a file structure, as well as the possibility of 'corrupting' the template spreadsheets. The implemented user experience also removes the need for the project manager to memorize the aforementioned procedure of copying the templates from the template folder to the Project folder.

  The instantiation and use of this solution in an ongoing project also validated this implementation of a solution as a web application was more user-friendly, facilitating data access and search. It also helped resolve the problem concerning data access control, since only the project manager and, optionally, the remaining members of his PMO may access his data entries.

  Another identified limitation in the first iteration was that of recurrent stakeholders, which was addressed in this iteration with the implementation of the generic Stakeholder entity that only includes data that identifies the Stakeholder as an individual, allowing for information reusability across projects. This design choice also defines a single point of change that updates a stakeholder's information in every project, in case some data entry concerning it must be updated (for example, contact information).

4.2.3 Iteration n.3

Building upon the application built on the second iteration, this third iteration's goal is to increment it to add functionality that supports the implementation of the project manager's planned engagement. The feedback from the previous iteration identified that the application lacked a way to act upon the engagement plan set out for each project stakeholder, defining and recording activities that involve engaging stakeholders, as well as displaying the gathered information in such a way that assists the project manager to monitor the outcomes of those activities.

4.2.3.A Use Cases

To support this added functionality, an additional Use Case was introduced, summarized in Table 4.2. This increment also caused an alteration to UC06 - Manage Project data, which is reflected in Appendix A.

ID	Use Case Name	Summary Description
08	Manage Stakeholder Engagement Activity	The Project Manager can consult, edit and add new Stakeholder Engagement Activities to one of the existing Projects. When managing an activity, the Project Manager must indicate which Project Stakeholders are involved and at what capacity.

Table 4.2: Iteration 3's Use Case Extension

4.2.3.B Database Schema

As a result of the additional Use Case, the proposed database schema diagram was tweaked to include the additional entities and attributes necessary to implement it. This addition represents the main entity of a Stakeholder Engagement Activity (here depicted as a ProjectActivity), as well as the attributes considered relevant to characterize this activity, based on the feedback acquired from the previous iteration. The additions to the schema can be seen in Figure 4.13.

This schema include an additional lookup table, ProjectActivityType, which can be Meetings, Tasks,
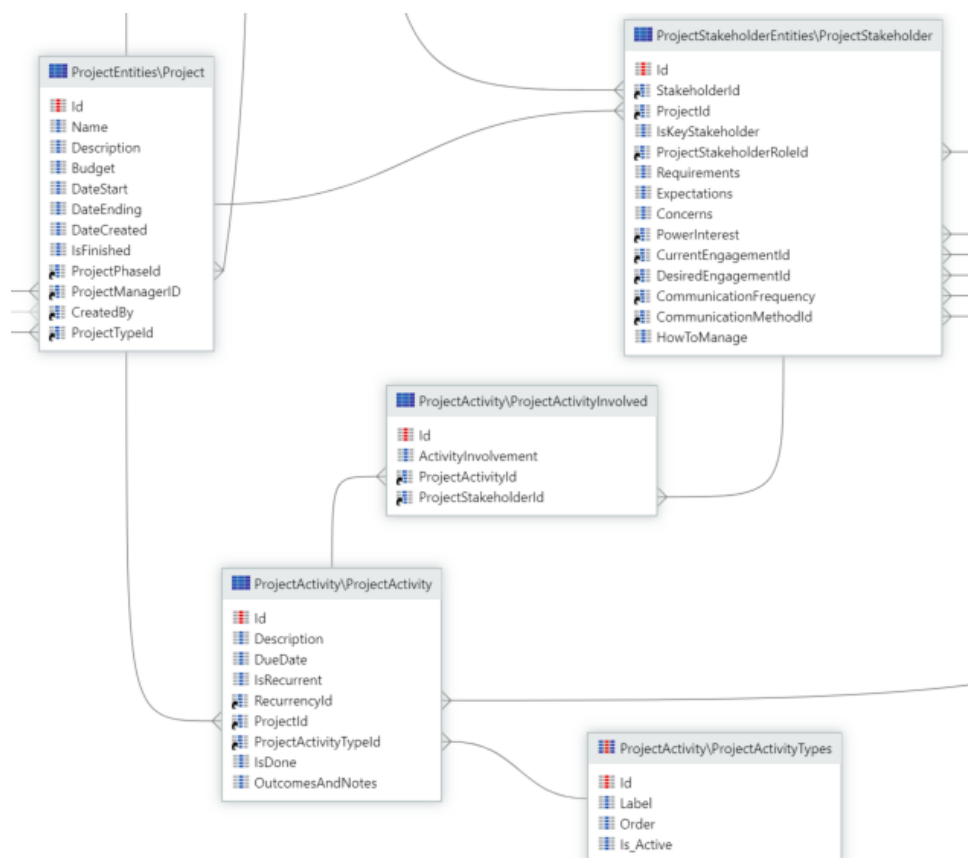

Figure 4.13: The additions to the previous database schema, now supporting the Stakeholder Engagement Activities.

and Deliverables. Also, it specifies a many-to-many relationship between Project Stakeholders and Stakeholder Engagement Activities.

4.2.3.C Implementation

Figure 4.14: Project Detail Page, now including a list of Engagement Activities.

Complementing the Project Stakeholders list in the Project Detail page, this iteration introduces a list of Stakeholder Engagement Activities that constitute the formal actions carried out by the Project Manager to engage with the identified Project Stakeholders and address them according to the identified communication needs, managing their involvement and expectations.

Stakeholder Engagement Activities were defined to be one of three types. Meetings represent communication in person or remote reunions with one or more Project Stakeholders that involve an exchange to address their requirements, concerns, and/or expectations, as well as discussing project status. Unlike the other two types, meetings do not represent any request of some form of work from any of the involved. Tasks are the type that represents an attempt by the project manager to involve the Project Stakeholder in some project activity and have him participate by providing something that is required of him (be it to test and validate a certain change performed in a QA environment and approve it, for example). Deliverables are the opposite and identify something that the Project Manager must present to the Project Stakeholder.

In addition to a type, the project manager should describe what comprises this activity, as well as its due date. In the case of a recurrent activity (such as a regular status meeting), a recurrency may be defined. Additionally, the project manager may select from the list of defined Project Stakeholders and

Figure 4.15: Engagement Activity Detail Page.

associate them to each activity, specifying what is their involvement in it. Lastly, there is a flag indicating if the activity has been completed. If it has, an additional field appears that allows the project manager to register notes regarding the activity and its outcomes.

4.2.3.D Conclusions

With the implemented third iteration, we can conclude the implementation with a viable solution proposal that meets all of the objectives set out for it. The steps taken to validate this proposal, as well as the results of its use on an ongoing Brisa IS project are detailed in the following chapter.

5

Validation

Contents

While this solution has been tested on an ongoing project of Brisa's DTS, during the iterations of its development, it shall also be validated by having it reviewed by experts judgement, who are selected for their involvement in management positions of IS departments, in similar organizations. These practitioners can help assess the potential impact of this solution in assisting project managers achieve greater stakeholder involvement and satisfaction.

The feedback of the demonstration of the solution on an ongoing project, as well as the results of the inquiries to practitioners are used to evaluate the proposed solution using the approach on artifact evaluation proposed by Nicolas Prat et al. [49] and the research principles proposed by Österle et al. [50].

This following chapter maps to the "Demonstration" and "Evaluation" steps of the followed DSRM process, with the proposed solution described in 4 having been instantiated in the course of an ongoing project and its results described, as well as evaluated by confronting if it meets the objectives set out for it.

5.1 Demonstration

Brisa's Digital Transformation team, one of the DTS's teams, is in charge of multiple projects. From those projects, a new IS project of Brisa's DTS for which I was nominated as project manager was selected for this demonstration activity, aiming to establish the use of artifacts in an attempt to solve the proposed research problem.

The proposed solution, the *ProjectStakeholders* application, was applied to this project starting at the Project Initiation phase. This project is an ongoing effort that includes the implementation of a back end, an Android application front end and a separate front end web page, serving as a back office application. The use of the tool in this project has been ongoing for 7 months, by this time this dissertation was submitted.

In this project, the proposed *ProjectStakeholders* application was applied to perform/register all of the stakeholder management processes and activities, according to the specified use cases, populating the application with real project data mapped to the relevant entities - the Digital Transformation team's with 2 Project Managers as users of the application and the companies involved in the project (Brisa, but also the five external companies involved in this project). The corresponding departments of these companies were added, totaling 6 companies and 7 departments.

Stakeholder identification was performed through the application, creating the necessary stakeholder entries (contact information, job title, organization, etc.). 35 relevant stakeholders were identified, of which 27 were external to the company. These stakeholders were added as Project Stakeholders, performing the corresponding stakeholder analysis and classification towards this project. Of the 35 identified stakeholders, the performed analysis resulted in 13 of them classified as key stakeholders,

both due to their heavy participation and/or considerable political power.

The analysis data was used to plan how to engage with the identified stakeholders, by defining communication frequency and preferred method(s). In turn, over 100 Engagement Activities were created and undertaken, including status and other meetings, defining tasks in which stakeholder participation is required, as well as activities in which a deliverable had to be presented to certain stakeholders.

The response of stakeholders to the performed activities, as well as their engagement levels, were monitored and registered thoroughly. Adjustments were made accordingly, editing the previously inserted data, when it was found necessary.

This finalizes the instantiation details performed of the proposed solution, used in an attempt to demonstrate how it potentially solves the stated problem.

5.1.1 Results

Based on this demonstration, it cannot be stated that this application guarantees an improvement of results or management ability. But it can be claimed that its use greatly helped organize relevant project information, and at the disposal of an able project manager can assist in improved decision-making regarding stakeholder interactions and engagement. However, it was noted that the application required a substantial amount of setup work to begin to be effective/useful, since it requires a lot of the base information (companies, departments, stakeholder identification) to be filled out before the project manager may move on to the more relevant activities of analysis, planning the engagement and carrying out the planned engagement.

The application of this tool was considered useful during the project life-cycle, enabling an effective stakeholder management strategy that has assisted in the achievement of successful project results. As stated by João Fontes, head of the Digital Transformation team of Brisa's DTS, "by being aware of the importance of stakeholder management, and recognizing a difficult landscape in our project, the implemented tool allowed us to address and anticipate needs from both internal teams and external partners. We were also able to achieve a better than expected engagement, cross-functional teamwork, and expectations management which resulted in a project that, despite having delays and unexpected events, avoided conflicts, finger-pointing, or a decrease in neither enthusiasm nor trust between stakeholders".

5.2 Interviews

As previously mentioned, the proposed solution was designed with an emphasis on the problem identified in the management of IS projects of Brisa's DTS. However, the solution was designed to be generic enough so that it could potentially be adopted in other IS departments of companies that share the

same difficulties. Thusly, for this validation process, it is sought to make use of interviews with expert judgment, in the form of my project manager peers from Brisa, but also other IS practitioners of different companies who were contacted and asked to participate due to their field of work and experience in similar management positions in IS departments. These interviews are performed to further validate the conclusions of the conducted research and the proposed solution, as well as potentially adding relevant feedback about the effectiveness and usability of the proposed solution.

Interviews may follow three different types of structure [51]:

- **Unstructured**: the researcher's questions are not prepared in advance and arise spontaneously in a free-flowing conversation, meaning that different interviewees are asked different questions.

- **Semi-structured**: the researcher asks some predetermined questions to all candidates, while others arise spontaneously.

- **Structured**: the researcher asks a set of predetermined questions, planned and created in advance, meaning that all candidates are asked the same questions in the same order.

To conduct this validation process of this dissertation, semi-structured interviews were chosen to stimulate the respondent to answer openly and flexibly, while still having an objective comparison of answers.

The interviews start with introductory questions about the interviewees' knowledge of stakeholders, their strategies, and methods to engage with them. These questions are followed-up by a demonstration of the proposed solution, led by the interviewer. Afterward, the questions are oriented to understand the interviewee's feedback concerning the proposed solution. The interviews took approximately 45 minutes each. The interview guide can be found in Appendix B.

5.2.1 Results

The gathered interview results were very positive overall, showcasing an interest by the interviewees in the proposed solution for the identified problems, both from my Brisa peers and also from four external companies of which practitioners were interviewed. These results also provided valuable feedback on how to improve the solution in future work.

The results can be consulted in Appendix B. The summary and conclusions that were reached based on those results can be summarized as follows:

1. Demographics and current Stakeholder Management strategies:
   The interviews were carried out with eight professionals involved in the area of IS projects, occupying different positions ranging from Project Managers to Governance positions, from 5 different

companies. Of those eight, four of the interviewees are from Brisa.

The results confirmed that, in general, all managers involved in IS projects are aware of the importance of active communication with their project stakeholers, corroborating it as a critical aspect of project management.

Concerning the used tools to implement Stakeholder Management, the most recurrent answer was that of Outlook (to schedule meetings and keep track of ongoing topics). Other answers included simple note taking in a notebook or applications such as Notepad/OneDrive/Evernote. While a few other answers were registered, it was noted that, as had been recognized in the literature study, the interviewees could not identify any preponderant tools of note that implement a concrete framework that specifically address the identified problem.

In fact, the frequency through which the interviewees planned their Stakeholder Engagement also provided uneven results, ranging from a daily review to only reviewing data once a month. Others even answered that their Stakeholder Engagement is performed *ad hoc* according to their perceived needs - such as due to certain outcomes of a project meeting or as some necessity dictates. These answers lead to the conclusion that concerning this topic, much of the Engagement Activities performed are reactive and not proactive.

Concerning the identification of relevant stakeholders, it was found that no consistent processes are followed. Instead, stakeholders are merely identified based on the results and mentions of 2 particular events: Steering Committees and Project Kickoff meetings. Another appointed justifications for the disregard with this process were that of the interviewees' knowledge of the company and its employees due to their experience in it, and communication centered in an appointed single point of contact when concerning external stakeholders.

2. Proposed Solution Feedback:

Interviewees were unanimous in their impressions, considering both the concept of a framework to address stakeholder management and the proposed implementation very interesting, innovative, and potentially very useful to structure the information of existing project stakeholders. Some of its potential applications were referenced by the interviewees, noting that this proposal clearly addresses an acknowledged pain point concerning existing project management practices. Interviewees could not identify any alternative project management software with the proposed features addressed by this solution. The interviewees provided plenty of constructive feedback, going as far as suggesting several extensions in detail. These proposed changes focused on 3 main areas: features, integrations and implementation.

Proposed features included additions to the existing data model and displayed data, such as a hierarchical notation that illustrates the power-dependencies between stakeholders or the possibility

68

to group them according to their power/interest assessment. Other additions included expanding the existing tooltips and providing theoretical information concerning the best-practices prescribed by the researched standards, thus providing an additional didactic benefit to the solution.

Concerning the proposed integrations, connectors to a Lightweight Directory Access Protocol (LDAP) directory service were suggested, which include the internal stakeholders contact, hierarchical, and department information. This integration could make the creation of Stakeholders in the application more efficient, and the implemented manual process left for the creation of external stakeholders. Other noteworthy addition would be a connector to a personal information management solution, such as Microsoft Outlook, to use the created Engagement Activities of the solution to automatically schedule meetings and generate and register communications with project stakeholders. This last suggestion could potentially address one of the identified problems, the amount of relevant communications that should be kept registered that end up 'lost' in a project mangers email inbox.

Concerning implementation, while the proposed solution was well-reviewed by each of in interviewees, it was noted it performs a complementary function in a field with many alternatives and more complete solutions. Hence, a potential problem of this solution is that a project manager may end up with an additional application in which project information is inserted, maintaining it spread across apps instead of centralized in a single tool. It was proposed that an additional iteration of development re-implement the application as a plugin to some of one of those solutions, with a concrete example being that of a Jira add-on that could be made available in the Atlassian Marketplace. Interviewees were unanimous in considering the proposed IS solution or an evolution thereof as a potential success factor for a project. Their answers did not consider the application as essential, but ranked it as potentially very important to access and make use of for the management of their projects.

5.3   Artifact Evaluation according to Prat et al.

The issue of artifact evaluation in IS design-science research is addressed in a paper by Prat et al., proposing a holistic view system that may assist clarifying *what* to evaluate (object and criteria of the evaluation) and *how* to conduct it, through three main components: a hierarchy of evaluation criteria for IS artifacts organized according to the dimensions of a system (goal, environment, structure, activity, and evolution) and a model providing a high-level abstraction of evaluation criteria and methods [49].

The developed IS solution was evaluated as an artifact following the proposed approach, by choosing four system dimensions and evaluation criteria.

The coherency between the proposed solution and the selected criteria can be proven through the

Dimension	Evaluation Criteria	Definition
Goal	Efficacy	The degree to which the artifact produces its desired effect (i.e. achieves its goal).
Environment	Consistency with the organization - utility	Measures the quality of the artifacts' practical use in an organization.
Structure	Homomorphism - fidelity	The degree through which the artifact reflects the intended modeled scenario/phenomena.
Activity	Efficiency	Ratio between inputs and the outputs of the activity

Table 5.1: Chosen dimensions, evaluation criteria and sub-criteria to evaluate the proposed solution/artifact.

feedback gathered by the demonstration of the solution proposal, instantiated on the real case of an ongoing project of Brisa's DTS department, but also by the collected inputs of the performed interviews detailed in the previous section. This included a direct evaluation made by the interviewee's to 3 of the 4 chosen criteria: efficacy, homomorphism, and efficiency (graded between 1 and 5, being 1 the lowest score and 5 the highest - full results in Appendix B). Consistency with the organization - utility was left out since the conditions through which this criteria is evaluated are based instead on the demonstration results.

5.3.1 Results

In every iteration performed while developing the proposed solution, additional insight was gathered. Having successive iterations with well-defined objectives, areas of improvement, and the ability to test them in a real project management environment, while perceiving the results, made possible that by the 3rd iteration the artifact was effective in fulfilling the defined objectives for the solution. Along with the results of the performed demonstration, the positive feedback drawn from the interviews, and the average score of 4,375 attributed by the interviewees, it can be concluded that in the **goal** dimension, **efficacy** is a criteria with a positive evaluation regarding the developed artifact.

While this solution was based and tested on the project management environment of Brisa's DTS, the developed artifact was implemented based on the knowledge acquired from the literature review, concerning some of the most well-accepted practices and standards on project and stakeholder management, selected based on the perceived needs for the solution. Nonetheless, no company-specific terms or other information was used, as it was intended to produce an artifact that was adaptable to several organizations that require a tool that assists in establishing methods for the processes of stakeholder

management. The demonstration showcase that the artifact was useful in terms of the importance of the information gathered about the project and their relevant stakeholders. The artifact can consequently be considered **consistent with organization – useful** within the **environment** dimension.

While there were some realized limitations during the demonstration of the performed implementation (such as the lack of hierarchical visibility between stakeholders, for example), it was found that the chosen fields to identify and analyze stakeholders were sufficient and not overly exhaustive in characterizing them. Interviewees were also asked to evaluate this particular criteria, as external interviewees could also provide an outsiders perspective concerning if the gathered information was enough to accurately characterize a project stakeholder. The average attributed score of 4,125 can assert that, in terms of the **structure** dimension, the artifact matches the **homomorphism - fidelity** criteria.

Lastly, the **efficiency** criteria of the **activity** dimension was also one of criteria that was appraised by the interviewee's, that gave it a lower score of 2,75. This score further validates one of the findings of demonstration results of the proposed solution - that it requires some effort by the project manager to carry out the initial setup. Thusly, it considered that the artifact does not fulfill this criteria, a limitation that could be addressed in future work.

5.4   Research Principles according to Österle et al.

Four principles in design-oriented IS research are detailed by Österle et al. in a memorandum signed by 10 authors and supported by 111 full professors from the German-speaking scientific community. Their objectives are providing rules for scientific rigor and improved guidance for IS researchers, criteria for journal and conference reviewers work, criteria for selection of young researchers and tenure procedures, criteria for evaluation of researchers and research organizations, and to position design-oriented IS research in the international research community [50].

In this memorandum, its is proposed that design-oriented IS research must be characterized by four principles in order to distinguish itself from the way solutions are developed in the practitioners' community (e.g. in user organizations) or by commercial providers (e.g. software vendors, consulting companies). The principles are:

- **Abstraction**: Each artifact must be applicable to a class of problems.

- **Originality**: Each artifact must substantially contribute to the advancement of the body of knowledge.

- **Justification**: Each artifact must be justified in a comprehensible manner and must allow for its validation.

- **Benefit**: Each artifact must yield benefit – either immediately or in the future – for the respective stakeholder groups.

5.4.1 Results

Reviewing the produced solution according to the four principles proposed by Österle et al., the following assessment can be made, supported by the performed demonstration and practitioners interviews:

- **Abstraction**: While the proposed solution was developed with a focus of Brisa's DTS and tested on an ongoing project there, the developed artifact is generic enough so that can be adapted and applied to many types of organizations and their project management team(s), as validated by the interviews with external practitioners. On account of the use of a generic data model, the solution can be applicable to other IS departments, in terms of the gathered information about projects and their stakeholders. One may then conclude that the artifact is abstract enough to be applicable to a wider class of problems.

- **Originality**: The proposed solution relied heavily on developing an IS that implements and supports a methodology for Stakehoder Management that is based on the stakeholder management processes of PMBOK, ISO 21500, the methods prescribed by PM^2, and the competence indicators of ICB, resulting on an implementation that reconciles knowledge from these different standards. While performing the Literature Study of this dissertation, no similar implementations or solutions were found that could fully tackle the identified problems, hence this proposed solution culminating as an original solution.

- **Justification**: The produced artifact is supported by the motivation and problem statement that were described in detail in Chapter 1, along with the different standards that were presented in the Literature Study of Chapter 3, and lastly by the positive conclusions drawn from the performed interviews.

- **Benefit**: According to results of demonstration of the artifact in an ongoing IS project, as well as the feedback and conclusions obtained from the performed interviews, the proposed solution is perceived to add value to the management of IS projects, specifically to project managers that require a tool that assists them perform stakeholder management.

In conclusion, the implemented solution complies with the detailed four principles, thus validating it in accordance to these criteria.

6

Conclusions and Future Work

Contents

In this final chapter, the conclusions reached by this dissertation are summarized. In the first section, the main research question and sub-questions are answered, stating how the performed work addresses the established objectives. This is followed by an analysis on the limitations of the performed research. Based on the achieved results but also the feedback acquired from the validations, a few recommendations are made for future research in this topic, finishing with the mediums through which this research will be communicated.

6.1 Conclusions

This research sought to explore and better understand the problem background and the inadequate processes and methods for management and control of stakeholder engagement, in Brisa's IS projects. Due to this, stakeholders may not be properly involved in projects, and their expectations may not be properly managed, ending up dissatisfied about IS project results. The following research question was followed: *can a established stakeholder management framework assist IS project managers improve their engagement of stakeholders during the project life-cycle?* To answer it three sub-questions were formulated, of which the answers are here summarized.

Having asked *what are the problems with stakeholder engagement in Brisa's IS projects?*, this research analyzed and identified them, which concerned the existing methods through which project managers plan and control stakeholder engagement. The main causes identified for improper stakeholder engagement were:

- Lack of effort in the consistent identification of all relevant project stakeholders and the key stakeholders among them;

- Lack of creation and implementation of a structured stakeholder management plan and/or methods to manage the stakeholder engagement during the project;

- No evaluation of the stakeholder engagement and satisfaction during the remaining project life-cycle, after the analysis and design phase.

There is a vast bibliography on project management and stakeholder management that helped answer the question *what are the some of the best practices for a project manager to effectively manage and control the engagement of a variety of stakeholders in projects, and especially in IS projects?* The conclusions drawn from the reviewed project management body of knowledge prescribe the implementation of stakeholder management processes and strategies, such as:

- Identify and document stakeholders, and in particular key stakeholders;

- Analyze their power, influence, main expectations, and requirements;

74

- Assess their current engagement and plan to act on it if a different level is desired;

- Engage with them to ensure their commitment and/or participation;

- Monitor the effect of these actions;

- Be prepared to implement corrections to the plan and consequent actions if the desired outcome isn't being achieved.

While carrying out this study, it was shown that there is a lack of available software alternatives that address this problem, unlike other areas of project management. Seeking to improve practices for Brisa IS project managers and facilitate management of stakeholders' engagement, the last sub-question was *what is the proposed solution to improve the management and engagement of existing stakeholders in IS projects?*. This solution consists of a stakeholder management framework, in the form of a software application, that can assist a project manager identify project stakeholders, analyze and classify them and register the plan for their engagement in a project setting. This solution can also record the defined engagement activities and their outcomes, allowing the project manager to monitor the results and adapt his plans if necessary.

This solution was demonstrated and tested in an ongoing projects of Brisa's DTS during the iterations of its development. It was also validated through the feedback of interviewees to a group of IS practitioners. Based on the registered results, it can be considered that this solution supported the project in which it was applied, enabling an effective stakeholder management strategy that has assisted in the achievement of a successful project result, thus positively answering the main research question.

Concerning the secondary objective of having the devised solution be adopted to other IS projects in the future, the developed tool will remain in use on my projects in Brisa. I will be making it available for any of my peers who seek to use it, and maintain it in operations, as well as seek to develop it further in the future.

6.2   Limitations

There are some acknowledged limitations to this work:

- Generalizability of outcomes - The results of the solution demonstration proposed by this research are limited to the project in which it was instantiated. Unfortunately, it was not possible to extend the instantiation to other project, or to an context outside of Brisa. Despite the results of the performed interviews, the generalizability of the conclusions are limited, at least applicable to Brisa IS projects, but not necessarily to all other IS projects.

- Generalizability of interviewee data - The validations of this research are based on the data collected from the interviewees to a set of IS practitioners. Additional interviews could have been conduced to better analyze how other project managers and practitioners perceived the solution. But additionally, it could have been especially useful to have the tool instantiated for each of those practitioners and have them use it in their projects. This could lead to more useful insights concerning their use of solution and how it assisted them.

- Efficiency Limitations - Concerning the performed validations using the artifact evaluation criteria proposed Prat et al., the lower score of the efficiency criteria is an acknowledged limitation of the solution. The results can assert that even in its current state, the additional setup time of the solution when planning can yield a worthwhile benefit to a project manager. But regardless, this limitation is acknowledged, and proposals to address it are listed in the following section.

6.3 Future Work

There are several opportunities identified for future work, in regards to this research. The validation chapter of this dissertation indicated that, as was intended, the defined solution may potentially be applicable for, not only in Brisa's DTS, but also in other companies' IS departments or in IT consulting. This possibility could be approached by a new or adjusted research in which the proposed solution is expanded and validated in other companies and scenarios other than IS projects. This possibility was recommended by one of the interviewees as a valuable future addition to the solution design.

Considering the implemented application, there are a considerable amount of features that could be added to the proposed solution that could not be implemented in the time span that this dissertation allowed for. Those features include:

- Software integrations with solutions such as Active Directory (or other LDAP), that could automatically synchronize many of the relevant stakeholder information that is raised in the stakeholder identification process, leaving the basic stakeholder information to be filled out exclusive to external stakeholders,

- Other possible software integrations, such as with Microsoft's Office 365 (especially with Outlook) allowing the application to be used to schedule meetings and integrate email data automatically (as, in my experience, much useful project information becomes 'lost' in an inbox),

- Development of an application dashboard, based on the underlying implemented database schema, that can provide a better visual representation of existing metrics (for example, a calendar highlighting the date/time for the scheduled stakeholder engagement activities, or even a cross-project kanban board to track and prioritize them).

- Regarding the existing stakeholder information and data visualizations, several additions could be made, such as the introduction of additional tooltips that advise the project manager on how to handle certain stakeholder interactions, depending on the performed analysis. Introducing dynamic graphical representations of each and/or all project stakeholders depending on their classification (such as in the power/interest grid or introducing an analysis via salience model) is another possibility.

Lastly, concerning to the delivery of the implemented solution to different companies and/or project managers, future deployment of this solution could be scaled in the form of isolated instances that are cloud-hosted, and distributed as a SaaS application. Another possibility in line with this proposition would be a new iteration on the solution that is implemented as a plugin to an existing project management tool with widespread usage, such as the case of Jira which supports third-party plugin implementations and extensions, instead of the standalone application that this dissertation explored, as a proof-of-concept.

6.4 Research Communication

In the followed DSRM process model, the final step is to communicate the performed research. This implies documenting the identified problem and its importance, the produced solution and/or artifact, its viability, utility and novelty, the rigor of its design and its effectiveness, and sharing it with researchers, companies, and other relevant audiences.

Concerning to this final step, this research work is communicated in three different means:

- The proposed methods were shared with and applied in an ongoing project of Brisa's DTS during the performed iterations of development of the solution. The final implementation will be maintained and made available to Brisa project managers who show interest in using it in their projects in the future.

- The research work was shared with several IS practitioners, both from Brisa and external companies, during the interviews carried out for the evaluation phase, having been well-accepted. These interviews added additional value to this research other than reviewing the performed work, as they provided valuable feedback but also made several suggestions and critiques which enable the reached conclusions, limitations, and also potential future work.

The completion and presentation of this dissertation itself also contributes to the fulfillment of this step, as it is made available for the academic community as a basis for a new study and other potential solutions.

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A

Appendix A: Solution Use Cases

Use Case: 01   User Login

Primary Actor: Project Manager

Main Success Scenario:

1. The use case starts when the Project Manager reaches the ProjectStakeholders web portal.

2. The Project Manager inputs his email and password.

3. The Project Manager is successfully logged in.

Exception Scenarios:
2.a Invalid Email/Password combination:

1. System shows failure message.

2. User returns to step 2.

Use Case: 02   Create Project Manager

Primary Actor: Administrator

Main Success Scenario:

1. The use case starts when the Adminstrator reaches the Users platform.

2. The Adminstrator inputs his email and password.

3. The Adminstrator is successfully logged in to the Users platform.

4. The Administrator creates a new User, inputting his email, password and name.

5. The Adminstrator attributes the Project Manager role to the User, and a Project Team role.

Exception Scenarios:
2.a Invalid login data:

    1. System shows failure message.

    2. User returns to step 2.

4.a Email already exists:

    1. System shows failure message.

    2. User returns to step 4.

Use Case: 03   **Manage Project Manager data**

Primary Actor: Administrator

Main Success Scenario:

1. The use case starts when the Administrator selects the 'Project Managers' option in the ProjectStakeholders web portal.

2. The ProjectStakeholders web portal returns a Project Manager list.

3. The Administrator selects a Project Manager from the list or searches by Name.

4. The Administrator edits the Project Manager data with a Description, Job Position, Company and Department.

5. The Adminstrator submits the changes.

Pre-requisites: • The Administrator has logged in the web portal (UC 01).

Use Case: 04	**Manage Company data**
Primary Actor:	Project Manager

Main Success Scenario:

1. The use case starts when the Project Manager selects the 'Companies' option in the ProjectStakeholders web portal.

2. The ProjectStakeholders web portal returns a Company list.

3. The Project Manager selects a Company from the list, or creates a new one.

4. The Project Manager edits the Company data with a Name, Address, NIF, Description and Photo/Logo.

5. The Project Manager adds one or more Departments that are part of the Company.

6. The Project Manager submits the changes.

Exception Scenarios:
3.a Company NIF already exists:

1. System shows failure message.
2. User returns to step 3.

Pre-requisites:	• The user has logged in the web portal (UC 01).

Use Case: 05	**Manage Stakeholder data**
Primary Actor:	Project Manager

Main Success Scenario:

1. The use case starts when the Project Manager selects the 'Stakeholders' option in the ProjectStakeholders web portal.

2. The ProjectStakeholders web portal returns a Stakeholder list.

3. The Project Manager selects a Stakeholder from the list, or creates a new one.

4. The Project Manager edits the Stakeholder data with a Name, Description, Job Position, Email, Phone Number, Photo, Company and Department.

5. The Project Manager identifies the Stakeholder according to their status, choosing from the available identification list.

6. The Project Manager submits the changes.

Exception Scenarios:

1. The Project Manager may decide to abort the operation at any step. In this case, the software returns to the precondition state.

3.a Stakeholder Email and/or Phone Number already exists:

   1. System shows failure message.
   2. User returns to step 4.

Pre-requisites:	• The user has logged in the web portal (UC 01).

Use Case: 06	**Manage Project data**
Primary Actor:	Project Manager

Main Success Scenario:

1. The use case starts when the Project Manager selects the 'Projects' option in the ProjectStakeholders web portal.

2. The ProjectStakeholders web portal returns a Project list, created by either the Project Manager or another Project Manager with the same Project Team.

3. The Project Manager creates a new Project or selects one from the Project list, or searches one by Name, Project Type or Project Phase.

4. The Project Manager edits the Project data with a Name, Description, Budget, Start Date, End Date, current Project Manager and Logo.

5. The Project Manager classifies the project according to its Project Phase, Type, and indicates if the Project has been completed or not.

6. The Project Manager registers the Project Stakeholders, include **UC 07 - Manage Project Stakeholder data**.

7. The Project Manager registers the Stakeholder Engagement Activities, include **UC 08 - Manage Project Stakeholder data**.

8. The Project Manager submits the changes.

Exception Scenarios:
4.a Project Name already exists:

   1. System shows failure message.
   2. User returns to step 4.

Pre-requisites:	• The user has logged in the web portal (UC 01).

Use Case: 07	**Manage Project Stakeholder data**
Primary Actor:	Project Manager

Main Success Scenario:

1. The use case starts when the Project Manager is currently editing a Project in the ProjectStakeholders web portal.

2. The ProjectStakeholders web portal returns a Project Stakeholder list belonging to the current Project.

3. The Project Manager creates a new Project Stakeholder or selects one from the Project Stakeholder list.

4. The Project Manager edits the Project Stakeholder data with an existing Stakeholder and his Role in the Project.

5. The Project Manager analyzes the Project Stakeholder in terms of Main Project Requirements, Expectations, and Concerns.

6. The Project Manager classifies the Project Stakeholder according to his Power/Interest and if this is a Key Stakeholder.

7. The Project Manager plans the Project Stakeholders' Engagement, indicating Notes on how to engage the stakeholder, Current Engagement estimate, the Desired Engagement, preferred Communication Method, and Frequency.

8. The Project Manager submits the changes.

Exception Scenarios:

4.a Selected Stakeholder is already registered as a Project Stakeholder of this Project:

1. System shows failure message.
2. User returns to step 4.

Pre-requisites:	• The user has logged in the web portal (UC 01).

Use Case: 08	**Manage Stakeholder Engagement Activity**
Primary Actor:	Project Manager

Main Success Scenario:

1. The use case starts when the Project Manager is currently editing a Project in the ProjectStakeholders web portal.

2. The ProjectStakeholders web portal returns a Stakeholder Engagement Activity list belonging to the current Project.

3. The Project Manager creates a new Stakeholder Engagement Activity or selects one from the Stakeholder Engagement Activity list.

4. The Project Manager edits the Stakeholder Engagement Activity data with an Activity Type, a Description, a Due Date, indicate a Recurrency and if the Stakeholder Engagement Activity has been completed.

5. The Project Manager identifies a Project Stakeholder that will be involved in this Stakeholder Engagement Activity and indicates his involvement.

6. The Project Manager submits the changes.

Exception Scenarios:

4.a Stakeholder Engagement Activity has been completed:

1. System shows an additional field for the Project Manager to fill the Outcomes and Notes.

2. User returns to step 4.

Pre-requisites:	• The user has logged in the web portal (UC 01).

B

Appendix B: Interviews

In this appendix, the used interview guide is presented, detailing the followed semi-structured interview questions. Additionally, the results of the carried interviews are registered in detail.

B.1 Interview Guide

Interview:
Project Stakeholders

The purpose of this questionnaire is to support the work object for a master's dissertation in Computer Science and Engineering, from Instituto Superior Técnico de Lisboa. It intends to conclude with a group of interviewees, whose functions are aligned with the scope of the management and/or governance of IT projects, the validity of the solution proposal introduced by this dissertation concerning the methods and support tools on which they plan and structure, in their role as managers, communication and management of expectations of their project stakeholders.

A - Demography / Previous Knowledge

1- Company and Professional Occupation?

2- How important do you consider active and planned communication with your project stakeholders, in your role? **(1 - Not very important, 2 - Nice to Have, 3 - Important, 4 - Very important, 5 - Essential for the success of the project)**

3- Do you plan for this type of management activities?

4- How? Please describe your steps with these tool(s) **(Ex.: Points to a notebook, emails marked in the inbox, computer reminders?)**

5- How often do you plan these types of activities beforehand?

6- In a scenario in which you are appointed to a new or ongoing project, how do you get information about who your project stakeholders are?

B – Solution Demonstration

C- Stakeholder Management Tool

1- What assessment can you make of this tool? Any first impressions?

2- What additional information about project stakeholders and/or their organization in the tool could be added/changed? Are there any other types of management activities related to stakeholders that you consider relevant and do not see represented here? If so, please elaborate.

3- Do you consider that a tool like this that allows the systematization of Stakeholder Management is a factor of success for a project? **(YES/NO)**

4- What is your perception of the importance of using such a tool for the management of your projects? **(1 - Not very important, 2 - Nice to Have, 3 - Important, 4 - Very important, 5 - Essential for the success of the project)**

5- How often would you use a similar product? What other additions or changes could be made to make this application more useful for you?

6- Evaluate the tool used according to the criteria presented in the following table **(scale from 1 to 5, with 1 being the lowest, and 5 being the highest)**:

Prat et al. Criteria	Evaluation:
Efficacy	
Homomorphism	
Efficiency	

B.2 Interview Results

The gathered results of conducting the semi-structured interviews, according to the aforementioned guide, are as follows. Due to the nature of the semi-structured interviews, answers were fully registered, but the responses are summarized and aggregated in this section.

B.2.1 Block A

First, the results of Block A, concerning the Demographics of the interviewees and their knowledge and current practices concerning Stakeholder Management strategies:

1. First Question - *Company and Professional Occupation?*
   The interviews were carried out with eight professionals involved in the area of IS projects, occupying different positions ranging from Project Managers to Governance positions. A quick description of their profiles:

   - Interviewee 1 - Senior Manager of the Digital Transformation Area, Brisa;
   - Interviewee 2 - Senior Manager of the Customer Care Area, Brisa;
   - Interviewee 3 - Project Manager of the Customer Care Area, Brisa;
   - Interviewee 4 - Deputy Director of Application Development, Brisa;
   - Interviewee 5 - Product Manager and Commercial Relationships, Company A;
   - Interviewee 6 - Director of IT, Company B;
   - Interviewee 7 - Cybersecurity and Information Protection Manager, Consulting Company C;
   - Interviewee 8 - Project Manager, Consulting Company D;

   For confidentiality reasons, the companies of the interviewees outside of Brisa are kept anonymous. Company A and Company B are two companies that, similarly to Brisa, heavily rely on IS projects, but their main is business unrelated to IT. Consulting Companies C and D provide IS services to other companies.
   Interviewee 5 was selected to be interviewed despite being outside of an IT department due to its frequent involvement in IS projects as a project stakeholder, potentially providing an outsider's view regarding the developed framework.

2. Second Question - *How important do you consider active and planned communication with your project stakeholders, in your role? (1 - Not very important, 2 - Nice to Have, 3 - Important, 4 -*

Very important, 5 - Essential for the success of the project)
Average result score of 4.75, with a result gap between [4,5].

3. Third, Fourth and Fifth Questions - *Do you plan for this type of management activities? How? Please describe your steps with these tool(s). How often do you plan these types of activities beforehand?*

A multitude of answers was provided to these 3 questions, showing that multiple approaches are used, although not all of them particularly consistent. The results have been grouped due to their similar nature.

Concerning the used tools to plan, register stakeholder information, and manage engagement, there is a prevalent use of Outlook to schedule meetings and keep track of ongoing topics through email threads relating to the project, with flagged emails on the inbox. Additional answers included *ad hoc* note registering in a notebook or applications such as Notepad/OneDrive/Evernote, both to register outcomes of meetings and calls, but also to plan future ones, as well as the use of reminders applications. Other non-repeating answers included the use of Microsoft Planner, Jira, and Excel spreadsheets to help register and organize relevant stakeholder information and register management tasks.

The frequency of use of these tools are used also provided some uneven results. These ranged from a daily review of performed/to-do tasks and registering notes, while also preparing for the tasks of the following day to only reviewing data once a month. There were also two relevant results indicating that no previous planning is performed and that their stakeholder management is performed *ad hoc* according to their perceived needs, such as due to certain outcomes of a project meeting.

4. Sixth Question - *In a scenario in which you are appointed to a new or ongoing project, how do you get information about who your project stakeholders are?*

Concerning the exchange of information when beginning a new project to help identify and analyze who the relevant stakeholder may be, most interviewees' responses appointed their knowledge of the organization (all of the interviewees have at least 3 years experience in their respective organizations, with all Brisa interviewees, except for one, having 10 years experience). Concerning external stakeholders, three responses also mentioned that often there is a single point of contact appointed that will list any relevant stakeholders of that organization that may support the project. Another appointed source of note project relevant stakeholder identification was that of the Project Steering Committee and/or Project Kickoff meetings. A noteworthy response from one of the interviewee's indicated that he had access to company internal reports that assisted in identifying

relevant stakeholders.

B.2.2 Block B

Secondly, the results of Block B of the interviews are outlined, which concern the feedback of the interviewees concerning the Proposed Solution that was demonstrated to them:

1. First Question - *What assessment can you make of this tool? Any first impressions?*

   Interviewees were unanimous in their first impressions, considering both the concept of a framework to address stakeholder management and the implementation very interesting, highlighting some of its potential applications. It was addressed by most of the interviewees that this implementation of an IS solution is considered innovative and potentially very useful to structure the information of existing project stakeholders and plan the activities that involve them. It was also mentioned that this clearly addresses an acknowledged pain point concerning existing project management practices and that there was no recollection of features in this segment being available in some of the most well-known project management software.

   It was remarked that this solution could be especially helpful in aggregating information about how to work with and manage the expectations of project stakeholders, especially stakeholders that are repeated across various projects. It was noted that this could assist the project manager in identifying their strengths and weaknesses and determining how to address them in the most effective way.

   The clear separation of project activities (referencing the tasks of implementation work packages) from the engagement activities was also highlighted as a relevant point that could introduce benefits to the coordination of the project manager's tasks. This was exemplified in the focus of most project management tools to assist in planning project activities, and not so much on the activities carried out by the project manager that support them, such as the ones in which stakeholders are thoroughly engaged. In the subject of the implemented Engagement Activities, the solution was also compared to another widely used software tool, Trello, as a more 'complete' solution, although with an inferior implementation. This was mentioned since it allows the registry of activities along with their deadlines and link them to their relevant stakeholders (even if they are not users of the application, which is not an option in Trello).

   The possibility of greater visibility concerning interactions with project stakeholders and of sharing project information with a set of other project managers was noted as another useful addition to a project management office, due to acknowledged problems stemming from the lack of a central repository, with information 'lost' between email inboxes and unregistered communications, especially in phone calls.

It was noted by one of the more senior interviewee's that it was his perception that many managers perform much of their decisions pertaining to stakeholder management *ad hoc*, especially senior managers, due to their larger experience in the field. This was considered unlike other branches of project management, such as issue management, and that the introduction of a similar solution could contribute to improving these practices. Two of the interviewees even proposed that this solution could perhaps be extensible to a greater range of stakeholder management than merely IS projects, such as for tracking clients of a commercial department and other non-IS projects.

2. Second Question - *What additional information about project stakeholders and/or their organization in the tool could be added/changed? Are there any other types of management activities related to stakeholders that you consider relevant and do not see represented here? If so, please elaborate.*

For this question, the interviewees provided plenty of substantial feedback and possible extensions, even beyond what was originally asked. Those suggestions include:

- Possibility to 'copy' a project in a scenario of nearly identical project stakeholders, which would be edited afterwards.
- Stakeholder pre-filed templates, in scenarios of repeated stakeholders across projects.
- Introduction of a hierarchical notation between stakeholders, if it exists.
- Combined visualization with all project stakeholders represented in the power/interest matrix.
- Introducing additional tooltips and theoretical information concerning the best-practices prescribed by the researched standards could also improve the solution by providing an additional didactic benefit, especially to project managers who are not familiar with these methods and/or processes.
- Adding a way to prioritize tasks other than the due date.
- Plugin integration with Active Directory/Other LDAPs, eliminating the need to fill the generic identification data concerning internal stakeholders, leaving that functionality exclusively for external stakeholders.
- Plugin integration with Office 365, allowing meeting invites and room scheduling to be automatically performed inside the application, as well as registering communications concerning tasks or deliverables automatically. Automatic creation of calendar events in Outlook was also suggested.

- Another noteworthy suggestion was to implement a Kanban board to administrate and track Engagement tasks. Another interviewee made a similar suggestion, going further and suggesting that a 'commercial' version for this application could be built as a Plugin for Jira, taking advantage of the existing synergies for Kanban boards, as well as centralizing all project management information under a single piece of software.

Lastly, there were some raised concerns regarding compliance with GDPR, as personal data concerning those stakeholders will be registered, suggesting that some automated process should exist to delete all data entries made by certain project managers or concerning a particular stakeholder, in such a case as any of them leaving the company. It was emphasized that all inputted data should be kept secret strictly confidential, with a noteworthy example of resistant/loss stakeholders, as the negative connotation, along with the justification for that classification could potentially cause damage should it be somehow made public.

3. Third Question - *Do you consider that a tool like this that allows the systematization of Stakeholder Management is a possible success factor for a project? (Yes/No)*
   Interviewees were unanimous, considering the tool a potential success factor for a project.

4. Fourth Question - *What is your perception of the importance of using such a tool for the management of your projects?* **(1 - Not very important, 2 - Nice to Have, 3 - Important, 4 - Very important, 5 - Essential for the success of the project)**
   Average result score of 3,875, with a result gap between [3,5].

5. Fifth Question - *How often would you use a similar product? What other additions or changes could be made to make this application more useful for you?*
   Responses from all interviewees to this question ranged from daily to weekly use of the tool, with answers indicating that if Stakeholder Engagement Activities could be expanded further according to some of the previously mentioned feedback, adoption would skew towards daily usage. Noteworthy events that were referenced for usage included activity tracking and note-registering, as well as initial registering of stakeholder information after the Project Kickoff meeting.

6. Sixth Question - *Evaluate the tool used according to the criteria presented in the following table* **(scale from 1 to 5, with 1 being the lowest, and 5 being the highest)**

Interviewee	Efficacy	Homomorphism	Efficiency
1	4	5	3
2	4	3	3
3	5	4	2
4	4	5	3
5	4	4	3
6	5	4	3
7	4	4	2
8	5	4	3
Average Scores:	4,375	4,125	2,75

Table B.1: Classification results attributed by each interviewees to three of the five defined evaluation criteria, according to Prat et al [49].