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Framework for the Utilization of the Agile Methodology in Engineering Consulting Services

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by

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Abstract

Title: Framework for the utilization of the agile methodology in engineering consulting services.

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The guidelines that form the Agile methodology framework are developed and adapted to the engineering consulting services industry. Four tools recommended by the literature are developed and adapted for the specific case of this industry. The implementation of the use of these tools is intended to help adopt the Agile methodology more effectively.

A company that performs consulting services for airports is taken as a case study. This company did not officially implement the Agile methodology at the time this research has been done. The data is obtained through a survey designed to associate the company's activities with the guides and tools mentioned above. A total of thirty-four responses were collected from personnel at all levels of the organization. The data analysis is performed by dividing the population in two different ways, namely experience, and job position. The results are evaluated by doing a frequency analysis and normalizing the data for comparison between the different categories. In addition, a statistical analysis is carried out using the Pearson's test, which allows to determine if there is a statistical relationship between the variables of experience or position, and the guides or tools. Finally, an estimation of the level of adaptation of the method is made.

The results show that although the company has not officially adopted the method, it does implement the use of the guides and tools at a certain level. It can be seen that in some aspects, such as communication, there are dependencies with the level of experience and job position. Finally, it is estimated that the level of adaptation of the method made by this company is 67%, so there is a margin to apply the tools, and increase the percentage of adaptation of the method.

At the end of the analysis, and taking into account the frequency study and the statistical study, the status of each of the parameters is detailed, and recommendations are provided accordingly.

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Chapter 1
Introduction

Globalization is one of the main factors why companies in growing expansion struggle to deliver results on time while keeping the product quality. The goal of this research is twofold. The first section of this research will establish bases and recommendations on how to use the agile methodology out of the software industry and specifically in the engineering consulting services industry. The second section , will be a case study where the estimation of how extensively each guide and tool are being used by an engineering consulting company that is not using the Agile methodology. Also, a statistical analysis will determine the dependency of the variables for each of the guides and tools, and a system of points is developed for the estimation of how agile the company is before making any modification. Finally, recommendations on how to implement those guides and tools to improve agility will be provided.

The agile methodology revolutionized the software industry, by shortening the duration of the developments, and improving the efficiency of the deliverables. The methodology mixes the stakeholder's dynamic participation, and commitment of the working team in different aspects of the project. Before the Agile methodology existed, software developers were using the waterfall methodology as a framework for their developments. As the name of the method suggests, in the waterfall methodology, every completed task in one phase needs to be reviewed and verified before moving to the next one. This is a linear and sequential approach, where phases flow downward (waterfalls) to the next. Agile, on the other hand, concentrates on people, results, collaboration, and flexibility. In this method, the project is broken down into small parts, or iterations of short length. shows the basic differences between these two methods.

Table 1 - Waterfall vs Agile methodologies

Waterfall vs. Agile	
Waterfall ("Predictive" Life Cycles)	Agile Methodology ("Adaptive" Life Cycles)
Works best in environments with stable, relatively unchanging project requirements (e.g., construction/manufacturing)	Works in environments with dynamic, changing project requirements like software development
Requires one phase to be completed before moving to the next phase (sequential)	Is iterative, team and requirements-driven
First developed by Herbert Benington in 1956 to describe software development (he thought it was a bad idea for software development)	Uses repeated cycles of planning–execution–reflection

The agile methodology has proven to be a revolutionary tool for software developers, reducing the time and improving the quality of the final products. Therefore, it is natural that some efforts have been made to tweak the method for its application in other types of industries. However, the application of the method is based on the utilization of certain tools, such as Just In Time, and Total Quality Management. The lack of a framework and standard key tools to use for consulting companies result in different approaches to similar projects, and therefore, different outcomes and performances for different project managers. Under these circumstances, even though some of the approaches might have better outcome than others, it is very likely that none of them is operating at their fullest potential, and therefore, their operation costs are higher than ideal.

The motivation to pursue this research is to find the capabilities of the agile methodology when applied to engineering consulting companies. The thesis is organized as follows: Following the introduction in Chapter 1, Chapter 2 presents the literature review. The development of the method is covered in Chapter 3, which is followed by the results and discussion in Chapter 4. Chapter 5 summarizes the conclusions reached in this study. The recommendations for future work are given in chapter 6. Subsequently, the nomenclature and bibliography are provided. Finally, the appendices are given at the end of this document.

Chapter 2
Literature review

This chapter covers a literature review about the use of Agile methodology in different industries, and the tools that had shown to be of importance for the successful application of the method. Many companies in the manufacturing sector are struggling to deliver projects on time and within budget. While this may be in part due to issues on project management, the main reason is the increasing technical complexities. The traditional waterfall model used for planning and running projects does not deliver good results, and therefore, companies are looking to implement Agile manufacturing (AM), which brings less upfront planning, collaborative teams, frequent alignment with the client, an iterative way of working with shorter project cycles, and a focus on building a first prototype fast.

Unfortunately, the use of the agile methodology is not that simple. [1] states that lean techniques can be applied where demand is predictable, variety is low and volume is high, characteristics of the automotive industry when Toyota developed the lean philosophy, and that agility is needed in less predictable environments where demand is volatile, and variety is higher. In order to use the methodology for a specific industry, a company needs to Identify the agile manufacturing enablers (AMEs) and then define the domain of each enabler so that right AMEs can be selected in a specific manufacturing environment, according to Potdar and Routroy [2]. These enablers can be used to determine the type of tools that can be used to apply the agile manufacturing methodology. According to [3], technology and management related companies were observed utilizing flexible manufacturing, lean manufacturing, production planning and control, computer-aided design and manufacturing, total quality management control, quality circle, quality function deployment and many more. The authors also states that companies utilizing AM can produce high quality products and low unit costs in compressed time, even in smaller quantities. Kumar et al states that the companies adopting AM can rapidly and efficiently respond to customer's demand.

In their investigation, [4] analyzes a metal forming company and develops recommendations of actions for facing a volatile market in the most efficient way. In their research, surveys were done, and they analyze the different technologies available, and how a good selection of devices and layouts can significantly reduce the production times. Seventeen barriers are identified in [5] for

the implementation of AM in the Indian industry. The authors managed to reduce these barriers into five groups (Managerial constraints, technological constraints, human resource constraints, operational constraints, and organizational culture constraints).

An analysis of the automotive industry is done in [6], where the author explores the usefulness of the AM methodology for this particular industry and proposes a manufacturing framework that follows agile principles with traceability management. The AM is strongly bonded to three specific tools that should be addressed when the industry allows, namely, just in time (JIT), total quality management (TQM) and total productive management (TPM). According to [7], the objective of these three tools are to reduce the costs and enhance the quality of the products, whereas JIT goes to inventory control, time reduction and defective rate reduction, TQM aims to cut costs by improving quality, and TPM aims to increase the machine's efficiency by stablishing a maintenance program. [8] explores the relationship between JIT, TQM, TPM, and operational and financial performance. They claim that the lean manufacturing tools do not seem to have direct impact on the operational performance, except when mediated through AM.

Other studies investigate the use of the method in the service field. [9] induces the skill to create a technical service culture that must be strategic, iterative, and innovative. To do so, they define that the technical agile formula is "Knowledge + Readiness = Transformation." They claim that knowledge is not enough to claim transformation, and that an equally important aspect is readiness. Finally, they define four strategies to obtain readiness: Transitioning staff to support holistic workflows; Iterative decision making; Transparent communication; and Accepting risk and experimentation.

Some concepts are present in many of the previous cited investigations, such as "iteration," "lean", "collaboration", "flexibility", and the way these concepts are implemented is through certain tools and methods. One of the most used tools is the "Scrum method." This method is intentionally iterative and utilizes an approach of incremental process. The reason for using an iterative process is to help to improve communication, embrace cooperation and anticipate issues. According to [10], the scrum model is built on three major components: roles, process, and artifacts. The author defines three basic roles: *The scrum master* as the equivalent to the project manager, *the scum team* as a cross-functional team who work on the project full time; *the product owner* that is the stakeholder and is the one that defines the final product as a customer. The processes defined by the author are five:

1. *Kickoff Meeting:* the scrum master, scrum team and product owner participates in this meeting to define the high-level backlog for the project and the major goals to achieve.
2. *The Sprint Planning Meeting:* is held among the same three participants at the beginning of each sprint (or iteration) and defines the sprint goals and the creation of the sprint backlog (activities to be done in the sprint).
3. *The Sprint*: is the well-defined time bracket the team must finish the activities proposed for the sprint. The duration of the sprint will depend on the nature of the project, and usually for the software industry is 2 weeks, and for the manufacturing industry is 4 weeks. During the sprint, no influence from outside should be allowed to interfere in the scrum teamwork, therefore, the requirements cannot be changed during the sprint.
4. *The Daily Scrum*: is a short fifteen minute meeting that is held between the scrum master and the scrum team. In this meeting every member answer three questions: what you did since the last scrum; what you are doing on the next scrum; what is stopping you achieve the goals. This is not a problem-solving meeting, but it is helpful for collecting information about the progress on the sprint backlog.
5. *The Sprint Review Meeting:* is held at the end of each sprint, and the functionality that was created during the sprint is showed to the product owner.

Finally, three artifacts are defined:

6. *The Product Backlog: is a prioritized list of backlog items. This list is managed and owned by the product owner, and each item is weighted using story points which are based in the estimation of hours the task would take.*
7. *The Sprint Backlog: is the section of the product backlog that will be issued in the sprint. This list is created and owned by the scrum team.*
8. *The Burndown Charts: are used to show the progress of the project. Basically, three charts are most commonly used: The Sprint burn down chart; The Release burn down chart; and the Product burn down chart.*

Chapter 3
Development of the method

This research will adopt the basic guides of the Agile methodology framework successfully used for the software industry, and then, the most important tools that can be put into use for projects in the engineering consulting services industry. The agile methodology framework that will be used is the Scrum method, which is the most used framework for the Agile methodology. The following guides compose the Scrum framework:

- *Kickoff meeting at the beginning of the project*
- *Project backlog creation*
- *Sprint planning meeting*
- *Sprint*
- *Briefing and debriefing for individual tasks*
- *Daily scrum meetings*
- *Retrospective (end of sprint)*
- *Burndown charts*

We need to define the concepts of tools and guides. While the guides are the basic elements that altogether creates the framework of the Agile methodology (backlog, sprints, retrospective, and the rest of the items listed above), the tools are the elements that will help the users adapting to the velocity and flexibility that the method brings, towards accelerating processes, increasing the product quality and reducing costs. The tools that will be used for the case engineering consulting services are:

- *Enablers*
- *Barriers*
- *Knowledge*
- *Readiness*

Each guide that is part of the Scrum method is described next.

3.1 Guides:

3.1.1 Kickoff meeting at the beginning of the project.

The daily meeting is an especially important component for the scrum methodology. It is hard to think of a product or service that does not require an initial meeting to set the objectives, resources, time frame, and approach proposals. At this meeting, the project participants and their roles are clearly defined. In the consulting services industry, there will be a customer, who is the owner of the project, the scrum team that will be integrated by the project manager, engineers, drafters, designers, simulators, etc. (depending on the service provided), and a scrum master, that can be the project manager, director or specialist in the field. This meeting will be the starting point for the project, and therefore, it must be defined as best as possible. It is the customer's duty to set the requirements of the system, service or element, and the scrum master and team are responsible for guiding the customer towards their objectives. The project will not be 100% defined by the time of the kickoff meeting, and modifications on the scope of the project are expected as the project progresses.

The experience of the consulting company will be a key factor for helping the customer to obtain what they really need as a final product and keep the project achievable in the budget and time frame specified. Several meetings might take place before the project is somewhat defined while the team works. It is a good idea to have an online kickoff meeting to discuss the most basic aspects of the projects, and an in-site workshop to meet the staff, perform surveys, and show similar products or services available.

3.1.2 Project backlog creation.

Now that the project has a certain definition, the team can start working on creating the backlog for the project. The first stage for this task is to create macro tasks, which are the most important milestones. These tasks could be CAD design for reference, a CFD model for simulations or the creation of specifications for bidding processes, etc. Once defined, these macro tasks will have to be fractioned into smaller tasks that can be done by individuals in the defined sprint time frame. For consulting services, the backlog will change for each project depending on the type of product that is being developed for the customer. This particular guide will need to be tailored for each project but the company could apply a similar criterion for similar projects in the future, as a base line.

It is particularly important to remember that this agile methodology is based on iterations, which means that tasks are planned to be partially done, tested, developed more in depth, tested again, and so on, until the product meets the requirements the product owner has stablished. Therefore, the backlog can have similar tasks but at different levels of development. For instance, if the consulting service contains CAD designs, the specifications could be a 25% progress, a 50% progress, a 75% progress and a final design, each of which will be presented in the retrospective meetings to the customer, to obtain the feedback needed to best approach the requirements.

3.1.3 Sprint planning meeting.

Once the backlog has been completed, the iterative process starts. In the sprint planning meeting the objectives of the sprint are defined, and the several tasks are selected from the project backlog to be done in that sprint to achieve the goals proposed. This meeting is the moment for the scrum team to communicate with the rest of the members and plan for teamwork and collaboration to avoid any inconvenience in the task.

3.1.4 Sprint.

This guide is the time bracket proposed to start developing and finishing the tasks assigned for each iteration. Different industries have different time brackets, depending on the activities that are done, and what is the time and effort that are required. For the case of consulting services, a sprints duration between 1 to 2 weeks should be adequate.

3.1.5 Briefing and debriefing for individual tasks.

Before starting a new task from the backlog, it is important to review transcendental aspects of the activities. Briefing means embracing the activity, planning on how to do it, who will be participants, what are the tools to be used, what are the risks associated with the activity, and what are the expected results. On the other hand, debriefing takes place at the end of the task, and the objective is to register how the task was performed, if there were issues, delays, or unplanned events such as incidents. Briefing and debriefing is also an iterative process when similar tasks are usually performed, and this guide will help the team to perform those tasks more efficiently. In the consulting services industry, these guides are frequently performed, specially by those members of the staff that are not experts yet. Therefore, this tool should be seriously considered in order to improve the consistency and quality of the task’s outcome.

3.1.6 Daily scrum meetings.

A daily scrum meeting is a quick meeting where everyone introduces the tasks to be done during the day and share concerns if it is expected to experience problems. This is not a meeting to discuss how to solve any issues, but only to inform the rest of the team about what project, or what task will be done. Depending on the size of the group, the meeting should take between 5 and 10 minutes. Consulting companies can have a small, a medium or large number of people working on the same project, so this guide will take different times, but should expose the same results no matter what the size of the company would be.

3.1.7 Retrospective (end of sprint).

Just like the debriefing guide, the retrospective is a meeting that takes place at the end of a sprint, and in it, the results of the work done during the sprint are shown to the project owner. It is not analyzed or explained every task, but the general function or features of the results obtained as a teamwork effort. After showing the results and getting feedback from the project owner, the next sprint is planned, and a new iteration starts. Finally, the scrum team and the scrum master have an internal retrospective, where each team member indicates what was done according to plan, what had to be done in a different way, and what should be changed for the next iteration. This retrospective meeting should be focused on tasks and the working-team as well, and it is not intended to criticize, but to improve the methodology and avoid future setbacks. In the consulting services industry, just like the briefing and debriefing guide, retrospective meetings are very common, and helps everyone, but specially to the junior staff.

3.1.8 Burn down charts.

A burn down chart shows how much work has been done during a project, and the total work remaining. A burn down chart can be made for a sprint or for a complete project, and the goal is to predict the team's likelihood of completing their work in the stipulated time. Therefore, the burndown charts are useful to evaluate if the sprint time bracket allocated is enough, or if it needs to be modified. For the consultant services industry, this tool is especially important to use when the type of project is new for the company, or the work team have little or no previous experience working together.

3.2 Tools

3.2.1 Enablers

The first step towards applying Agile is to verify the enablers for the specific project. According to [11], there are eleven categories of enablers:

- *Adaptability (ADP):* How well the organization adopts new methods as a response to changes in the environment
- *Product and process automation (PPA):* Technology available to automate routine processes
- *Supply chain integration (SCI):* All supply chain partners working to achieve a common goal
- *Core competency (CCT):* What the company does well and is unique and sustainable
- *Supply chain key partner's alacrity (SCP):* Is the readiness exhibited by the supply chain partners
- *Devolution of authority (DOA):* Delegating authority to the members of the organization
- *Information visibility and transparency (IVT):* Availability of accurate information across all levels of the organization
- *Manufacturing management (MFM):* Conversion process which is core to manufacturing organizations
- *Customer relationship management (CRM):* Practices used to enhance a relationship with the customers for better outcome results
- *Supplier relationship management (SRM):* Close relationship with the suppliers to understand their possible problems and work together
- *Human resource management (HRM):* Activities and efforts to engage and motivate the employees

The main objective is to identify the enablers that have an impact on the type of consulting projects that are usually done by the user. This would allow the company to identify the competitive advantage of the company as a sustainable strategy, and therefore, a plan can be developed to achieve the best results towards agility. The enablers that apply will depend on the service provided

by the company, and by a simple analysis it can be observe that there are some enablers that can be related to many types of activities, and others that are focused on specific activities. Identifying enablers will also allow the company to identify barriers to implementing the Agile methodology. Common barriers are Management, Technology, HR, Operations, and the organization's culture.

3.2.2 Barriers

Many studies have been done indicating the possible issues that a company must face to successfully integrate the Agile methodology to its operations. Embracing the active barriers should allow a company to quickly attack the weaknesses of the organization and succeed as an innovative competitor. Several tool can be used to do an analysis of the company's barriers [12]. Internal studies including the following questions can clarify the company's situation:

- How is the company's strategy doing?
- What are the company's strengths, weaknesses, opportunities, and threats? (SWOT analysis)
- What are the key resources and capabilities, and will they give a sustainable competitive advantage?

Common barriers are identified at every level of an organization, including poor management support, lack of training, poor incentive and rewards for workers, insufficient competency of employees, insufficient use of tools that improves agility, and slow decision making. Many other reasons could be listed, and it is the responsibility of each organization to identify the ones that apply to them. In their research, [5] clustered seventeen different barriers and defined 5 major groups of barriers. Each barrier will be described from the consulting services industry point of view:

1. Managerial constraints:

Commitment and support from the management is the top ranked barrier, which means that special attention is required for this one. In the consulting services industry, the management is responsible for building cooperation among the different levels of the organization, by listening to employees, and sharing information with them. A good business relationship with providers and customers can be achieved by delivering quality products or services through innovative ideas, cultural values, and adequate technology.

2. Technology constraints:

Technology is a key factor to improve agility in the engineering consulting services industry. Accessing information is a vital factor that allows the staff to share, comment on and improve work at the same time from different locations, and in any part of the world. An adequate database is essential, as is its maintenance, and therefore, IT has a big responsibility. In this industry, new technology should always be welcomed, especially in matters of specialized software, where technical support is crucial, and compatibility of files among customers and support organizations is necessary.

3. Human resources constraints:

Human resources management is responsible for the adequate use of their resources, and their proper training, which are factors that directly impact on the successful implementation of Agile. In an environment as dynamic as the consulting services industry, having the skills for participating and adapting to different aspects of a project is very important. These kind of skills will give the personnel confidence, and therefore the motivation for getting things done in time and properly. Companies need to embrace the importance of involving their people in projects, through transparent and crossed communication between the areas.

4. Operations constraints:

Operations are strictly related to the customer's satisfaction in the engineering consulting services industry, so the client's continuous feedback is utterly important. Building a collaborative relationship with the clients and suppliers are aspects that will help to increase the agility of the company.

5. Organizational culture constraints:

Finally, the organization culture needs to be revised continuously. A consulting company needs to embrace change as normal and be prepared to adapt to the different projects and realities. Companies need to be ready to change the organizational scheme, roles, and business approaches, without losing the essence of the service or the company's heritage.

3.2.3 Knowledge

Adapting fast to circumstances is a difficult task for any type of company, no matter what industry it belongs to. It is somewhat unnatural to plan changing something that works in the present for something unknown or untested before. However, the point of applying the agile methodology is to avoid working out of habit and adapt to fast-changing environments to maximize results. Engineering consulting service companies must adapt quickly to the necessities of the customers and need to be flexible to the requirements on each project. The nature of a consulting company is to be an expert in the field it works for, so knowledge is one of the key factors, if not the most important. One of the major issues a consulting company has to deal with is relying on a few expert people, and having many other team members following orders, instead of working in teams to grow as a group. The agile methodology eliminates the verticality in the organization and puts everyone in the position of being clearly informed about the project status. Everyone is more involved in the project, and therefore, there is a sense of appreciation for it.

3.2.4 Readiness

It has been established that any company in any industry needs to be adaptative to changes. Change should be understood as a given, and therefore, being prepared to adapt to it is crucial for the successful operation of the company. It has also been established that knowledge is one of the key factors for consulting companies, however the knowledge itself is not enough. According to [9] readiness is as important as knowledge to achieve transformation. Readiness is a cultural tool that must originate from the management and must be instilled at every level of the company. There are several strategies that prepare a company for readiness and depending on the type of activity, different approaches can be taken. Readiness is strictly bonded to an iterative learning mindset, and what must be modified in order to successfully operate. For the service industry in general, there are different approaches that can be used as a single or as a set of tools. Each of the approaches will be listed from the engineering consulting services industry point of view:

1. Involve the staff in the complete workflow:

Involving the work team in the complete workflow rather than in small, isolated tasks, helps the team to better understand the project, and become experts sooner through critical thinking. Apart from helping the project to be done in a more comprehensive way, adopting this conduct helps the team to adapt faster to changes, which is the main objective of applying Agile. In the consulting

services industry, although the number of people involved in a project is not big, and so communication on progress and cross information should not be a problem, it does present challenges if the management is not prone to delegate work.

2. Iterative decision making:

It has been established that the agile methodology is based in iterations of processes to quickly adapt to changes. Those changes could be related to modifications in external factors, such as changes in technology, governmental regulations, work unions, and environmental requirements, or those changes could be related to changes in the customer's requirements. Usually in short or medium-sized projects, changes in requirements from the customer are expected, but the external factors might not change. In longer projects, external factors could be a source of drastic modifications, and should be monitored more closely. No matter the type of changes that the project may have to face, iterative decisions will help the project to follow the most efficient path due to the constant feedback from the customer's needs and the expert's constant input.

3. Transparent communication:

Communication is a key factor for the agile methodology implementation to be successful. Clear communication between the stakeholders and the project manager, and among the work team is vital to succeed in a fast-changing environment. Agile is based in cycles that induces communication and constant feedback about the partial objectives, results obtained, and issues had during each iteration (sprint). The engineering consulting services industry is no exception to this, and communication is utterly encouraged to include everyone in the complete workflow (as mentioned in section 3.2.4.1). The key factor for communication is to have the necessary means, but also to use them efficiently. Every means of communication has its own purpose, and that needs to be respected. For instance, the daily scrum meeting is a 15-minute meeting that is not designed to solve issues, but to let everyone know who is working on what. Therefore, there should not be any discussion or brainstorming during these sessions.

4. Risk assessment and experimentation:

In a fast change environment, a company must be willing to take risks to solve new situations or conditions. Being an Agile methodology user means quickly adapting and changing as needed, and therefore an important feature for a company is to assess the risks to face in front of a new situation. This can be achieved using their own experience, or by observing competitor's similar situations,

or by studying trends. The second part of the process is to experiment with the theoretically best options. It is highly improbable that the best approach is taken in every situation, and therefore, embracing mistakes and performing self-criticism is a skill that a fast-adapting company must develop. Guides such as the retrospective meetings and the burndown charts allow the team to do this kind of analysis. In the engineering consulting services industry, risk assessment and experimentation are very common. No project is identical to the next one, and therefore, embracement of risk and use of experimental methods are often done. Communication, teamwork, and feedback in these situations are key, thus, the Agile methodology seems to have the right characteristics for succeeding in this industry.

Chapter 4
Case study

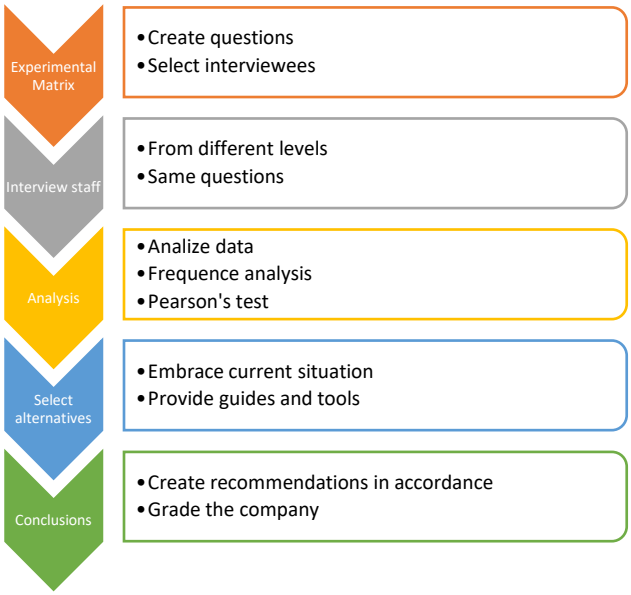
This chapter will present the data collected in an engineering consulting company that provides services to airports. The name of the company will remain confidential, and from now on it will be called “company X.” Company X provides different services for the baggage handling systems (BHS), including engineering, design, build of specifications, representation during construction phases, and testing, among other services. After the terrorist attacks in September of 2001, better known as “9/11”, President Bush signed the Aviation and Transportation Security Act into law, requiring screening conducted by federal officials, 100 percent checked baggage screening, expansion of the Federal Air Marshal Service and reinforced cockpit doors. TSA (transportation Security Administration) is created to oversee security in all modes of transportation [13]. Since 2001, the priority of the TSA has been to maximize the safety in airplanes by applying the latest technology available to detect dangerous elements going in the aircraft. To standardize the inspection of the bags, the TSA developed a standard, and published in 2007 the Planning Guidelines and Design Standards, version 1 (PGDS v1), which stablished a baseline for security regarding the handling of bags, different levels of inspection, sortation, and procedures for manipulating suspected bags. The TSA is continuously improving the PGDS, as technology and techniques progress, leveling up the standards for faster processes but keeping safety as the main priority. TSA officially released the latest version in 2020 as v7 of the PGDS, which include key changes in important parameters such as the checked Baggage average length analysis, individual carrier system (ICS), Explosive detection system (EDS) machines throughput clarifications, and so on.

On the other hand, along the years, it has been seen an exponential use of the air transportation around the world, which requires the airports to continuously need expanding their capacities for processing passengers and bags and keeping the safety levels above the standards. Airports must develop plans for the next ten to fifteen years, anticipating increases in the number of X-ray machines, passengers’ security check lines, baggage self-drop systems, number of claim devices, baggage queue lines, and make-up carousels. The continuous improvements in the requirements from the TSA, plus the exponential use of the air transportation, makes the BHS industry a dynamic

industry. Therefore, as experts in the subject, company X needs to quickly adapt to these changes and keep up with industry standards, to provide the best solutions for their customers.

The customers of company X need to satisfy the two conditions named above, namely, TSA dynamic requirements, and passenger and bags increasing throughput. To balance both requirements, the consultant needs to analyze in detail every aspect of the project, considering the building's physical space, trajectories, existing installations not only related to the BHS but also every service that the building contains, technology required and available, possible providers of the equipment, phasing, and budget. Company X also provides its services to overseas countries, which may or may not follow the PGDS standard, so in those cases, the company needs to pay extra attention to the specifications and provide solutions above those specific requirements.

Company X is working at the moment on sixteen projects inside the USA, eight projects in the rest of America, and twelve projects in the rest of the world. The company has eighty-six employees distributed strategically in four offices in the USA, and presence in United Arab Emirates, Japan, Singapore, United Kingdom, and China. The company has not formally adopted the agile methodology, but some guides and tools developed in chapter #3 are being used at some extent. It is the purpose of this investigation to provide recommendations for improving the aspects that could be upgraded. And grade the company based on the use of the Agile methodology, so future companies could be measured and compared to company X. This investigation will follow the next workflow to arrive to conclusions about the situation of company X:



4.1 Survey details:

The survey was sent to all the employees in the USA, and thirty-four answers were obtained from people from different departments, different positions, and different levels of expertise. Appendix 1 shows the survey format delivered to the employees of the company, and the summary of responses obtained. The survey was divided into two sections. Section 1 is composed of sixteen questions regarding the utilization of the scrum method guides, while the questions in section 2 were designed to provide information about the tools defined in chapter 3. The analysis of the data was done in two different ways for both sections. First, the data was segregated by years of experience in the BHS industry into three categories, 0 to 5 years of experience, 6 to 15 years, and 16 and more years of experience. A second segregation was done by work position, into Project Managers (PM), Project Engineers (PE), Associate Directors (AD), and Designers (D). It is important to point out that no distinction was made between PM and Sr. PM positions, nor Drafter, Designer and Sr. Designers. Also, Associate Directors usually acts as PMs, but because they are also involved in marketing projects, and usually are the ones that function as the PMs supervisors, it is interesting to see their responses as a separate category.

4.2 Statistical analysis:

This thesis focuses on the recommended guides and tools to use in order to implement the Agile methodology to the engineering consulting services industry, and one of the most important tasks in the analysis is recognizing which of these tools are being used and how. That information will help us understand the main differences among the different levels of the organization. The survey used to obtain the data presented in this work revealed categorical data, and many questions allowed a yes/no answer, or two different alternatives. For this type of data, and to answer the question stated above, the approach taken was implementing the χ^2 Pearson's test, which tests for the difference in distribution of categorical variables between two or more independent groups.

Table 2 - Type of tests for different kind of data

	Categorical	Numerical
Categorical	Chi-Square Test	T-test ANOVA
Continuous	Regression	Correlation Test

The test procedure is described next:

The first step is to identify the variables that we want to compare, and then create a table as shown in Table 4. The tables show the variables (Seniority or position) and the response to each question (yes or no). The goal is to find for each question if the seniority or position variables are independent of the others. For instance, for question #1: “do you have a kickoff meeting where the scope of the project is defined?”, the goal in analyzing this question is to try to determine if the kickoff meetings are held by some of the seniority brackets and not the others, or one of the positions and not the others. The second step is to establish what the expected results would have been if there was no relationship (or dependency) between the guide or tool (question) and the category of expertise or position. Finally, the difference between our real case and the expected value is calculated. The further away our real case deviates from the expected scenario values, the more likely we are to reject the null hypothesis and accept the alternative hypothesis, and therefore that there is a dependency in the data. The hypothesis to test is as follows:

- Ho: Null hypothesis (variables are independent).
- H1: Alternative hypothesis (Variables are not independent).

The significance level used is 0.05, and this value represents the risk of making a type 1 error (Null hypothesis is rejected when it is true). Finally, the P-value is calculated as the preferred statistical parameter. If the P-value is equal or lower than the significance level, the Null hypothesis is rejected, and we can conclude than there is a statistical dependency between the variables (Therefore, the guide or tools depends on the expertise or position of the staff).

4.3 Section 1: Guides

Table 3 is also shown in appendix B in a larger font.

Table 3 shows the Guide associate each question, and the summary of responses obtained from the questions in section 1, segregated into two categories (seniority and positions). Table 3 is also shown in appendix B in a larger font.

Table 3 - Survey analysis (Section 1)

			Seniority						Position							
			0 to 5		6 to 15		16+		PM		PE		AD		D	
Guides			Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Kickoff meeting at the beginning of the	1	When you are being assigned a job, do you have a kickoff meeting where the scope of the project is defined?	70%	30%	70%	30%	100%	0%	92%	8%	71%	29%	100%	0%	67%	44%
	2	Do you feel that the information provided to you in the first meeting allows a clear interpretation of the project?	80%	20%	50%	50%	86%	14%	67%	33%	86%	14%	100%	0%	56%	44%
Project Backlog	3a	After the kickoff meeting, do you hold other meetings to divide the project into blocks?	80%	20%	40%	60%	57%	43%	58%	42%	71%	29%	60%	40%	56%	44%
	3b	After the kickoff meeting, do you hold other meetings to define expected results?	90%	10%	40%	60%	93%	7%	75%	25%	100%	0%	80%	20%	56%	33%
	3c	After the kickoff meeting, do you hold other meetings to define roles and responsibilities?	90%	10%	70%	30%	86%	14%	92%	8%	86%	14%	80%	20%	67%	44%
	4	Are you usually involved in a small part, or in the complete project?	70%	30%	50%	50%	14%	86%	25%	75%	71%	29%	0%	100%	56%	78%
Sprint planning meeting	5	When you are being assigned with a task, do you get a description of the scope of the complete project or just the scope of the task you are being asked to perform?	30%	70%	20%	80%	57%	43%	50%	50%	29%	71%	60%	40%	22%	63%
	6	Do you participate in defining the tasks and responsibilities?	20%	80%	50%	50%	69%	31%	58%	42%	29%	71%	80%	20%	38%	56%
Sprint	7a	Do you usually get a well-defined deadline at the moment you are assigned a task?	80%	20%	50%	50%	79%	21%	75%	25%	86%	14%	80%	20%	44%	78%
	7b	Are those deadlines constant in time (1 week, 2 weeks, etc)?	40%	60%	20%	80%	36%	64%	33%	67%	43%	57%	40%	60%	22%	44%
	8	Do you usually work in a team or by yourself?	20%	80%	50%	50%	21%	79%	25%	75%	14%	86%	0%	100%	56%	22%
Brief and debrief	9a	Do you plan your approach before doing a task?	80%	20%	100%	0%	86%	14%	92%	8%	86%	14%	100%	0%	78%	22%
	9b	After you are done with a task, do you analyze what was done right and wrong?	90%	10%	70%	30%	79%	21%	67%	33%	86%	14%	100%	0%	78%	44%
Scrum meetings	10	Do you inform your project team about the tasks you will be doing during the day?	89%	11%	90%	10%	50%	50%	67%	33%	100%	0%	80%	20%	56%	33%
	11	Do your teammates inform you about the tasks they will be doing during the day?	80%	20%	70%	30%	71%	29%	67%	33%	71%	29%	100%	0%	67%	56%
Retrospective meeting (end of sprint)	12	Do you usually participate in meetings with the customer?	70%	30%	70%	30%	93%	7%	100%	0%	71%	29%	100%	0%	44%	78%
	13	Do you usually have direct communication with the customer?	50%	50%	40%	60%	79%	21%	75%	25%	43%	57%	100%	0%	22%	67%
	14	Do you ask for or receive feedback from the customer about the project progress?	30%	70%	70%	30%	71%	29%	75%	25%	29%	71%	100%	0%	33%	44%
Burndown charts	15	Do you receive information about the status of the project you are working on? (Percentage done, estimated time to end, deadlines, etc)	60%	40%	60%	40%	79%	21%	67%	33%	71%	29%	80%	20%	56%	22%
	16	Do you receive feedback about the tasks you perform from your manager?	80%	20%	60%	40%	43%	57%	58%	42%	71%	29%	20%	80%	78%	

4.3.1 Kickoff meeting at the beginning of the project.

Two questions were made to evaluate how much information is shared at the kickoff meeting:

1) When you are being assigned a job, do you have a kickoff meeting where the scope of the project is defined?
2) Do you feel that the information provided to you in the first meeting allows a clear interpretation of the project?

Table 4 - Chi square test for question #1

	Question 1			
		Yes	No	Total
	0 to 5	7	3	10
	6 to 15	7	3	10
	16+	14	0	14
	Total	28	6	34
	Expected	Yes	No	Total
	0 to 5	8.235294	1.764706	10
	6 to 15	8.235294	1.764706	10
	16+	11.52941	2.470588	14
	Total	28	6	34
	Deviation	Yes	No	
	0 to 5	0.185294	0.864706	
	6 to 15	0.185294	0.864706	
	16+	0.529412	2.470588	
Chi squared	5.1			
p-value	0.078082			

	Question 1			
		Yes	No	Total
	PM	11	1	12
	PE	5	2	7
	AD	5	0	5
	D	6	3	9
	Total	27	6	33
	Expected	Yes	No	Total
	PM	9.818182	2.181818	12
	PE	5.727273	1.272727	7
	AD	4.090909	0.909091	5
	D	7.363636	1.636364	9
	Total	27	6	33
	Deviation	Yes	No	
	PM	0.142256	0.640152	
	PE	0.092352	0.415584	
	AD	0.20202	0.909091	
	D	0.252525	1.136364	
Chi squared	3.790344			
p-value	0.285011			

The P-value calculated for the seniority point of view is 0.078, and from the position point of view is 0.285. Both values are larger than 0.05, and therefore, we cannot reject the null hypothesis. This means that the kickoff meetings are being statistically used independently of the level of seniority or position. We cannot conclude that any of those groups are using this particular guide differently than the others.

For question 2, the analysis shows the same results, where there is no dependency on the variables.

Table 5 - Chi square test for question #2

	Question 2						Question 2			
		Yes	No	Total				Yes	No	Total
	0 to 5	8	2	10			PM	8	4	12
	6 to 15	5	5	10			PE	6	1	7
	16+	12	2	14			AD	5	0	5
	Total	25	9	34			D	5	4	9
							Total	24	9	33
	Expected	Yes	No	Total						
	0 to 5	7.352941	2.647059	10			Expected	Yes	No	Total
	6 to 15	7.352941	2.647059	10			PM	8.727273	3.272727	12
	16+	10.29412	3.705882	14			PE	5.090909	1.909091	7
	Total	25	9	34			AD	3.636364	1.363636	5
							D	6.545455	2.454545	9
	Deviation	Yes	No				Total	24	9	33
	0 to 5	0.056941	0.15817							
	6 to 15	0.752941	2.091503				Deviation	Yes	No	
	16+	0.282689	0.785247				PM	0.060606	0.161616	
							PE	0.162338	0.4329	
Chi squared	4.127492						AD	0.511364	1.363636	
p-value	0.126977						D	0.364899	0.973064	
						Chi squared	4.030423			
						p-value	0.258198			

Observing the data obtained, the following observations were done:

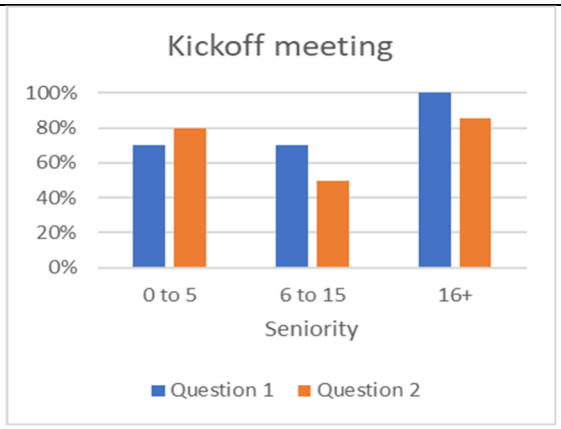


Figure 1 - Kickoff meeting - Seniority

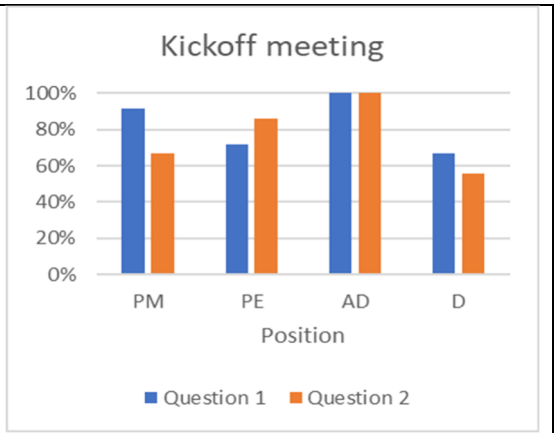


Figure 2 - Kickoff meeting - Position

In the left side, the responses segregated by seniority can be seen, while in the right side, the responses segregated by position are shown. The answers by seniority display the three brackets of years of experience: 0 to 5, 6 to 15, and 16+ years, while the answers by position show the answers from the four categories of employees: Project Manager (PM), Project Engineer (PE), Associate Director (AD), and Designer (D). Every graphic in this section will be shown in pairs, conserving the same format and position.

It can be seen from the seniority point of view that the junior employees (0 to 5 years) hold kickoff meetings about 70% of the time, and they feel that about 80% of the time, the information provided to them allows a clear interpretation of the project. The staff in the intermediate bracket holds kickoff meetings at about the same rate as the first group, but the information provided to them is enough only 50% of the time. Finally, the more experienced group holds kickoff meeting for every project, and the information is enough in more than 80% of the projects. It is important to note that the more experienced bracket is composed of senior staff and associate directors, who are the ones that usually sell the service to customers, and therefore, have a clear view of the scope of the project. The first 2 brackets on the other hand are mostly composed by designer, engineers, and drafters, who are invited to join in meetings when the project starts, and therefore, do not have the same clear view of the scope of the project, nor their responsibilities.

When the same data is analyzed from the position's perspective, it can be observed that associate directors have kickoff meetings for every project, and the information that they acquire in that meeting is enough to understand the project. Project managers and project engineers usually have kickoff meetings, and the information that the meeting provides is not always enough. Finally, the designers are usually invited to participate in specific parts of a project, and kickoff meetings are not as frequent as they should be. Moreover, the information the meetings provide is good enough only about 50 % of the time.

4.3.2 Project Backlog

A total of 4 questions were made to evaluate the distribution of the workload:

> 3a) After the kickoff meeting, do you hold other meetings to divide the project into blocks?
> 3b) After the kickoff meeting, do you hold other meetings to define expected results?
> 3c) After the kickoff meeting, do you hold other meetings to define roles and responsibilities?

4) Are you usually involved in a small part, or in the complete project?

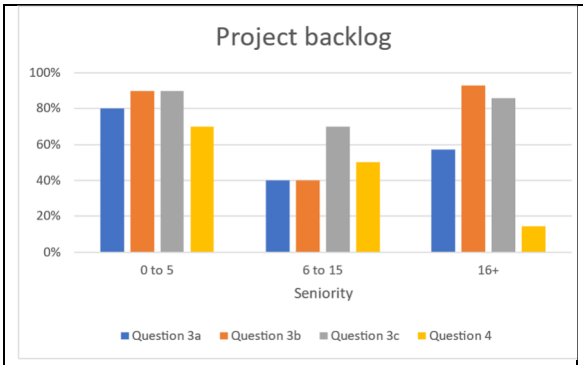


Figure 3 – Project Backlog - Seniority

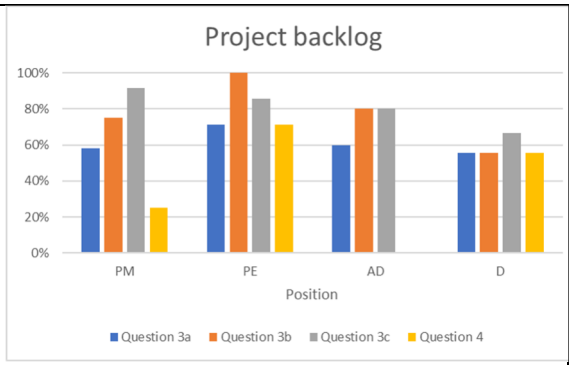


Figure 4 – Project Backlog - Position

The statistical analysis shows the following results for the P-value:

Table 6 - P-value for project backlog

Section 1 - Guides		
Question	P-Value Seniority	P-Values Position
3a	0.189	0.926
3b	0.005	0.232
3c	0.458	0.521
4	0.019	0.040

Questions 3b and 4 show statistical dependency between the variables, and therefore, we reject the null hypothesis for those questions, and can conclude that the guide is used in different ways throughout the company. Dividing the project into small tasks is more frequent for project engineers, who are usually in charge of managing specific tasks, such as field surveys, preparation of documents, responses to constructors, and so on. Project managers and Associate directors usually work on a project in a macroscopic manner, so subdivision of tasks is less frequent. Designers usually work in specific tasks, and subdivision of tasks is subject to the dimension of the project. Expected results and role definition are seen in the junior bracket of employees, and in the senior bracket. Usually, the senior bracket is the one that states the goals to the juniors, so these meetings are usually held among those two groups. The intermediate group has enough experience to know what is expected, and therefore, their participation in those meetings is less frequent.

For question 4, 100% indicates that the employees work mostly in a small part of the project, while 0% indicates that work in the whole project. Associate directors responded that they always work on the whole project, while project managers do so about 80% of the time (macroscopic management), while designers and project engineers are more focused in single activities. From this analysis junior employees are involved partially in their projects, and that the staff participates in more phases of the project as they gain experience.

4.3.3 Sprint planning meeting

The following questions were made regarding the Sprint planning meeting guide:

> 5) When you are being assigned a task, do you get a description of the scope of the complete project or just the scope of the task you are being asked to perform?
> 6) Do you participate in defining the tasks and responsibilities?

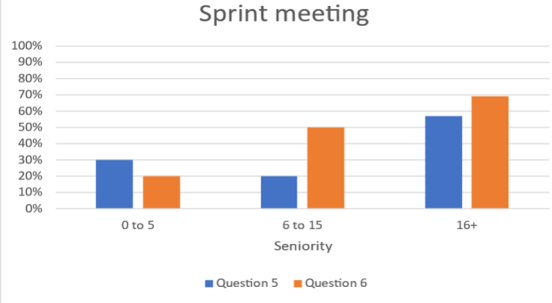


Figure 5 – Sprint meeting - Seniority

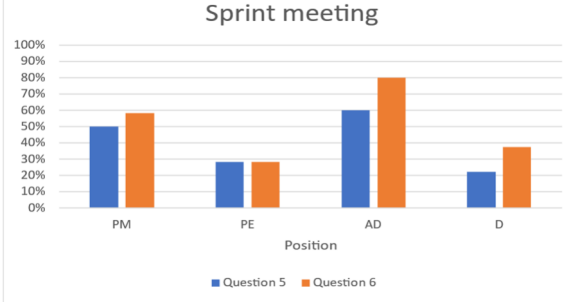


Figure 6 – Sprint meeting - Position

The statistical analysis shows the following results for the P-value:

Table 7 - P-value for Sprint meeting

Section 1 - Guides		
Question	P-Value Seniority	P-Values Position
5	0.148	0.406
6	0.064	0.270

There is not enough evidence to confirm that there is statistical dependency between the variables even though the P-value obtained from the seniority point of view for question 6 is very close to 0.05, but nevertheless, we cannot reject the null hypothesis. The answers to this set of questions are

interesting to analyze. There is a general uncertainty regarding the scope of the project in every group of both categories. Junior personnel, project engineers and designers are usually assigned individual tasks, and they are not introduced with the project's details, which is a communication problem. On the other hand, the answers to question 6 reveal that there is a well-defined chain of command, and that associate directors and project managers oversee defining roles and responsibilities most of the time. Moreover, analyzing from the seniority point of view, this authority seems to be associated with the level of expertise.

4.3.4 Sprint

The following questions were associated to the Sprints:

7a) Do you usually get a well-defined deadline at the moment you are assigned a task?
7b) Are those deadlines constant in time (1 week, 2 weeks, etc.)?
8) Do you usually work in a team or by yourself?

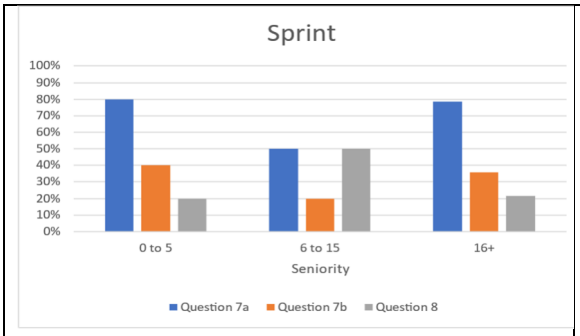


Figure 7 – Sprint - Seniority

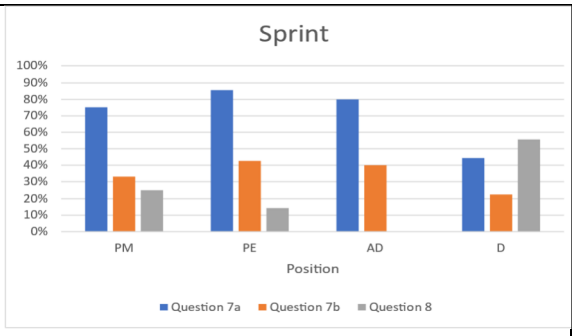


Figure 8 – Sprint - Position

The statistical analysis shows the following results for the P-value:

Table 8 - P-value for Sprint

Section 1 - Guides		
Question	P-Value Seniority	P-Values Position
7a	0.235	0.264
7b	0.596	0.829
8	0.235	0.105

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. This set of questions shows that the deadlines are usually well defined from the beginning of the project. Associate directors and Project managers, who are in close contact with the customer, manage those deadlines and inform project engineers and designers. In the design department, deadlines seem to be fuzzier than for the rest of the staff, and that is in accordance with the iterative process of defining the scopes. There is also a general feeling that the deadlines are not constant in time, which also makes sense due to the wide spectrum of tasks that the company performs. Finally, question 8 exhibits that there is a good sense of teamwork, and most of the times people work with others on the same project. There is a little more independence observed in the design department, who are assigned individual tasks as stated in the previous guides.

4.3.5 Brief and debrief

The following questions were associated to briefing and debriefing:

9a) Do you plan your approach before doing a task?
9b) After you are done with a task, do you analyze what was done right and wrong?

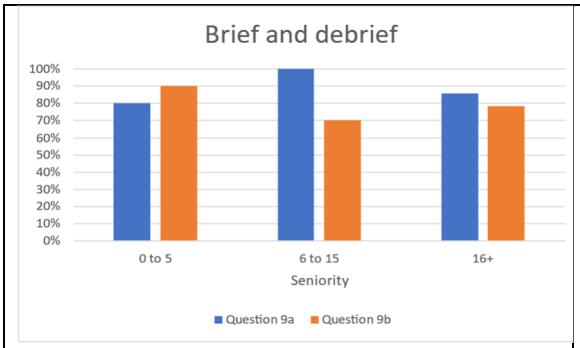


Figure 9 – Brief and debrief - Seniority

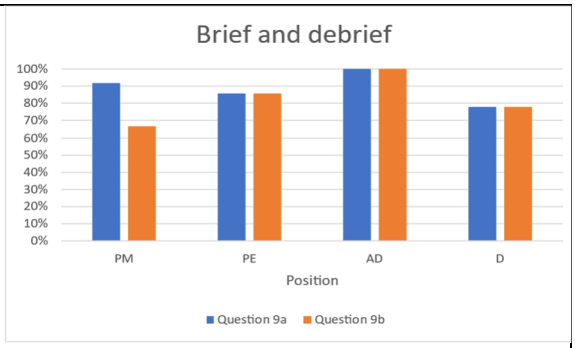


Figure 10 – brief and debrief - Position

The statistical analysis shows the following results for the P-value:

Table 9 P-value for brief and debrief

Section 1 - Guides		
Question	P-Value Seniority	P-Values Position
9a	0.355	0.627
9b	0.540	0.456

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. Briefing and debriefing are very important tools for a consulting company, who is an expert in a matter. Company X is no exception, and it can be seen that activities are usually planned in advance. Debriefing seems to be used extensively by Associate directors, project engineers and designers, followed closely by project managers.

4.3.6 Scrum meeting

The following questions were associated to the scum meeting:

10) Do you inform your project team about the tasks you will be doing during the day?
11) Do your teammates inform you about the tasks they will be doing during the day?

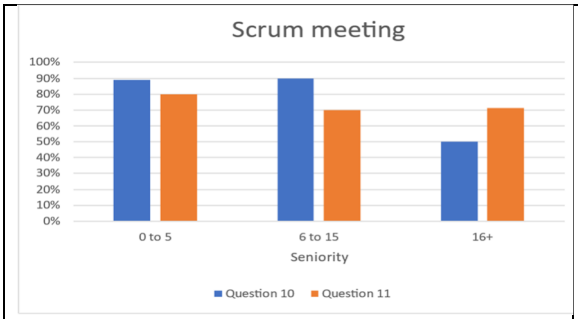


Figure 11 – Scrum meeting - Seniority

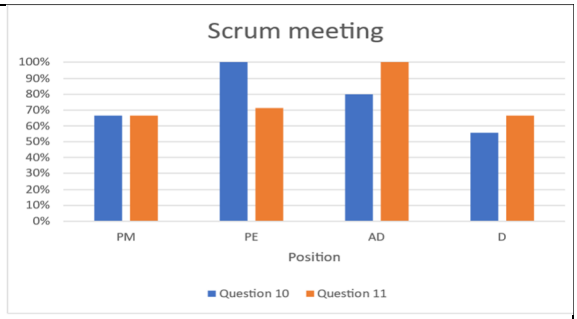


Figure 12 – Scrum meeting - Position

The statistical analysis shows the following results for the P-value:

Table 10 - P-value for Scrum meeting

Section 1 - Guides		
Question	P-Value Seniority	P-Values Position
10	0.042	0.277
11	0.856	0.518

The answer for question 10 shows dependency on the seniority level, and therefore, the null hypothesis is rejected. The dependency on task information is reflected in the greater use of this guide for the first two levels of experience. This guide's question results show the demarked line of command, where seniors do not inform others of their tasks for the day but do receive information from the other two brackets. On the other hand, it can be seen that juniors and

intermediates do inform about 90% of the time what they will be working on daily. From the position's point of view, project engineers are highly encouraged to inform about their duties, while project managers, who oversee the project in a macroscopic way, report their activities less frequently. Project managers and designers seem to be the areas with less communication with the rest of the staff.

4.3.7 Retrospective meeting

The following questions were associated to the retrospective meeting:

12) Do you usually participate in meetings with the customer?
13) Do you usually have direct communication with the customer?
14) Do you ask for or receive feedback from the customer about the project progress?

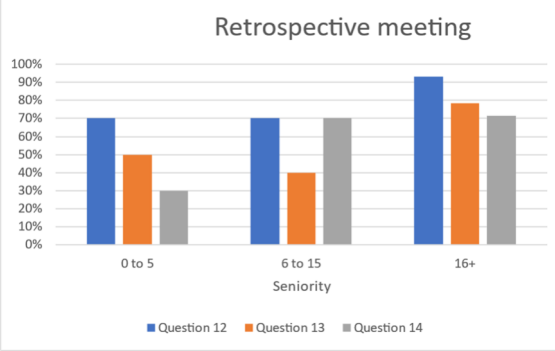


Figure 13 – Retrospective meeting - Seniority

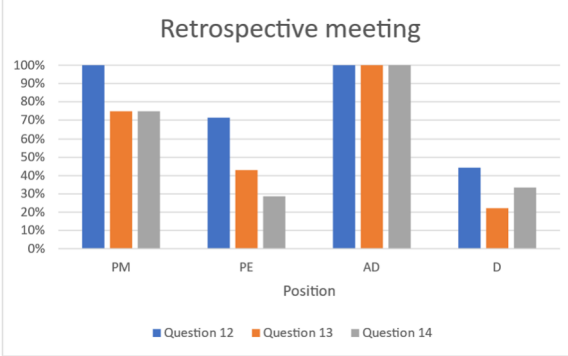


Figure 14 – Retrospective meeting - Position

The statistical analysis shows the following results for the P-value:

Table 11 - P-value for Retrospective meeting

Section 1 - Guides		
Question	P-Value Seniority	P-Values Position
12	0.268	0.011
13	0.133	0.015
14	0.088	0.021

There is a strong dependency between the variable "positions" and the back-and-forth communication with the customer, which indicates that this communication is stronger for some of the positions, and weak for other positions. Therefore, we reject the null hypothesis. This dependency can be observed in how differently the tools are used depending on the position of the employee. This guide shows how extensive is the communication of associate directors and project managers with the customer, and how narrow it is for designers and project engineers. Feedback from the customer is only provided to the high-level positions, and it is important to make sure the same feedback is delivered to the resto of the company. From the seniority point of view, it is also clear that communication with the customer improves with the increase of experience.

4.3.8 Burndown charts

The following questions were associated to burndown charts:

15) Do you receive information about the status of the project you are working on? (Percentage done, estimated time to end, deadlines, etc.)
16) Do you receive feedback about the tasks you perform from your manager?

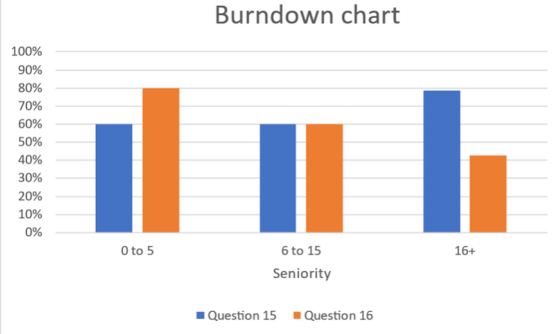


Figure 15 – Burndown charts - Seniority

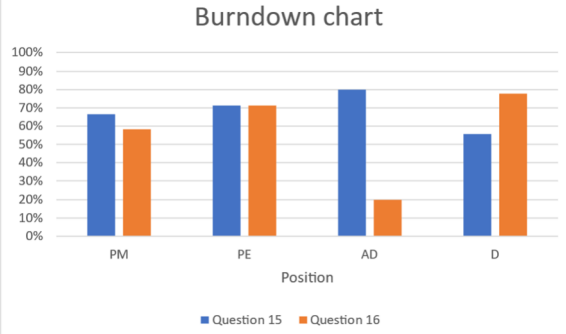


Figure 16 – Burndown charts - Position

The statistical analysis shows the following results for the P-value:

Table 12 - P-value for burndown charts

Section 1 - Guides		
Question	P-Value Seniority	P-Values Position
15	0.523	0.808
16	0.189	0.177

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. Even though an actual chart is not usually used, the concept of keeping the work team informed about the activities, the progress, and the percentages of work to be done is usually applied. Juniors and intermediates are informed about the progress of the project about 60% of the time, where seniors get informed about 80% of the time. In the same category, the feedback from supervisors can be seen to be larger for juniors, less for intermediates and even less for seniors, which makes sense because of the line of command. From the position's point of view, the line of command is even more pronounced, with 20% for associate directors, increasing to project managers, engineers, and designers. As can be seen, the observation of the guide's answers brings interesting observations about the usage of them and allows the analyst to make conclusions and recommendations for this particular case study.

4.4 Tools

4.4.1 Enablers

1. Adaptability

The following questions were associated to adaptability:

> 1) Do your tasks usually require having a plan B in case the requirements from the customer change?
> 57) Do you usually provide a different approach if the customer wants to modify aspects of the project you are involved in?
> 58) Do you use the standards of the industry as a ruling document when the customer requires a modification of a deliverable?

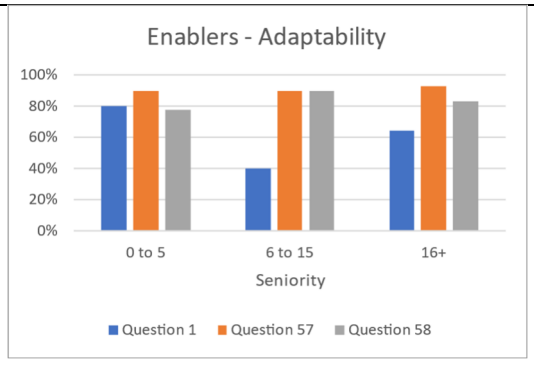


Figure 17 – Enablers - Adaptability

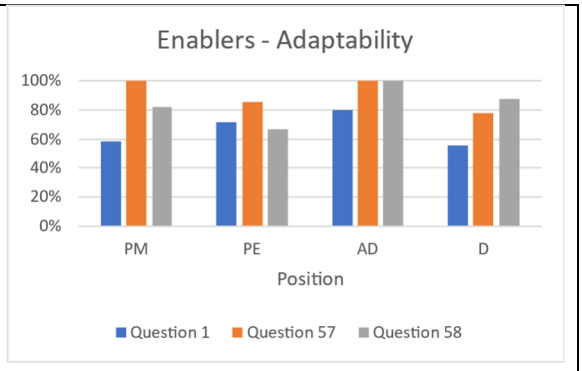


Figure 18 – Enablers - Adaptability

The statistical analysis shows the following results for the P-value:

Table 13 - P-value for Enablers - Adaptability

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
1	0.178	0.762
57	0.959	0.283
58	0.768	0.509

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. The results for this set of questions show that the company has an open mind to change the course of the deliverables in order to adapt to the customer's needs, but taking into consideration the PDGS, which rules the handling baggage system industry. The standard allows some flexibility that can be used to adapt to the customer's requirements. A plan B is mostly taken into consideration by project engineers and associate directors and is less frequent for designers and project managers.

A final question regarding adaptability was done, and because of the nature of the question, it needs to be analyzed separately:

59) If the customer requires a modification of a deliverable that is in a grey area of the standard, you: (Select one)

- Do the modification as required.
- Refuse to modify the deliverable to protect the customer.
- Look for a gap that satisfies both standard and customer.
- Ask your supervisor.

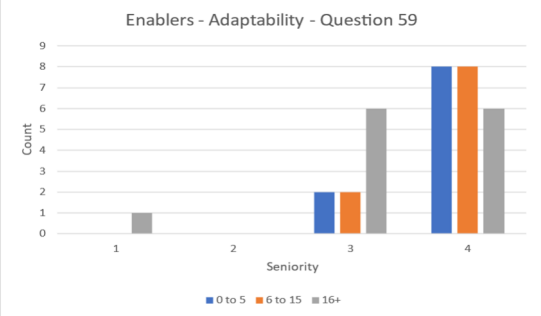


Figure 19 – Enablers – Adaptability

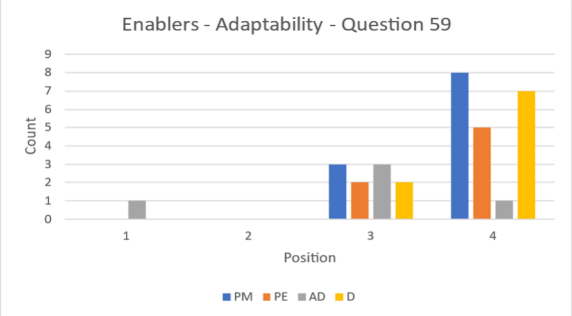


Figure 20 – Enablers - Adaptability

It can be seen here that there is a strong tendency to ask the supervisors from every position except the associate directors (which are usually the supervisors). The second most frequent answer was looking for a gap that satisfies the standard and the customer's needs, which is exactly why a customer hires experts in the subject.

2. Automation

The following question was associated to automation:

> 2) Do you use automated means to do daily activities? (Excel sheets, Revit families, M.S Project templates, etc.)

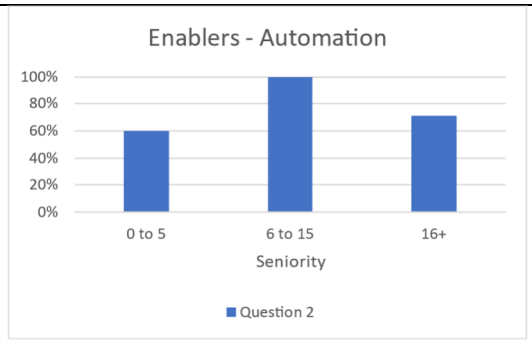


Figure 21 – Enablers - Automation

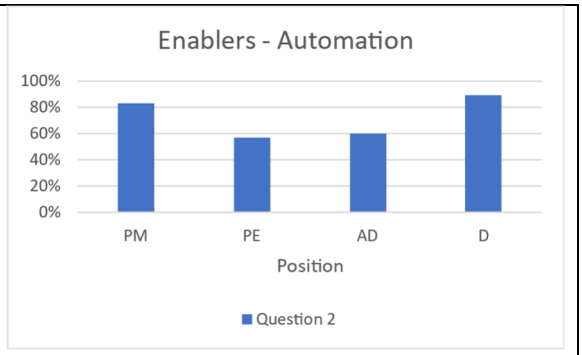


Figure 22 – Enablers - Automation

The statistical analysis shows the following results for the P-value:

Table 14 -P-value for Enablers - Automation

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
2	0.092	0.359

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. Automation of processes is key to reduce the time that the tasks take. Automation can be done in the BHS industry by using software developed specially for a task, and families or blocks for design, or any other means that helps the daily tasks to be done on time. It can be seen that project managers and designers are the ones that use these means extensively, while less frequent in associate directors and project engineers. The company

is developing and started using a beta version of an in-house developed software that allows the project engineer to do surveys, installation progress updates, and even reports automatically, therefore the frequency for this question is expected to grow specially for project engineers in the future.

3. Core competencies

The following question was associated to core competencies:

3) According to your opinion, what does the company do better from the following list?

- Deliver on time
- Customer satisfaction
- Customer relationship
- Customer representation
- Project design

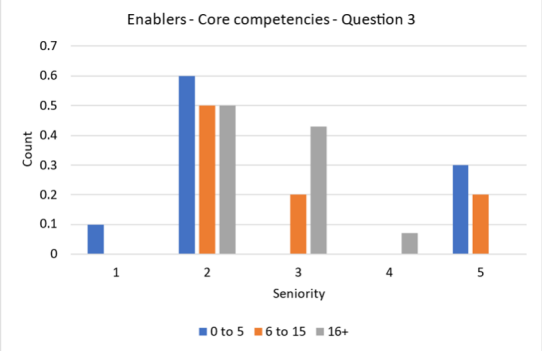


Figure 23 – Enablers – Core competencies

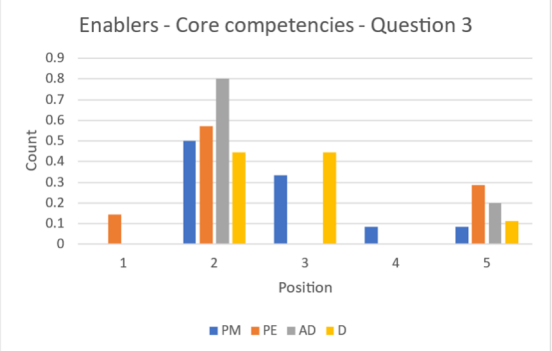


Figure 24 – Enablers – Core competencies

This question was provided to the staff of the company to observe what their thoughts were regarding what the company does best. It can be seen that there is a strong tendency to believe that the company's core competency is customer satisfaction, and customer relationships. Both answers are strongly related to adapting and satisfying the customers' needs.

4. Delegate

The following questions were associated to delegation:

4) Are you often delegated with responsibilities?
5) Do you delegate responsibilities to others?
6) Do you check and provide comments to the person you delegated a task to?

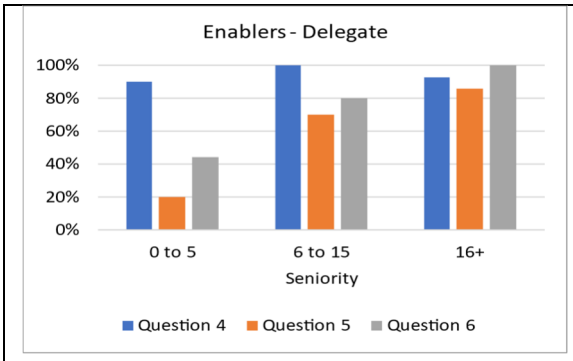


Figure 25 – Enablers - Delegate

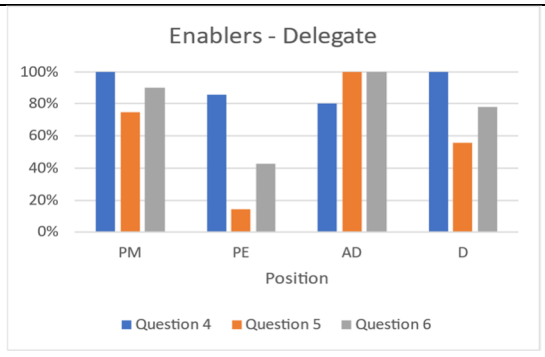


Figure 26 – Enablers - Delegate

The statistical analysis shows the following results for the P-value:

Table 15 - P-value for Enablers - Delegate

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
4	0.643	0.294
5	0.004	0.014
6	0.008	0.067

While being delegated tasks is common for everybody in the organization, the action of delegating tasks is dependent on the seniority and the position as well. Because of that, checking the task assigned to others is also dependent on the seniority level, and is very close to being from the position's point of view. We reject the null hypothesis for those questions.

From the seniority point of view, the response was as expected, with a strong delegation of tasks at every level of the organization, and with an increase of the act of delegating responsibilities and checking for those tasks with the increase of experience. From the position point of view, project

engineers and designers delegate the smaller number of responsibilities, and therefore, checking for those tasks is less frequent than for PMs and ADs.

5. Human Resources

The following questions were associated to human resources:

7) Do you feel motivated to do your tasks?
8) Have you participated in any non-work-related event organized by the company in 2022?
9) Do you feel you can count on your teammates for work-related matters?
10) Do you feel you can count on your teammates for personal matters?

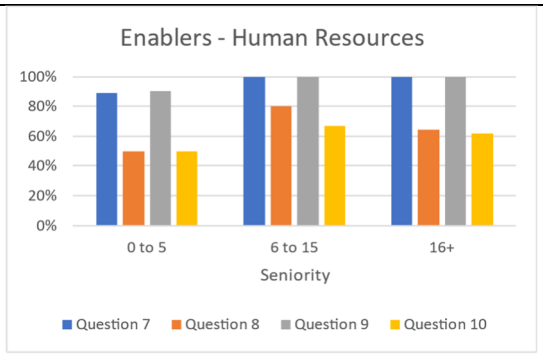


Figure 27 – Enablers – Human Resources

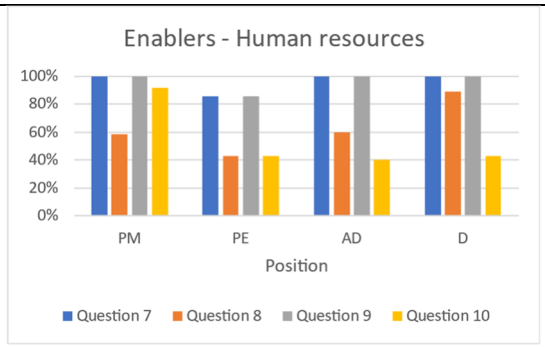


Figure 28 – Enablers – Human Resources

The statistical analysis shows the following results for the P-value:

Table 16 - P-value for Enablers - Human Resources

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
7	0.253	0.297
8	0.373	0.266
9	0.305	0.297
10	0.745	0.054

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. The results for these questions show that the personnel are highly motivated to do their jobs in every level of the company, and that the

employees can count professionally on their teammates, no matter seniority or position. There is, however, a low participation in events organized by the company, and there is a low feeling of fellowship outside the working environment. It is interesting to observe that PMs do not agree with that tendency and show elevated levels of camaraderie outside the working environment.

4.4.2 Barriers

1. Managerial constraints

a. Cooperation between levels

The following questions were associated to cooperation between levels:

> 11) Do you usually work as a team with personnel from different hierarchies inside the company?
> 12) Have you ever felt uncomfortable working with any of the other company's employees?

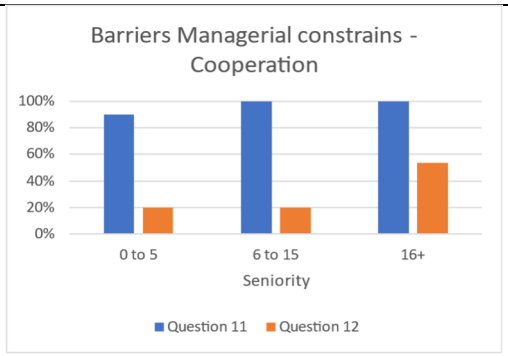


Figure 29 – Barriers – Managerial constraints – Cooperation between levels

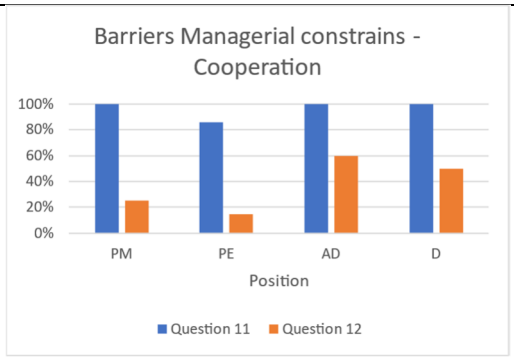


Figure 30 – Barriers – Managerial constraints – Cooperation between levels

The statistical analysis shows the following results for the P-value:

Table 17 - P-value for Barriers - Managerial - Cooperation between levels

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
11	0.290	0.280
12	0.131	0.257

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. The responses show a large cooperation between the different departments of the company. Every employee, no matter what level or position, usually works with other departments in the same project. The level of discomfort while working with other employees is low and can be seen an increase with the increase of experience. From the position point of view, ADs and designers feel more frequently uncomfortable at some point because of working with other employees.

b. Business relationship with customers

The following questions were associated to business relationship with customers:

13) Have you worked on different projects for the same customer?
14) Do you usually have feedback from the customer at some point?

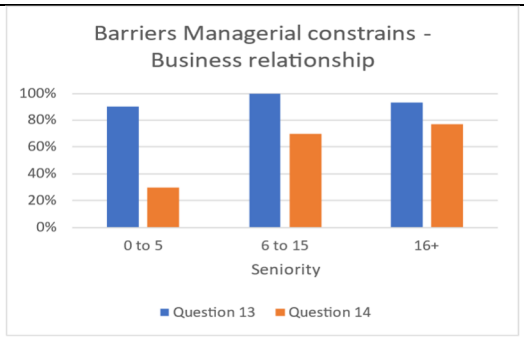


Figure 31 – Barriers – Managerial constraints - Business relationship with customers

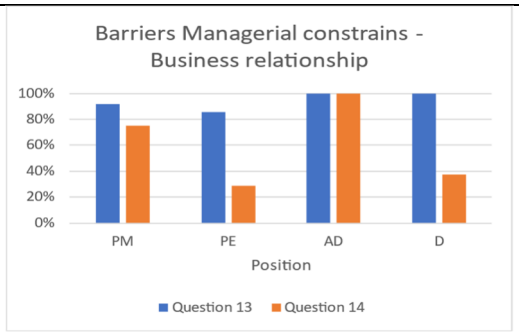


Figure 32 – Barriers – Managerial constraints - Business relationship with customers

The statistical analysis shows the following results for the P-value:

Table 18 - P-value for Barriers - Managerial - Business relationship

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
13	0.615	0.605
14	0.057	0.030

Receiving feedback from the customer is strongly bonded to the position of the employee. We can see that for this question, the seniority point of view is remarkably close to the boundary as well. We cannot reject the null hypothesis. The responses show that customers work with the company repeatedly on different projects, and the staff usually work on different projects of the same clients. This can be interpreted to be due to the good business relationship with the customer and how the company's core competencies lean towards customer satisfaction. There is, however, a low relationship between the customer and certain staff members. It can be seen an increasing rate of feedback from the juniors to the seniors, and from the position point of view, ADs and PMs are the once that get most of the feedback, with little feedback from the customer to PEs and designers.

c. Work quality

The following questions were associated to work quality:

15) Do you usually have enough time to finish your tasks?
16) Do you have your tasks checked by someone before delivering it to the customer?
17) Do you allocate time to have your work checked by somebody else before delivering?

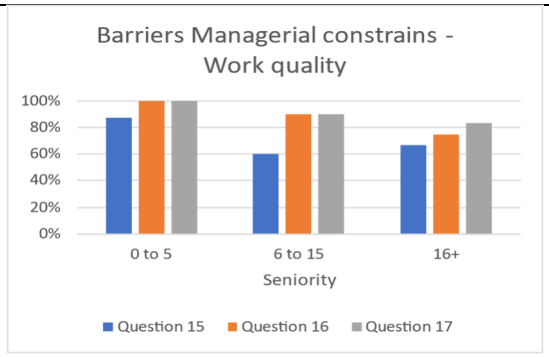


Figure 33 – Barriers – Managerial constraints – Work quality

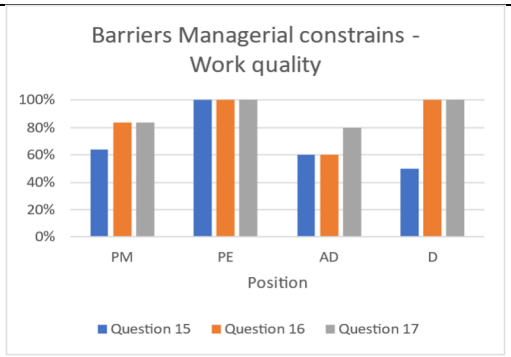


Figure 34 – Barriers – Managerial constraints - Work quality

The statistical analysis shows the following results for the P-value:

Table 19 - P-value for Barriers - Managerial - Work quality

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
15	0.426	0.213
16	0.226	0.158
17	0.409	0.427

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. The answers for this set of questions show that project engineers have enough time to finish their tasks, but designers only have enough time around 50% of the time. The results also show that checking the work before submitting to the customer is extensively done by each position, but by associate directors. Finally, and because checking the information is important before delivering to the customer, in general everybody allocates time for the revision of the deliverables.

d. Innovative ideas

The following questions were associated to innovative ideas:

18) Do you feel the solutions provided to the customer adapt accordingly to each project?
19) Do you feel the tasks assigned to you require a methodical approach? Do you usually follow the same procedures for similar tasks every time?

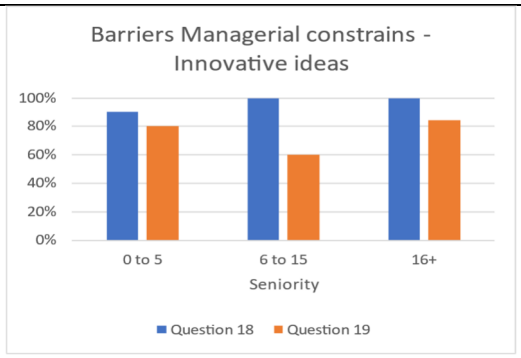


Figure 35 – Barriers – Managerial constraints – Innovative ideas

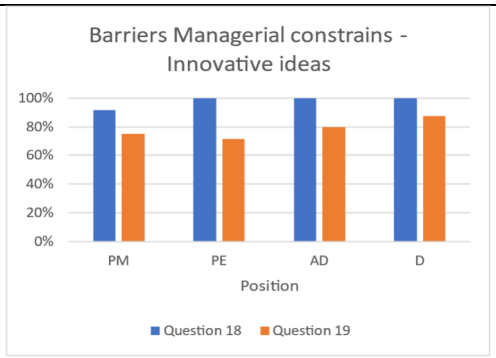


Figure 36 – Barriers – Managerial constraints – Innovative ideas

The statistical analysis shows the following results for the P-value:

Table 20 - P-value for Barriers - Managerial - Innovative ideas

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
18	0.290	0.614
19	0.367	0.879

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. There is a general sense of adaptability to each project, but also the procedures used are alike other similar projects. The company must be careful not to fall into the use of techniques without questioning whether there are better alternatives, just because in the past those techniques were successful.

2. Technology constraints

a. Data base

The following questions were associated to data base:

20) Do you use the Company's portal resources often?
21) Do you save all your information in the cloud, or do you prefer working locally on your computer?

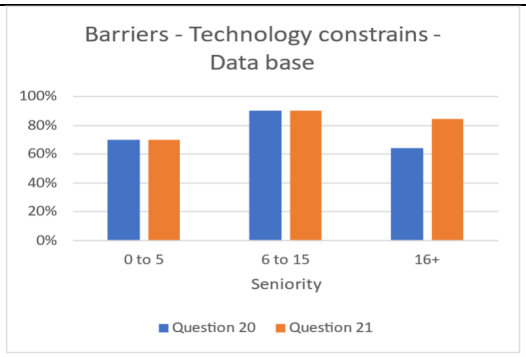


Figure 37 – Barriers – Technology constraints – Data base

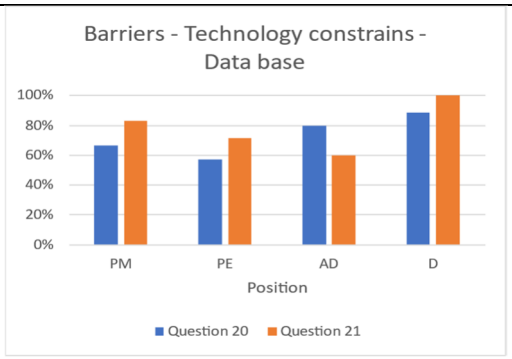


Figure 38 – Barriers – Technology constraints – Data base

The statistical analysis shows the following results for the P-value:

Table 21 - P-value for Barriers - Technology - Data base

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
20	0.355	0.494
21	0.483	0.283

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. The technology resources provided are being used extensively by the design department, and there is a correct and responsible use of the data, by utilizing the cloud service, in order to avoid losing important data. Other departments use those resources in a less efficient way, and create problems of data availability, and a dangerous situation for the security of the information.

b. Computer

The following questions were associated to computers:

22) Do you think the computer provided to you is powerful enough to perform your specific tasks?
23) Have you had repetitive problems with your computer?
24) If any problem ever occurred to your computer, did IT solve the issue fast enough?

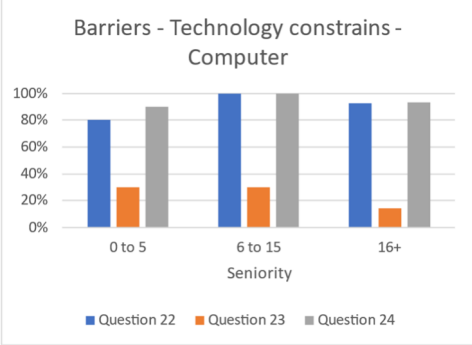


Figure 39 – Barriers – Technology constraints – Computer

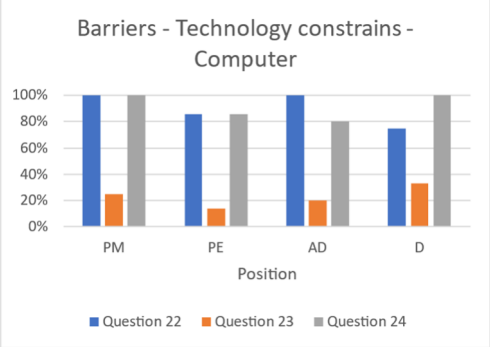


Figure 40 – Barriers – Technology constraints – Computer

The statistical analysis shows the following results for the P-value:

Table 22 - P-value for Barriers - Technology - Computers

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
22	0.291	0.235
23	0.568	0.841
24	0.615	0.273

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. Regarding computers, the resource seems to be efficient. The staff manifest to have a powerful enough computer for the tasks, even for the design department, which apart from drafting and building 3d models, is also in charge of operational simulations, which are very demanding of computers. There is a small number of issues in computers reported, and if there was any problem, the IT department was capable of solving them quickly enough.

c. Software

The following questions were associated to software:

25) Do you have installed on your computer all the software you need to do your job?
26) Do you get software updates installed on your computer often?

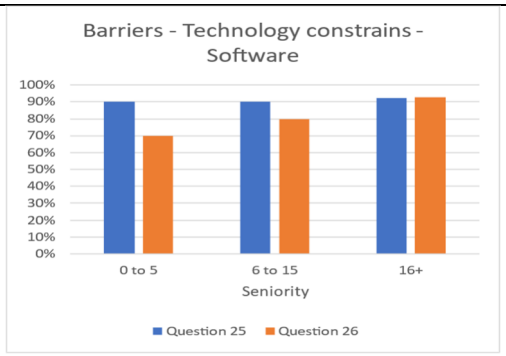


Figure 41 – Barriers – Technology constraints – Software

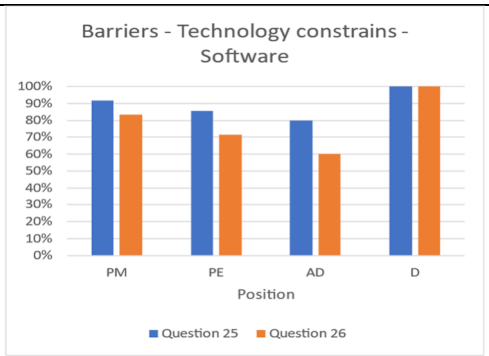


Figure 42 – Barriers – Technology constraints – Software

The statistical analysis shows the following results for the P-value:

Table 23 - P-value for Barriers - Technology - Software

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
25	0.975	0.636
26	0.341	0.248

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. Regarding software, the design department agrees that all the tools needed to do their job have been installed on the computers, and that updates are usually installed. The rest of the company barely uses design software, and therefore, their needs and resources are different. There is a general acceptance of the software available, but some departments report a lower number of updates.

d. Communication

The following questions were associated to communication:

27) What is the main means of communication you use to get in contact with your teammates?

- Microsoft teams
- E-mails
- Phone call
- Texts
- WhatsApp

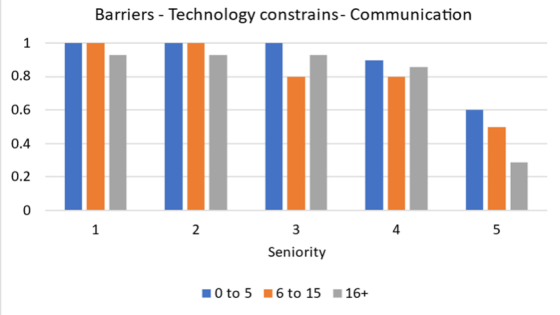


Figure 43 – Barriers – Technology constraints – Communication (Question 27)

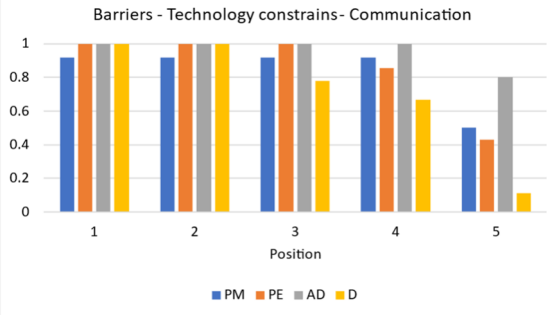


Figure 44 – Barriers – Technology constraints – Communication (Question 27)

There is an extensive use of tools such as Microsoft Teams, email and phone calls and text to communicate with other people from the company. The availability of all those means makes the use of online services, such as WhatsApp, not preferred for internal communication.

28) What is the main means of communication you use to get in contact with a customer?

- Microsoft teams
- E-mails
- Phone call
- Texts
- WhatsApp

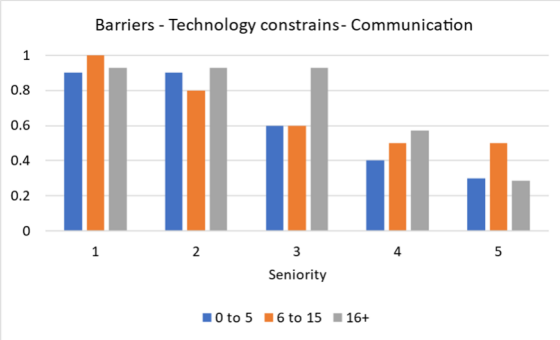


Figure 45 – Barriers – Technology constraints – Communication (Question 28)

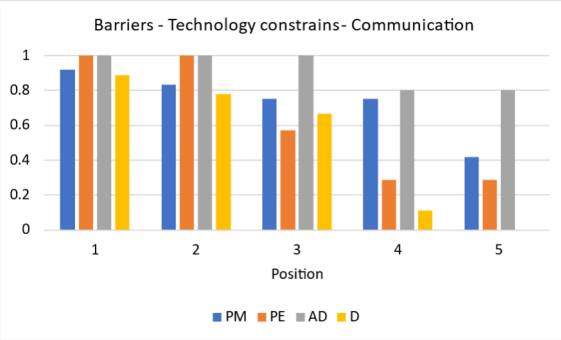


Figure 46 – Barriers – Technology constraints – Communication (Question 28)

The communications mean between the company's staff and the customers are more focused, being Microsoft Teams and email the preferred means. Phone calls are used by associate directors, which are usually in closer contact with the customers by any means, including online services such as WhatsApp.

3. Human resources constraints

a. Training

The following questions were associated to training:

29) Do you feel you have been trained to do your tasks?
30) Have you had the possibility to observe a BHS working?

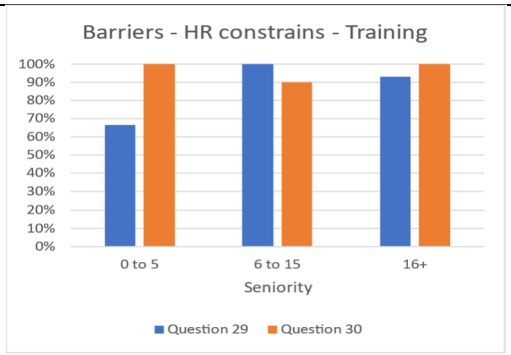


Figure 47 – Barriers – Human Resources constraints – Training

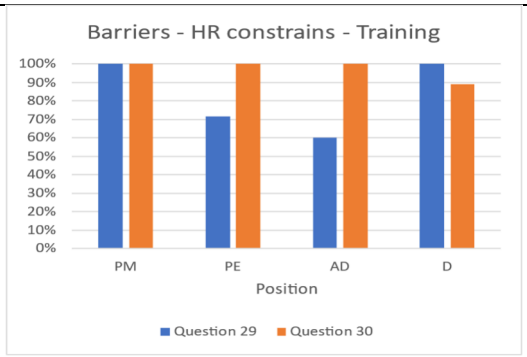


Figure 48 – Barriers – Human Resources constraints – Training

The statistical analysis shows the following results for the P-value:

Table 24 - P-value for Barriers - Human resources - Training

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
29	0.064	0.047
30	0.290	0.432

The training of employees shows a dependency on the position assumed. There is a difference in the level of training depending on the type of work that the employee does. Therefore, we reject the null hypothesis for this question. Training is an utterly useful tool that needs to be addressed in order to succeed in the consulting services industry. It is interesting to observe that the lowest rate of training is observed in the junior's bracket, but intermediate and seniors feel that have been trained to do their jobs. Regarding positions, Project managers and designers strongly agree that their training was provided, while project engineers are positioned at a lower level of training. The most interesting response however is that associate directors feel they have not been trained for their jobs.

A third question for the training matter had to be analyzed in a separate way, because of the nature of the question.

31) When you have technical questions, do you get the answers form:

- Supervisor
- Teammates
- PGDS

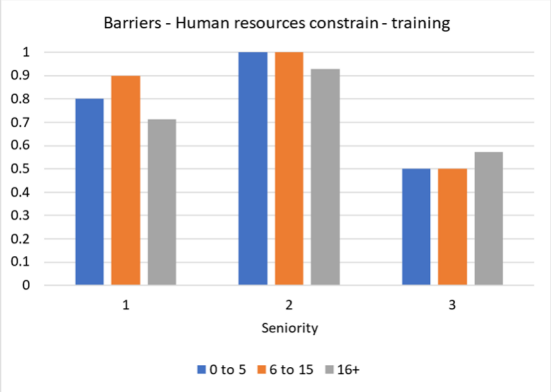


Figure 49 – Barriers – Human Resources constraints – Training

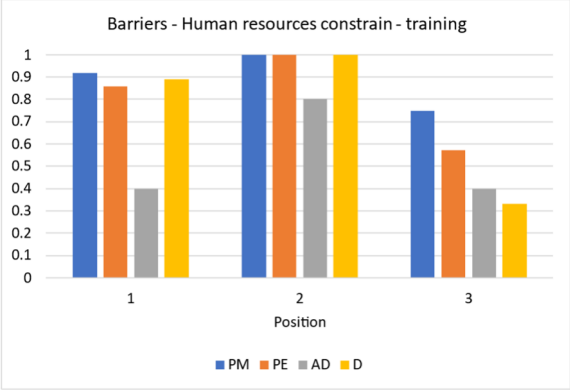


Figure 50 – Barriers – Human Resources constraints – Training

It can be observed that there is an effective communication between peers when a technical question arises. The most used tool to solve technical questions are teammates, followed by consultations with a supervisor. The standard is always consulted at some point, but as is shown in the response, it is the less frequently used tool.

b. Incentive

The following questions were associated to incentive:

32) Do you feel your salary is in accordance with your tasks?
33) Are you incentivized by the other benefits of the company?
34) Do you usually do any activity after working hours with other company members?
35) Are you interested in doing activities after working hours with your teammates?

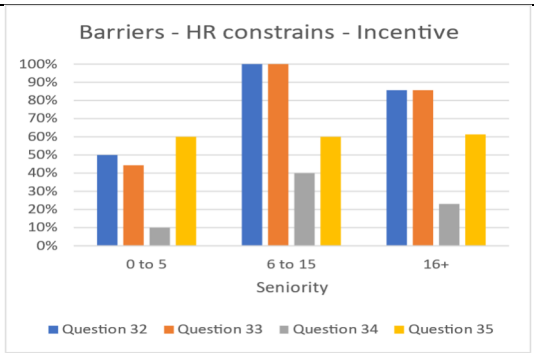


Figure 51 – Barriers – Human Resources constraints – Incentive

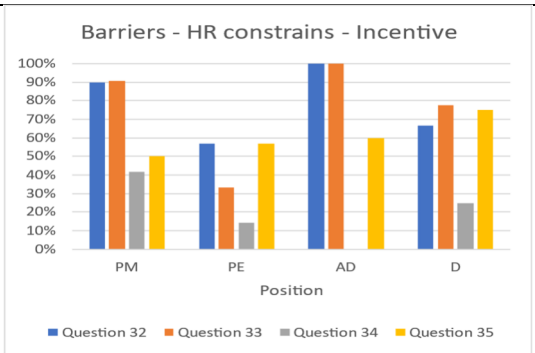


Figure 52 – Barriers – Human Resources constraints – Incentive

The statistical analysis shows the following results for the P-value:

Table 25 - P-value for Barriers - Human resources - Incentive

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
32	0.025	0.203
33	0.011	0.026
34	0.291	0.276
35	0.952	0.826

The conformity about the salary and other benefits that the company offers to the employees has a dependency on the seniority level and the position's perspective, and therefore we reject the null hypothesis for those questions. The employee's incentive was measured in several aspects, including economic, beneficial, and social. Intermediate and senior staff agree that their salaries and other benefits that the company offers are in accordance with their tasks, while juniors agree around 50% of the time. This is also observed from the position point of view, where PMs and ADs are in strong accordance with their salaries and benefits. Designers agree about 70% about their salaries, and a bit more about their other benefits, while PEs showed the lowest agreement in both salary and especially their other benefits.

There is an alarming small number of employees sharing time after leaving the working environment. PMs seems to be the most socials with their teammates, and any Associate Director

manifested to interact with other employees. It is interesting to observe that there is a higher desire for interacting with their teammates outside of the working environment than what is currently happening from the position and the seniority point of view.

Last, the following question had to be analyzed separately due to its nature.

36) In your opinion, which option best describes the work environment of the company?

- Friendly and comfortable
- Strictly professional
- Competitive
- Others

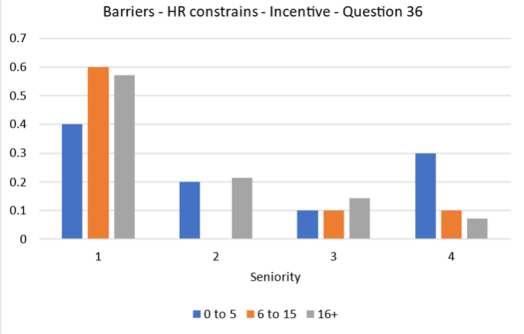


Figure 53 – Barriers – Human Resources constraints – Incentive

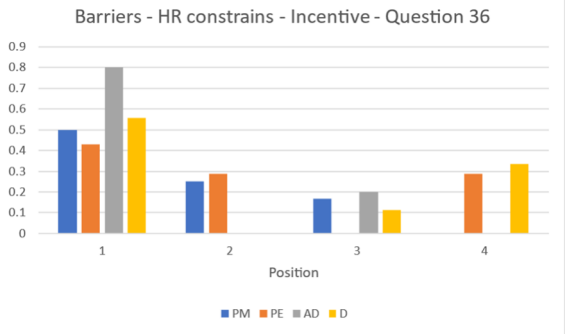


Figure 54 – Barriers – Human Resources constraints – Incentive

As can be seen, the company's environment was defined as friendly and comfortable in every bracket of both categories.

c. Multitasking

The following questions were associated to multitasking:

37) Are you usually involved in different projects at the same time?
38) Are you usually involved in different roles at the same time? (Project management, design, marketing, etc.)

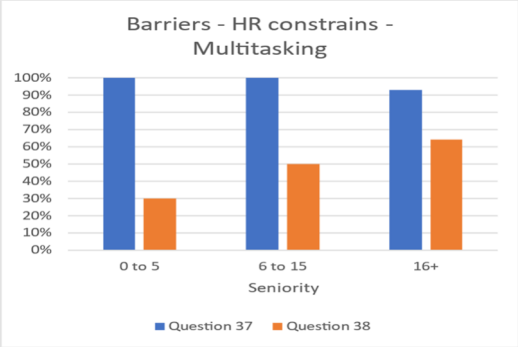


Figure 55 – Barriers – Human Resources constraints – Multitasking

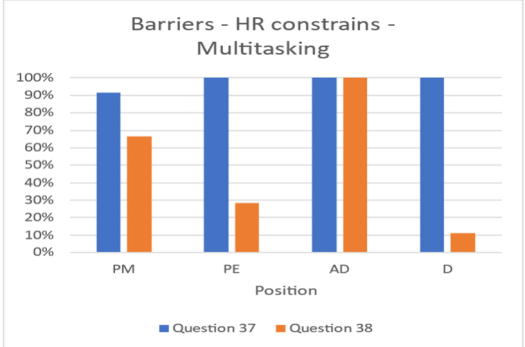


Figure 56 – Barriers – Human Resources constraints – Multitasking

The statistical analysis shows the following results for the P-value:

Table 26 - P-value for Barriers - Human resources - Multitasking

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
37	0.479	0.614
38	0.254	0.005

The roles that the staff are involved in at the same time have a dependency on the position of the employees, and therefore we reject the null hypothesis. The answers to these questions show that almost everyone is involved in multiple projects at the same time. However, being involved in projects performing different roles seems to be a function of the experience from the seniority point of view, and it is clearly accentuated in associate directors and project managers. Project engineers and designers seem to be involved in single roles for the different projects.

Finally, question 39 is analyzed separately, because of its nature.

39) How many projects are you involved in right now?

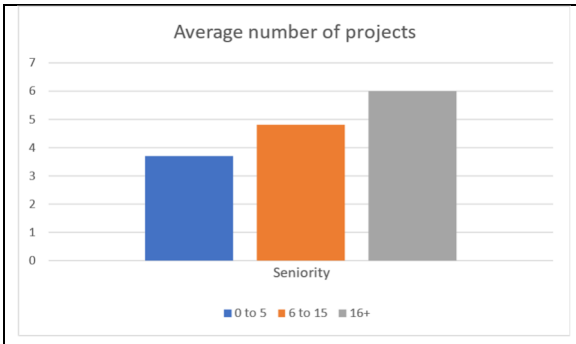


Figure 57 – Barriers – Human Resources constraints – Multitasking

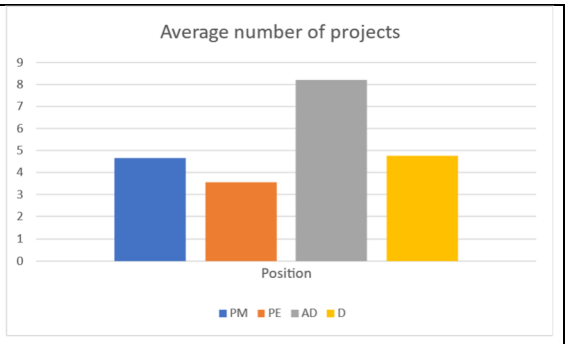


Figure 58 – Barriers – Human Resources constraints – Multitasking

The average number of projects that the staff is involved in, seems to increase with experience, averaging 6 projects each senior, and about 3,5 project each junior. From the Position point of view, ADs hold an average above 8 projects, while the rest of the staff is involved between 3 and 5 projects at the same time.

d. Cross communication

The following questions were associated to cross communication:

40) Do you work closely with other departments of the company involved in the same project as you?
41) Do you usually know exactly who else is working on the same project as you?

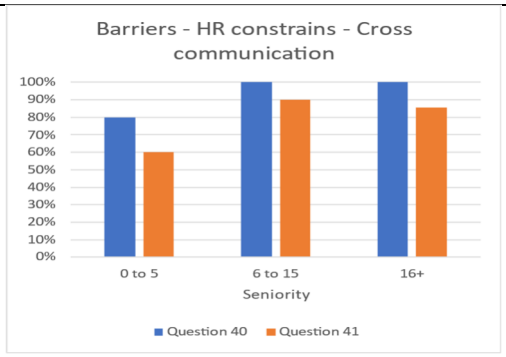


Figure 59 – Barriers – Human Resources constraints – Cross communication

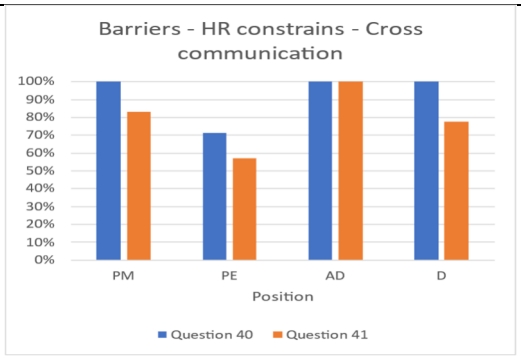


Figure 60 – Barriers – Human Resources constraints – Cross communication

The statistical analysis shows the following results for the P-value:

Table 27 - P-value for Barriers - Human resources - Cross communication

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
40	0.086	0.055
41	0.189	0.326

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. There is a strong agreement about cross communication between employees working in the same project, intermediate and seniors seem to use this tool extensively, and also are aware of who else is working on the same project at the same time. Junior's work with other departments about 80% of the time, and their awareness regarding who else is working on the same project is sensibly less than the rest. From the position point of view, ADs, PMs, and Designers communicates with other departments extensively, and Project engineers follow that trend about 70% of the time. Associate Directors, who usually control the projects, seem to be fully aware of who else is working on the projects, but that information is not being delivered effectively to the rest of the staff, specially to PEs.

4.4.3 Knowledge

The following questions were associated to knowledge:

42) How long have you worked for the BHS industry?

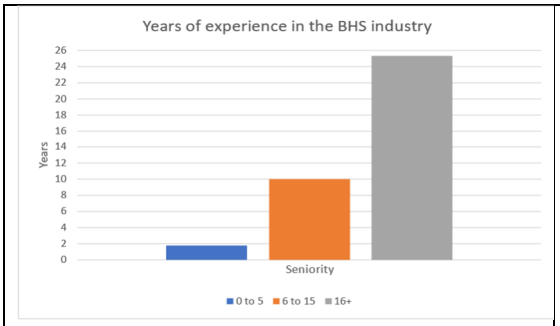


Figure 61 – Knowledge

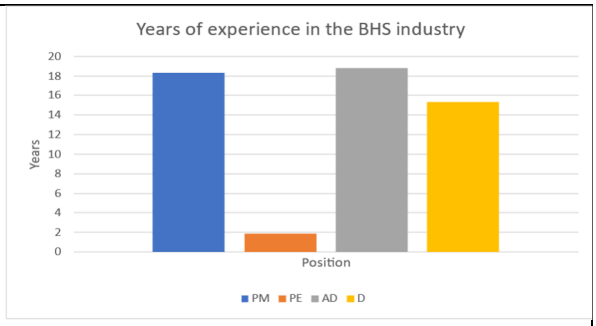


Figure 62 – Knowledge

The average number of years for the junior's bracket is less than 2 years, while the intermediate averages 10 years of experience and the seniors an average of more than 25 years of experience. The same information shows that PMs and ADs average experience in the industry is above 18 years, while the designing department averages 15 years of experience. Project engineers average a bit less than 2 years of experience.

Statistical analysis could be added to the following three questions, regarding knowledge:

43) Are you challenged by your supervisor to use your best judgement?
44) Do you have your supervisor's support for technical questions?
45) Do you usually get a straight answer from your supervisor to solve a problem, or are you encouraged to consult standards or other resources as a guide?

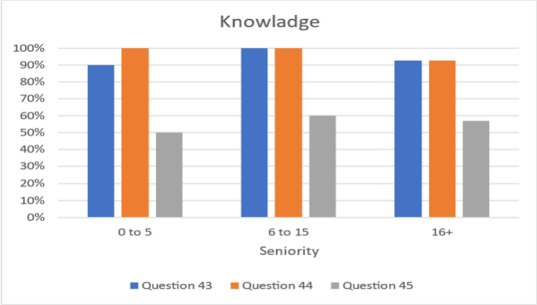


Figure 63 – Knowledge

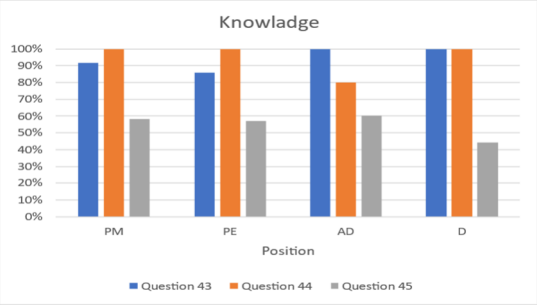


Figure 64 – Knowledge

The statistical analysis shows the following results for the P-value:

Table 28 - Knowledge

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
43	0.615	0.605
44	0.479	0.123
45	0.897	0.915

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis.

The answers from this set of questions shows a strong encouragement for people to use their best judgement at every level of the organization. The answers also show that supervisors have a strong presence in the organization, and the staff can rely on the more experienced once to perform their tasks in the best possible way. Question 45 shows that about 50% of the times, people receive a straight answer from their supervisors, and the other 50% of the times, the staff is encouraged to consult the standards documents.

Question 46) Indicate your experience in the company or other company in the BHS industry:

- Drafting
- Designing
- Project Engineer
- Project Manager
- Marketing

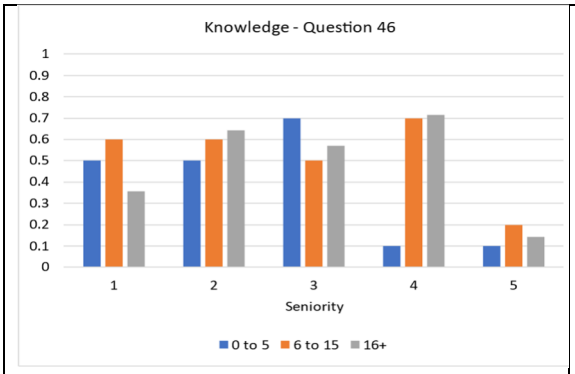


Figure 65 – Knowledge

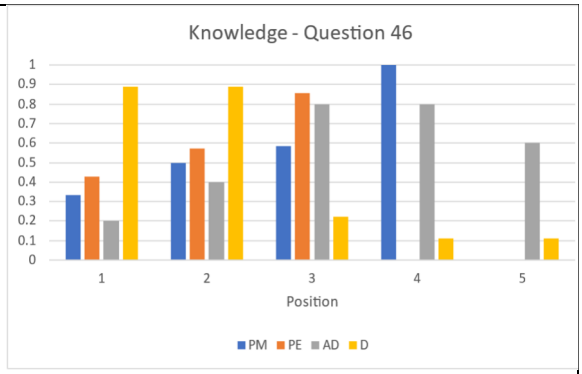


Figure 66 – Knowledge

As can be observed, juniors have general experience as drafters, designers and as project engineers, while intermediate and seniors also add project management. There is a small portion of the staff doing marketing tasks. From the position point of view, it seems that there is experience in every position available, and that most of the marketing tasks are done by Associate directors.

4.4.4 Readiness

1. Iterative decision making

The following questions were associated to iterative decision making:

47) Do you usually get feedback from the customer after a deliverable that requires a revision?
48) Do you hold a fluid communication with the customer through the development of the project?
49a) When you are required to do a task, do you review it with your supervisor before sending it to the customer?
49b) When you are required to do a task, does your supervisor usually ask for modifications?
49c) When you are required to do a task, do you usually go through a second revision with your supervisor?

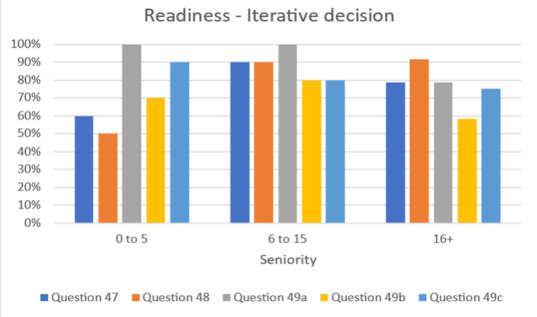


Figure 67 – Readiness – Iterative decision making

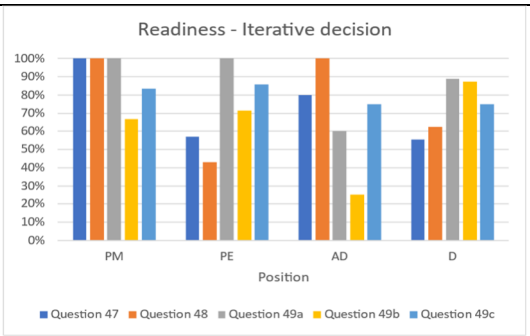


Figure 68 – Readiness – Iterative decision making

The statistical analysis shows the following results for the P-value:

Table 29 - Readiness - Iterative decision making

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
47	0.278	0.066
48	0.034	0.015
49a	0.095	0.052
49b	0.548	0.185
49c	0.663	0.937

The communication with the customer throughout a project has a dependency on both the seniority and the position variables, and therefore we reject the null hypothesis for this question and conclude that this tool is used in different ways depending on the variables. Iterative decision making answers show that there is strong communication with the customers to receive feedback in the case of intermediate and seniors' brackets. Juniors do not have as much contact with the customer, and therefore, the feedback is observed to be less frequent. PMs and ADs leads the communication with the customer, and therefore, receive most of the customer's feedback. The communication with their supervisors is extensive in the case of juniors and seniors, and can be observed in PMs, PEs, and designers. It is also seen that modifications and further revisions are frequent at every level of seniority, and is led by designers, PEs, and PMs.

2. Involve staff in complete workflow

The following question was associated to involving staff in complete workflow:

> 50) Are you usually assigned isolated tasks that don't need explanation of the scope of the project?

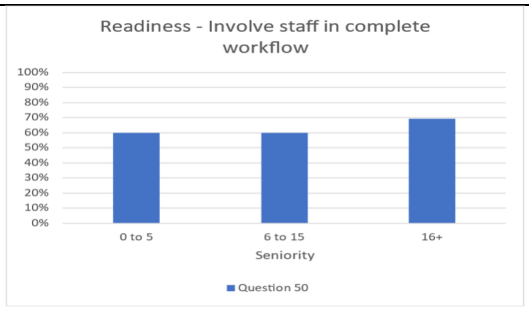


Figure 69 – Readiness – Involve staff

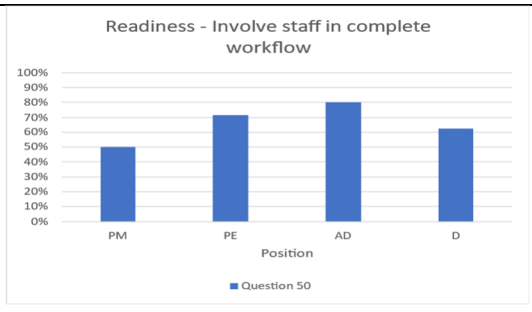


Figure 70 – Readiness – Involve staff

The statistical analysis shows the following results for the P-value:

Table 30 - Readiness - Involve staff in complete workflow

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
50	0.865	0.639

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. The answers for this question show that isolated tasks that do not need explanation of the scope of the project vary between 60 to 70% when dividing the data in seniority brackets. ADs are usually involved in these types of activities, while project managers experiment with these tasks about 50% of the time.

3. Transparent communication

The following questions were associated to transparent communication:

52a) When involved in a project, are you usually aware of every aspect of the project? (Scope, timeframe, participants)
52b) When involved in a project, are you usually involved in a single aspect of the project? (Marketing, design, management, etc.?)
52c) When involved in a project, does the project manager provide an explanation of the project scope when involving you in any activity of the project?
52d) When involved in a project, are you asked about the tasks you are going to be doing in the day?

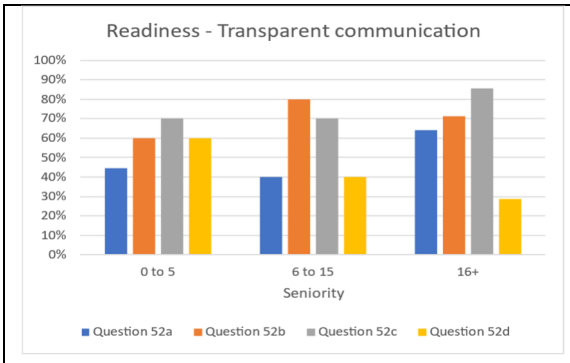


Figure 71 – Readiness – Transparent communication

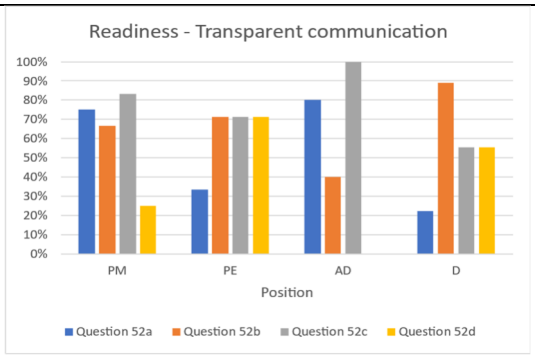


Figure 72 – Readiness – Transparent communication

The statistical analysis shows the following results for the P-value:

Table 31 - Readiness - Transparent communication

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
52a	0.444	0.043
52b	0.615	0.293
52c	0.568	0.256
52d	0.303	0.040

The awareness of the project status and the information regarding the tasks to be done for that project has a dependency on the position of the staff, and therefore we reject the null hypothesis for those questions. The answers show that juniors and intermediates are informed about the details of the project only about 40% of the time. Managers inform about the project about 70% of the time. Project managers and Associate directors are usually more informed, according to the results, while designers receive the less amount of information. Project managers and engineers usually work on a single aspect of the project about 70% of the time, while designers do so about 90% of the time. Finally, ADs are involved in multiple aspects of a project about 60% of the time. Regarding communication with the working team, the information requested decreases with the years of experience, and can be seen that designers and PEs are asked more frequently than PMs, and ADs are rarely asked.

4. Risk assessment

The following questions were associated to risk assessment:

51) Do you usually approach similar tasks in the same way?
53) Are you encouraged by your supervisor to make mistakes and learn from them?
54) Are you encouraged to make your own decision for your tasks?
55) Do you make a risk assessment study when the task requires it?
56) Do you usually have a closing meeting with your teammates after a project ends to point out good and bad aspects of what was done?

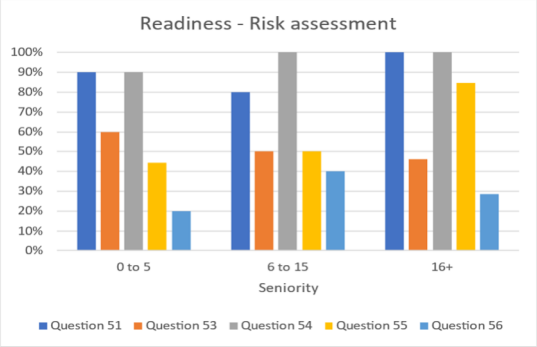


Figure 73 – Readiness – Risk assessment

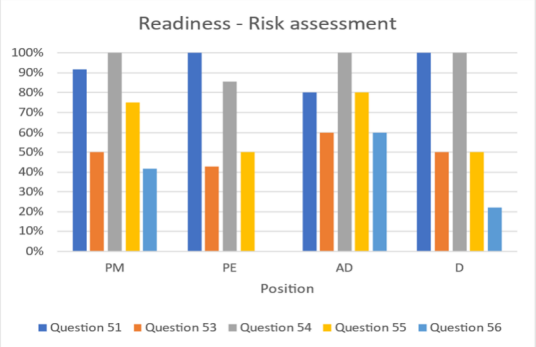


Figure 74 – Readiness – Risk assessment

The statistical analysis shows the following results for the P-value:

Table 32 - Readiness - Risk assessment

Section 2 - Tools		
Question	P-Value Seniority	P-Values Position
51	0.232	0.416
53	0.800	0.952
54	0.290	0.280
55	0.099	0.496
56	0.615	0.105

There is not enough evidence to confirm that there is statistical dependency between the variables and therefore, we cannot reject the null hypothesis. The results for this set of questions show that there is a strong tendency to repeat approaches in similar situations, and also that decision making is strongly encouraged for every level of experience and position. Risk assessment is done frequently by seniors, being used mostly by PMs and ADs, while retrospective meetings are not frequent for designers or PEs.

4.5 Agility estimation points

We established at the beginning of the case study that company X has not officially adapted the Agile methodology to its operations. However, many of the guides (which define the Agile working framework) are used to a certain level, as was observed in the results of the survey. It is interesting to observe at what level the company adapts the methodology before making any kind of changes to its operations. That way, we could follow the progress towards agility when using any of the tools proposed in chapter 3. Furthermore, if the procedure proposed in this research is followed for different companies, an estimative comparison between companies could be made. To estimate the level of agility of the company, the guides of the method are used, and the average of each guide is calculated. Finally, a grand average is provided at the bottom of Table 33.

Table 33 - Agility estimation points

			Agility number	
Guide	Question		Question	Guide
Kickoff meeting	1	When you are being assigned a job, do you have a kickoff meeting where the scope of the project is defined?	82%	78%
	2	Do you feel that the information provided to you in the first meeting allows a clear interpretation of the project?	74%	
Project Backlog	3a	After the kickoff meeting, do you hold other meetings to Divide the project into blocks?	59%	69%
	3b	After the kickoff meeting, do you hold other meetings to Define expected results?	76%	
	3c	After the kickoff meeting, do you hold other meetings to Define roles and responsibilities?	82%	
	4	Are you usually involved in a small part, or in the complete project? (This doesn't mean that you do the complete project by your own, but you are somehow involved)	59%	
Sprint planning meeting	5	When you are being assigned with a task, do you get a description of the scope of the complete project or just the scope of the task you are being asked to perform?	38%	43%
	6	Do you participate in defining the tasks and responsibilities?	48%	
Sprint	7a	Deadlines: Do you usually get a well-defined deadline at the moment you are assigned a task?	71%	58%
	7b	Deadlines: Are those deadlines constant in time (1 week, 2 weeks, etc.)?	32%	
	8	Do you usually work in a team or by yourself?	71%	
Brief and debrief	9a	Brief and debrief: Do you plan your approach before doing a task?	88%	84%
	9b	Brief and debrief: After you are done with a task, do you analyze what was done right and wrong?	79%	

Scrum meetings	10	Do you inform your project team about the tasks you will be doing during the day?	73%	73%
	11	Do your teammates inform you about the tasks they will be doing during the day?	74%	
Retrospective meeting	12	Do you usually participate in meetings with the customer?	79%	66%
	13	Do you usually have direct communication with the customer?	59%	
	14	Do you ask for or receive feedback from the customer about the project progress?	59%	
Burndown charts	15	Do you receive information about the status of the project you are working on? (Percentage done, estimated time to end, deadlines, etc.)	68%	63%
	16	Do you receive feedback about the tasks you perform from your manager?	59%	
			Total	67%

Therefore, we conclude that this company has adopted the Agile methodology by about 67%. To improve that percentage, recommendations in chapter 5 should be followed.

Chapter 5
Conclusions and Recommendations

The implementation and level of importance of each of the guides and tools developed in chapter 3, will depend on many factors such as the company's organization structure, number of employees, services provided, market share, external conditions, competition, level of expertise, human resources, and so on. The utilization of the Agile methodology will depend on a deep analysis of all the factors, and the level of utilization of the method will vary on a case-by-case basis.

This research used data obtained at a company that provides services to airports by designing baggage handling systems and providing technical orientation in different ways to their customers, in order to satisfy their needs without deviating from what the strict security standards indicate. To analyze the company's status, a questionnaire was sent to every employee in the USA offices. A total of thirty-four responses were received, from different areas of the company, and with different levels of expertise. The data was later analyzed from two different perspectives, seniority, and position points of view. Finally, agility estimation points were assigned to the company, based on the results of the survey.

The results obtained show some interesting results, and recommendations to increase the level of agility in the company are provided below.

5.1 Guides

5.1.1 Kickoff meeting:

Current situation: Kickoff meetings are being used independently of the experience or position assumed. These meetings are more commonly held by seniors in positions such as associate directors, and project managers, and the project objectives are usually clear for the associate directors and engineers only. Because the company has multiple people doing similar jobs for different projects, it is common that some people participate in a small part of the project, due to availability. Therefore, involving every person that will be working at some point in a project is challenging.

Recommendations: Invite all parties that will be involved to the kickoff meeting and allocate time to answer questions for a clear understanding of each player's responsibilities, including the customer. To avoid miscommunication, or lack of information, the company should develop a short document at the beginning of each project with the general scope, responsibilities, schedules, and people originally involved, so anybody jumping into the project after it started can have a clear interpretation of the project's scope.

5.1.2 Project backlog:

Current situation: The subdivision of the workload is done around 60% of the time for every position. There is no statistical evidence that any of the variables is dependent on others, therefore the subdivision is done approximately in the same way, but still in a low percentage. The project's expected results are dependent on the seniority of the staff, while does not show dependency from the position point of view, and it is defined about 75% of the time on average. Roles and responsibilities are usually defined for every position and expertise in a similar way. Finally, the staff's involvement in a project will depend on the position and seniority of the employee, showing big differences between categories.

Recommendations: Work on dividing the tasks into smaller tasks that can be weighted individually, so the subdivided task can be finished in the specified time. Information about the project, responsibilities, roles and expected results need to be better defined in meetings. Cross-communication between the different departments needs to be improved, and everybody should be introduced to the information cited above.

5.1.3 Sprint planning meeting

Current situation: There is a general uncertainty regarding the scope of the projects. Designers, PE, and juniors are usually assigned with individual tasks, without further details of the rest of the project. There is a defined chain of command regarding the assignation of tasks. Juniors, PE, and designers do not participate in the assignation of responsibilities. It is also noticed that there is no statistical dependency between the variables and the different groups, and therefore, the guide is used in a similar way.

Recommendations: Cross-communication needs to be improved. When broader information is given to the working team, better decisions or approaches can be made and less dependency on the

supervisor's judgement would be noticed. The subdivision of the tasks was bordered in the previous guide, and at this one, the implementation should be done. Cross communication would also allow the team members to select from the tasks they feel more comfortable with, or that their experience would put the team in a better position.

5.1.4 Sprint

Current situation: There is a good sense of teamwork observed, and depending on the position, the contact with other departments of the organization is broader or narrower. Deadlines are in general clearly stated, but those deadlines are very variable in duration.

Recommendations: Sprints as used in other industries like the software development industry would be hard to implement in an industry such as the engineering consulting industry. For this particular company, there might be some room to implement this guide in a stricter way for the design department only. For the rest of the positions, some flexibility is needed to implement this guide. The first step is to divide the tasks to their minimum dimensions, and then test different time brackets to check for the velocity of the working teams. That way, an estimated sprint time can be considered and implemented.

5.1.5 Brief and debrief

Current situation: These guides are usually used by every staff member. The work is organized before starting the tasks, and there is enough allocation of time at the end of the task to review the general performance.

Recommendations: Even though the company seems to use these guides, there is not an official format in use for taking these activities, and therefore, it is up to the personnel to do them or not. A format should be implemented, including the most important aspects of briefing and debriefing.

5.1.6 Scrum meeting

Current situation: There is a dependency on the seniority level and the information provided to others inside the working teams. While juniors and intermediate do inform their tasks for the day, seniors do it in a much lower percentage. This shows the company's verticality and dependency on supervisors.

Recommendations: improve cross-communication by providing the information about the tasks at all levels of the working teams.

5.1.7 Retrospective

Current situation: There is dependency between positions and communication with the customers. While AD's and PM's communication with the customer is extensive, PE's and designers' is not.

Recommendations: Extend the communication between the customers and the staff members. Direct feedback from the customer would help to improve the quality of the work and deliverables.

5.1.8 Burndown charts

Current situation: there is no evidence of statistical dependency between the different levels of experience or positions, it is noticeable that feedback from managers is low for juniors and intermediates but especially low for seniors. Associate directors get the less amount of feedback from the position's point of view, but in general everyone receives few feedback.

Recommendations: Feedback is crucial for the improvement of expertise, and supervisors should consider allocating time and resources to provide such feedback. Associate directors are in general the supervisors for others, so they usually do not have supervisors to get feedback from. For those cases, feedback should be provided by the upper management at least a few times per year. Actual charts might not be necessary, due to the time they request to build, but it is utterly important to provide the teamwork with feedback to improve the quality of the work.

5.2 Tools

5.2.1 Enablers

1. Adaptability

Current situation: The company's mission is to satisfy the customer's needs, and a good adaptability is shown according to the goals of the project. It is also seen that even though the aim is to satisfy the customer, there is appropriate work ethics, and the recommendations are done within the limits of the stablished in the industry's standards. Finally, there is a strong tendency to ask for supervisor's input.

Recommendations: Maintain good communication with the customer and with the project team, so the required changes in the project can be easier and faster to achieve. The strong communication is even more important considering that there is a dependency on supervisor's input.

2. Automation

Current situation: The automation of tasks is based on automatic spread sheets and designing features of the 3d software the company uses. There is also an in-house development of an app that helps project engineers to do in-site supervisions, allowing to check for several installation items status, and later building reports automatically.

Recommendations: Continue the development of automation tools that allow a faster, trustworthy way of performing tasks. Continue training for designers to use all the possible capabilities of the software.

3. Core competencies

Current situation: Several employees agree that the core competencies of the company are related to the customer satisfaction and relationship. In such a focused activity as this company is, this core competency is adequate. The company provides a service that only a few competitors can match, and therefore, working on satisfying the customers and building a relationship based on trust is key.

Recommendations: Continue working on building a reputation of excellence, and a good relationship with customers.

4. Delegate

Current situation: Being delegated responsibilities is a common practice in the company, while delegating is usually done by the upper levels, who organize and distribute the workload. The staff that delegates workload usually allocates time to check for the work done by those assigned with the tasks.

Recommendations: Continue improving the communication among the different positions and involve the personnel that will be working on the project from early stages, so the responsibilities can be assigned as a teamwork rather than following a line of command.

5. Human resources

Current situation: the staff in general shows motivation to do their jobs, and the professional relationship and work environment is of mutual collaboration. There is however a lack of relationship between the personnel out of the office hours, which would help to strengthen the communication and commitment.

Recommendations: Organize more social events, or relaxation times within the office hours. Pursue engagement for different activities other than strictly work related out of the office hours.

5.2.2 Barriers

1. Managerial constraints

a. Cooperation between levels

Current situation: As stated before, teamwork has been a crucial factor for the success of the company, and the interaction of people from different departments and experience helps to speed up the process of learning for junior employees. Moreover, a few responses show that people have felt uncomfortable at some point when working with peers inside the company.

Recommendations: Continue building a good environment for workers and promote good relationships among employees.

b. Business relationship with customer

Current situation: The customers usually hire the company's services for multiple projects over time. The differences in communication with the customer from the different positions have been addressed in section 1, and recommendations have been made accordingly. This time, the important is to acknowledge the positive or negative feedback from the customer to build a good business relationship.

Recommendations: Keep working on building a good relationship with customers.

c. Work quality

Current situation: Even though the time allocated to finish the tasks is usually enough, designers can struggle a bit more than the rest of the positions. Revisions before submitting to customers are extensively used at every level, except Associate directors, which do not have supervisors to check

with. Because many of the tasks need revision before submission, allocating time for this purpose seems to be a common practice.

Recommendations: Measure the velocity of the design team and assign enough time to obtain high quality results. Make sure that work is revised before submitting. The company has a team of experts in the QAQC team to revise certain types of deliverables.

d. Innovative ideas

Current situation: Adaptability seems to be correct, but people tend to use similar approaches to similar problems or situations.

Recommendations: Do not underestimate alternatives to approaches used in the past.

2. Technology constraints

a. Data base

Current situation: The resources provided by the company are extensively used by every employee, particularly by the design department. The design staff uses the cloud services to store files, increasing the safety of the data. The rest of the departments uses this resource in a less efficient way.

Recommendations: Encourage using cloud storage only. Provide short training courses about the use of the resources and the hazards associated.

b. Computers

Current situation: Computers are good enough for every position and expertise. Only a few problems have been reported, and a good response from the IT department was observed.

Recommendations: Continue updating computers and pay attention to increases in the number of claims regarding performance or issues.

c. Software

Current situation: All the software needed to operate is available for every position, especially for designers, who uses the latest versions of the REVIT software. The rest of departments claim less updates in their software.

Recommendations: Continue providing useful software to automate the processes. Make sure to keep licenses and updates available for every employee.

d. Communication

Current situation: Extensive use of Microsoft Teams, email, and phone between employees and customers. Internet-based means are less attractive for the staff members.

Recommendations: Guarantee the availability of the communication means.

3. Human resources constraints

a. Training

Current situation: Juniors show a lack of training, while intermediates and seniors exhibit a good level of training. The most interesting fact is that AD expressed the fewer training. The most used tool to solve issues is teammates and supervisors, which is an indication of training needed for some sectors of the company.

Recommendations: Reinforce training, especially for juniors. Specialize seniors in their tasks. Many seniors have been in the BHS for many years, but oversee administrative and marketing tasks, which need different training.

b. Incentive

Current situation: There is a dependency on seniority and the salary perceived, as well as other benefits provided by the company. Juniors tend to agree less with their salary and benefits. There is a low number of employees that do activities with others but are willing to engage in out of the office activities. Finally, “Friendly and comfortable” is the most popular work environment option selected.

Recommendations: Revise salaries for juniors, check competitiveness and other benefits. Organize social events out of the office time, and activities that might be appealing to many employees to join. Encourage cooperation and engagement with the company’s culture.

c. Multitasking

Current situation: Many employees involved in multiple projects at the same time. On the other hand, performing different roles is a function of the positions, where ADs are usually enrolled in different aspects, while PE, and designers are involved in only one. The average number of projects that the staff is involved in increases linearly with the seniority level.

Recommendations: Involving people into more projects will accelerate their learning, leading to better understanding of the projects, and less dependency on supervisors.

d. Cross-communication

Current situation: Contact and communication between departments is used by the whole company. However, some information is not shared to everybody, such as who else is working on the same project.

Recommendations: improve cross communication.

5.2.3 Knowledge

Current situation: The experience of seniors and intermediates is extensive, averaging 10 and 25 years of experience, respectively. Best judgement is encouraged, but there is a strong presence of supervisors to guide through the process. Mentees count on the knowledge from the seniors and the standards to consult to.

Recommendations: Continue supporting junior staff, and provide the training needed for better judgement and good decisions making.

5.2.4 Readiness

1. Iterative decision making

Current situation: Communication with customers depend on both seniority and position. Feedback from customers for juniors is observed to be sensibly lower than for both the other brackets. Communication with supervisors is good enough for juniors and finally, modifications in deliverables are frequent for all seniorities and positions.

Recommendations: Feedback is the key to the iterative process. Include everybody in internal and customer feedback. Review and revise the work done constantly. Shorter and smaller tasks are preferred for the iterative decision making.

2. Involve staff in complete workflow

Current situation: Isolated tasks are on average highly likely for all seniorities and positions.

Recommendations: Isolated tasks should be avoided. By introducing the staff into the complete project and multiple roles, there is better control of the variables, the confidence to take decisions grow, and the chances to make mistakes are reduced.

3. Transparent communication

Current situation: Awareness of the project status and information regarding the tasks are dependent on the staff position. There is a low project information awareness from PE and designers. PM, PE, and designers usually work on a single aspect of a project. Daily activity meetings are in descendent order from juniors to seniors.

Recommendations: Improve cross-communication. It is crucial for agility to have everybody informed about the project progress to quickly adapt to any modification. Cross-communication includes who is working on the project, deadlines, responsibilities, customer's feedback, latest versions of documentation, files accessibility, teamwork, etc.

4. Risk assessment

Current situation: There is a tendency to repeat approaches to similar situations. Decision making and best judgement are encouraged for every expertise and position. Retrospective meetings are not put into practice by designers and PEs. Finally risk assessment is a tool used mostly by seniors.

Recommendations: Taking risks is part of adapting to new situations, therefore, it is recommended to analyze different approaches over time for similar conditions. Continue encouraging people to use their best judgement and to take risks. Adopt retrospective meetings to embrace the project's outcomes.

Chapter 6
Future work to be done

The research presented in this thesis document is a first approach for the use of the Agile methodology in the engineering consulting services industry, and therefore, some work should be addressed in the future to complete the research. Some of the interesting future investigations are:

1) Create a list of questions that could be used for the companies in general, that allow standardization for the agility points that provides a sense of the level of use of the agile framework.
2) Apply the method to different engineering consulting services companies and compare results.
3) Provide the exact recommended tools to be used for specific guides that may need improvement, as a practical recommendation table that can be used for a wide variety of engineering consulting services companies.

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Appendix A – Survey format

Questionnaire

This is an anonymous questionnaire. Its objective is not to evaluate the performance of any employee. The responses will be part of a statistical analysis that will show general information about the company's situation, in order to make the pertinent changes and improve the performance of the company’s overall results. Your name will not be requested or traceable, and the specific information provided will not be disclosed to any member of the company or outside of it.

There are no right or wrong answers, this is not an evaluation of performance questionnaire. Responding as honestly as possible will help the company to improve, since the results of this survey will possibly be used to develop guides and tools to be applied in the best interest of the company and their employees.

What is your position at the company: _____

Section 1

1. When you are being assigned a job, do you have a kickoff meeting where the scope of the project is defined?

   ☐ ***Yes***

   ☐ ***No***

2. Do you feel that the information provided to you in the first meeting allows a clear interpretation of the project?

   ☐ ***Yes***

   ☐ ***No***

3. After the kickoff meeting, do you hold other meetings to:
   - Divide the project into blocks?

     ☐ ***Yes***

     ☐ ***No***
   - Define expected results?

     ☐ ***Yes***

     ☐ ***No***
   - Define roles and responsibilities?

     ☐ ***Yes***

     ☐ ***No***

4. Are you usually involved in a small part, or in the complete project? (This doesn't mean that you do the complete project by your own, but you are somehow involved)

   ☐ ***Part***

   ☐ ***Complete***

5. When you are being assigned with a task, do you get a description of the scope of the complete project or just the scope of the task you are being asked to perform?

   ☐ ***Complete project***

   ☐ ***Task***

6. Do you participate in defining the tasks and responsibilities?

   ☐ ***Yes***

   ☐ ***No***

7. About Deadlines:
   - Do you usually get a well-defined deadline at the moment you are assigned a task?
     - ☐ ***Yes***
     - ☐ ***No***
   - Are those deadlines constant in time (1 week, 2 weeks, etc)?
     - ☐ ***Yes***
     - ☐ ***No***

8. Do you usually work in a team or by yourself?
   - ☐ ***Myself***
   - ☐ ***Team***

9. Brief and debrief:
   - Do you plan your approach before doing a task?
     - ☐ ***Yes***
     - ☐ ***No***
   - After you are done with a task, do you analyze what was done right and wrong?
     - ☐ ***Yes***
     - ☐ ***No***

10. Do you inform your project team about the tasks you will be doing during the day?
    - ☐ ***Yes***
    - ☐ ***No***

11. Do your teammates inform you about the tasks they will be doing during the day?
    - ☐ ***Yes***
    - ☐ ***No***

12. Do you usually participate in meetings with the customer?
    - ☐ ***Yes***
    - ☐ ***No***

13. Do you usually have direct communication with the customer?

    ☐ ***Yes***

    ☐ ***No***

14. Do you ask for or receive feedback from the customer about the project progress?

    ☐ ***Yes***

    ☐ ***No***

15. Do you receive information about the status of the project you are working on? (Percentage done, estimated time to end, deadlines, etc)

    ☐ ***Yes***

    ☐ ***No***

16. Do you receive feedback about the tasks you perform from your manager?

    ☐ ***Yes***

    ☐ ***No***

Section 2

1. Do your tasks usually require having a plan B in case the requirements from the customer change?

   ☐ ***Yes***

   ☐ ***No***

2. Do you use automated means to do daily activities? (Excel sheets, Revit families, M.S Project templates, etc)

   ☐ ***Yes***

   ☐ ***No***

3. According to your opinion, what does the company do better from the following list? ***(Select one)***

   ☐ ***Deliver on time***

   ☐ ***Overall customer satisfaction***

   ☐ ***Customer relationship***

   ☐ ***Customer representation***

   ☐ ***Project design***

4. Are you often delegated with responsibilities?

   ☐ ***Yes***

   ☐ ***No***

5. Do you delegate responsibilities to others?

   ☐ ***Yes***

   ☐ ***No***

6. Do you check and provide comments to the person you delegated a task to?

   ☐ ***Yes***

   ☐ ***No***

7. Do you feel motivated to do your tasks?

   ☐ ***Yes***

   ☐ ***No***

8. Have you participated in any non-work-related event organized by the company in 2022? (Fundraising event, dinners, picnics, others)

   ☐ ***Yes***

   ☐ ***No***

9. Do you feel you can count on your teammates for work-related matters?

   ☐ ***Yes***

   ☐ ***No***

10. Do you feel you can count on your teammates for personal matters?

    ☐ ***Yes***

    ☐ ***No***

11. Do you usually work as a team with personnel from different hierarchies inside the company? (President, vice-president, Associate directors, Project managers, Project eng, etc)

    ☐ ***Yes***

    ☐ ***No***

12. Have you ever felt uncomfortable to work with any of the other company's employees?

    ☐ ***Yes***

    ☐ ***No***

13. Have you worked in different projects for the same customer?

    ☐ ***Yes***

    ☐ ***No***

14. Do you usually have feedback from the customer at some point? (Meetings, end of the project, after deliveries)

    ☐ ***Yes***

    ☐ ***No***

15. Do you usually have enough time to finish your tasks?

    ☐ ***Yes***

    ☐ ***No***

16. Do you have your tasks checked by someone before delivering it to the customer?

- ☐ ***Yes***
- ☐ ***No***

17. Do you allocate time to have your work checked by somebody else before delivering?

- ☐ ***Yes***
- ☐ ***No***

18. Do you feel the solutions provided to the customer adapts accordingly to each project?

- ☐ ***Yes***
- ☐ ***No***

19. Do you feel the tasks assigned to you requires a methodic approach? Do you usually follow the same procedures for similar tasks every time?

- ☐ ***Yes***
- ☐ ***No***

20. Do you use the Company's portal resources often?

- ☐ ***Yes***
- ☐ ***No***

21. Do you save all your information in the cloud, or do you prefer working locally on your computer?

- ☐ ***Server***
- ☐ ***Locally***

22. Do you think the computer provided to you is powerful enough to perform your specific tasks?

- ☐ ***Yes***
- ☐ ***No***

23. Have you had repetitive problems with your computer?

- ☐ ***Yes***
- ☐ ***No***

24. If any problem ever occurred to your computer, did IT solve the issue fast enough?

- ☐ ***Yes***
- ☐ ***No***

25. Do you have installed in your computer all the software you need to do your job?

- ☐ ***Yes***
- ☐ ***No***

26. Do you get software updates installed in your computer often?

- ☐ ***Yes***
- ☐ ***No***

27. What are the main mean of communication you use to get in contact with your teammates? ***(Rank 1 to 5 – where 1 is the most important and 5 is the less important, left blank if unused)***

- ☐ ***Microsoft teams***
- ☐ ***E-mails***
- ☐ ***Phone call***
- ☐ ***Texts***
- ☐ ***Whatsapp***

28. What is the main mean of communication you use to get in contact with a customer? ***(Rank 1 to 5 – where 1 is the most important and 5 is the less important, left blank if unused)***

- ☐ ***Microsoft teams***
- ☐ ***E-mails***
- ☐ ***Phone call***
- ☐ ***Texts***
- ☐ ***Whatsapp***

29. Do you feel you have been trained to do your tasks?

- ☐ ***Yes***
- ☐ ***No***

30. Have you had the possibility to observe a BHS working?

- ☐ ***Yes***
- ☐ ***No***

31. When you have technical questions, do you get the answers form: ***(Select all that apply)***

- ☐ ***Supervisor***
- ☐ ***Teammates***
- ☐ ***PGDS***

32. Do you feel your salary is in accordance with your tasks?

- ☐ ***Yes***
- ☐ ***No***

33. Are you incentivized by the other benefits of the company?

- ☐ ***Yes***
- ☐ ***No***

34. Do you usually do any activity after working hours with other company members?

- ☐ ***Yes***
- ☐ ***No***

35. Are you interested in doing activities after working hours with your teammates?

- ☐ ***Yes***
- ☐ ***No***

36. In your opinion, which option best describes the work environment of the company? ***(Select one)***

- ☐ ***Friendly and comfortable***
- ☐ ***Strictly professional***
- ☐ ***Competitive***
- ☐ ***Other:*** _____

37. Are you usually involved in different projects at the same time?

- ☐ ***Yes***
- ☐ ***No***

38. Are you usually involved in different roles at the same time? (Project management, design, marketing, etc)

- ☐ ***Yes***
- ☐ ***No***

39. How many projects are you involved in right now? _____

40. Do you work closely with other departments of the company involved in the same project as you? (design team, managers, project engineers, etc)

- ☐ ***Yes***
- ☐ ***No***

41. Do you usually know exactly who else is working on the same project as you?

- ☐ ***Yes***
- ☐ ***No***

42. How long have you worked for the BHS industry? _____

43. Are you challenged by your supervisor to use your best judgement?

- ☐ ***Yes***
- ☐ ***No***

44. Do you have your supervisor's support for technical questions?

- ☐ ***Yes***
- ☐ ***No***

45. Do you usually get a straight answer from your supervisor to solve a problem, or are you encouraged to consult standards or other resources as a guide?

- ☐ ***Straight answer***
- ☐ ***Resources***

46. Indicate your experience in the company or other company in the BHS industry ***(check all that apply):***

- ☐ ***Drafting***
- ☐ ***Designing***
- ☐ ***Project Engineer***
- ☐ ***Project Manager***
- ☐ ***Marketing***

47. Do you usually get feedback from the customer after a deliverable that requires a revision?

- ☐ ***Yes***
- ☐ ***No***

48. Do you hold a fluid communication with the customer through the development of the project?

- ☐ ***Yes***
- ☐ ***No***

49. When you are required to do a task:

- Do you review it with your supervisor before sending it to the customer?
  - ☐ ***Yes***
  - ☐ ***No***
- Does your supervisor usually ask for modifications?
  - ☐ ***Yes***
  - ☐ ***No***
- If modifications were asked, do you usually go through a second revision with your supervisor?
  - ☐ ***Yes***
  - ☐ ***No***

50. Are you usually assigned isolated tasks that don't need explanation of the scope of the project?

- ☐ ***Yes***
- ☐ ***No***

51. Do you usually approach similar tasks in the same way?

- ☐ ***Yes***
- ☐ ***No***

52. When involved in a project:

- Are you usually aware of every aspect of the project? (Scope, timeframe, participants)

  ☐ ***Yes***

  ☐ ***No***

- Are you usually involved in a single aspect of the project? (Marketing, design, management, etc.?)

  ☐ ***Yes***

  ☐ ***No***

- Does the project manager provide an explanation of the project scope when involving you in any activity of the project?

  ☐ ***Yes***

  ☐ ***No***

- Are you asked about the tasks you are going to be doing in the day?

  ☐ ***Yes***

  ☐ ***No***

53. Are you encouraged by your supervisor to make mistakes and learn from them?

  ☐ ***Yes***

  ☐ ***No***

54. Are you encouraged to make your own decision for your tasks?

  ☐ ***Yes***

  ☐ ***No***

55. Do you make a risk assessment study when the task requires it?

  ☐ ***Yes***

  ☐ ***No***

56. Do you usually have a closing meeting with your teammates after a project ends to point out good and bad aspects of what was done?

  ☐ ***Yes***

  ☐ ***No***

57. Do you usually provide a different approach if the customer wants to modify aspects of the project you are involved in?

  ☐ ***Yes***

  ☐ ***No***

58. Do you use the standards of the industry as a ruling document when the customer requires a modification of a deliverable?

- ☐ ***Yes***
- ☐ ***No***

59. If the customer requires a modification of a deliverable that is in a grey area of the standard, you: ***(Select one)***

- ☐ ***Do the modification as required.***
- ☐ ***Refuse to modify the deliverable to protect the customer.***
- ☐ ***Look for a gap that satisfy both standard and customer.***
- ☐ ***Ask your supervisor.***

Appendix B – Survey summary of results

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Question	Position	PE	AD	Intern	PE	PE	Sr PM	Sr PM	PM	D	AD	PE	AD	PM	AD	Sr D	Sr PM	Sr PM	Sr D	D	PM	PE	Sr. D	Sr. D	PM	PM	AD	Sr PM	TW	Designer	Sr PM	PE	Sr D	PM	PE
	Section 1																																		
1	When you are being assigned a job, do you have a kickoff meeting where the scope of the project is defined?	1	1	2	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2
2	Do you feel that the information provided to you in the first meeting allows a clear interpretation of the project?	1	1	2	1	1	2	1	1	2	1	1	1	1	1	1	1	2	1	2	1	1	2	1	2	1	1	2	1	1	1	1	1	1	2
3a	After the kickoff meeting, do you hold other meetings to Divide the project into blocks?	1	2	1	1	1	2	2	2	2	1	1	2	1	1	1	1	1	2	1	2	2	2	2	1	1	1	2	2	1	1	1	1	1	2
3b	After the kickoff meeting, do you hold other meetings to Define expected results?	1	1	1	1	1	2	1	2	2	1	1	1	1	1	1	1	1	1	2	1	1	2	2	2	1	2	1	1	1	1	1	1	1	1
3c	After the kickoff meeting, do you hold other meetings to Define roles and responsibilities?	1	1	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1
4	Are you usually involved in a small part, or in the complete project? (This doesn't mean that you do the complete project by your own, but you are somehow involved)	2	2	1	1	1	1	2	2	1	2	1	2	2	2	2	2	2	2	1	2	1	1	2	2	2	2	1	1	1	2	2	2	1	1
5	When you are being assigned with a task, do you get a description of the scope of the complete project or just the scope of the task you are being asked to perform?	1	1	2	2	2	2	1	2	2	2	2	1	1	2	1	1	2	2	2	1	2	2	2	2	2	1	1	2	2	1	1	1	2	2
6	Do you participate in defining the tasks and responsibilities?	1	1	2	2	1	2	2	1	2	1	2	1	1	1	1	1	1	2	1	1	2	2	2	2	1	2	2	2		1	2	1	2	2
7a	Deadlines: Do you usually get a well-defined deadline at the moment you are assigned a task?	1	2	2	2	1	1	1	2	2	1	1	1	1	1	1	1	1	2	1	1	1	2	1	2	2	1	1	1	1	1	1	2	1	1
7b	Deadlines: Are those deadlines constant in time (1 week, 2 weeks, etc)?	2	2	2	2	1	1	2	2	2	2	2	2	1	1	1	1	2	1	2	2	1	2	2	2	2	1	1	2	2	2	1	2	2	2
8	Do you usually work in a team or by yourself?	2	2	1	2	2	2	2	1	1	2	2	2	2	2	2	2	1	1	1	2	2	2	2	1	2	2	2	1	2	2	2	1	2	1
9a	Brief and debrief: Do you plan your approach before doing a task?	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2
9b	Brief and debrief: After you are done with a task, do you analyze what was done right and wrong?	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	2	1	1	1	1	1	1	1	2	1	2
10	Do you inform your project team about the tasks you will be doing during the day?	1	1	2	1	1	1	2	1	1	1		2	2	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	1	2	1	2	1	1
11	Do your teammates inform you about the tasks they will be doing during the day?	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	2	2	1	1	2	2	1	2	1	1	1	1	1	1	1	2	1	2
12	Do you usually participate in meetings with the customer?	1	1	2	1	2	1	1	1	2	1	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1
13	Do you usually have direct communication with the customer?	1	1	2	2	2	2	1	1	2	1	2	1	1	1	1	1	1	2	2	2	2	2	1	2	1	1	1	1	2	1	1	2	1	1
14	Do you ask for or receive feedback from the customer about the project progress?	2	1	2	1	2	1	1	1	1	1	2	1	1	1	1	1	1	2	1	2	2	2	2	2	1	1	1	1	2	1	1	2	2	2
15	Do you receive information about the status of the project you are working on? (Percentage done, estimated time to end, deadlines, etc)	1	1	2	2	1	1	1	2	2	1	1	2	1	1	1	1	2	2	1	1	2	2	1	2	1	1	1	1	1	1	1	1	2	1
16	Do you receive feedback about the tasks you perform from your manager?	1	2	1	1	1	2	1	2	1	2	1	2	1	2	1	1	2	2	1	1	2	1	2	2	1	1	2	2	1	1	1	1	1	2
	Section 2																																		
1	Do your tasks usually require having a plan B in case the requirements from the customer change?	2	1	1	1	1	2	2	2	1	2	1	1	1	1	2	2	1	2	1	1	1	2	2	2	1	1	1	2	1	1	1	1	1	2
2	Do you use automated means to do daily activities? (Excel sheets, Revit families, M.S Project templates, etc)	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	2	2	1	1	1	2	1	1	2
3	According to your opinion, what does the company do better from the following list?	2	2	2	5	2	2	2	3	5	2	1	2	3	2	3	2	3	3	2	5	5	2	3	2	3	5	4		2	2	2	3	2	2
4	Are you often delegated with responsibilities?	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2		1	1	1	1	1	1	1	1	1	1	1	1
5	Do you delegate responsibilities to others?	1	1	2	2	2	1	1	1	2	1	2	1	1	1	1	1	2	2	1	1	2	2	1	2	1	1	1	1	1	1	2	1	2	2
6	Do you check and provide comments to the person you delegated a task to?	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	2	2	1	2	1	1	1	1	1	1	2	1		2
7	Do you feel motivated to do your tasks?	1	1		2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Have you participated in any non-work-related event organized by the company in 2022? (Fundraising event, dinners, picnics, others)	1	2	1	2	2	1	2	1	1	1	2	1	1	1	1	1	2	1	2	1	1	1	1	1	2	2	2	1	1	2	2	1	1	1
9	Do you feel you can count on your teammates for work-related matters?	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
10	Do you feel you can count on your teammates for personal matters?	2	1	1	2	2	2	1	1	2	1	1	2	1	2	2	1	1	2	1	1	1			1	1	2	1	2	1	1	2	2	1	1
11	Do you usually work as a team with personnel from different hierarchies inside the company? (President, vice-president, Associate directors, Project managers, Project eng, etc)	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	Have you ever felt uncomfortable to work with any of the other company's employees?	2	1	1	1	2	2	1	1	2	1	2	1	1	2	2	2	2	1	1	2	2	2		2	2	2	2	2	2	2	2	2	1	2	2
13	Have you worked in different projects for the same customer?	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	Do you usually have feedback from the customer at some point? (Meetings, end of the project, after deliveries)	2	1	2	2	1	1	1	1	2	1	2	1	1	1	1	1	2	2	1	1	2	2		2	1	1	1	1	2	1	1	1	2	2
15	Do you usually have enough time to finish your tasks?	1	1		1	1	1	1	2	2	1	1	2	1	1	1	1	1	2	1	1	1	1		2	2	2	1	1		2	1	2		1
16	Do you have your tasks checked by someone before delivering it to the customer?	1	2	1	1	1	1	1	1	1	1		2	1	1	1	1	2	1		1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
17	Do you allocate time to have your work checked by somebody else before delivering?	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1
18	Do you feel the solutions provided to the customer adapts accordingly to each project?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1
19	Do you feel the tasks assigned to you requires a methodic approach? Do you usually follow the same procedures for similar tasks every time?	1	1	1	1	2	2	1	1	1	1	2	2	2	1	1	1	1	1	2	1	1	1		1	2	1	1	2	1	1	1	1	1	1
20	Do you use the Company's portal resources often?	1	2	1	2	1	1	1	1	1	1	2	1	2	1	1	1	2	1	1	1	2	2	1	1	1	1	2	1	1	2	1	1	1	1
21	Do you save all your information in the cloud, or do you prefer working locally on your computer?	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1		1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1
22	Do you think the computer provided to you is powerful enough to perform your specific tasks?	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
23	Have you had repetitive problems with your computer?	2	2	1	1	2	1	2	1	2	1	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
24	If any problem ever occurred to your computer, did IT solve the issue fast enough?	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	Do you have installed in your computer all the software you need to do your job?	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	2
26	Do you get software updates installed in your computer often?	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	2	1	1	1	2	1	1	1	1	1	1	1	2
27	What are the main mean of communication you use to get in contact with your teammates?	1-2-3-4	4,3,2,1,5	1,2,4,3,5	1,3,2	1,2,3,4,5	1,4,3,2,5	2,1,3,4	1,2,4,3,5	2,1,3,4	1,4,2,3,5	1,3,2,4	3,2,1,4,5	1,2,3,4	1,2,3,4	1,2,3,4	2,1,3,4,5		1,2,0,3	1,2,1	1,2,3,4	1,2,3,4	1,1,2	1,2,3,4		1,2,4,3	1,3,2,4,5	3,2,1,4,5	2,1,3,4,5	1,2,3,5,4	1,2,4,3	1,2,4,3	1,2,4,3,5	1,2,4,3	1,2,3,4,5	1,2,3,4,5

28	What is the main mean of communication you use to get in contact with a customer?	1,2,3	4,1,2,3,5		2,1	2,1,3,4,5	4,1,2,3,5	3,2,1,4	4,1,2,3,5	2,1	4,1,2,3,5	2,1	4,2,1,5,3	3,1,2,4	2,1,3	2,1,3	3,1,2,4,5		3,1,2	3,1,3	0,1	0,1,2,3	1,1,2	2,1,3,4	2,1	4,1,2,3,5	4,2,1,3,5	3,1,2,4,5	4,1,2,3,5	2,1,3	1,3,2,4	0,1,2	2,1,3	2,1,3,4	4,1,2,3,5
29	Do you feel you have been trained to do your tasks?	1	2		2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2
30	Have you had the possibility to observe a BHS working?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
31	When you have technical questions, do you get the answers form: ***(Select all that apply)***	1,2,3		1,2	2	1,2,3	1,2	1,2,3	1,2,3	1,2	1,2	1,2	1,2,3	1,2,3	2,3	1,2	1,2,3	1,2	1,2,3	1,2	1,2,3	1,2	1,2	1,2,3	1,2,3	1,2,3	2	2	2	2	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3
32	Do you feel your salary is in accordance with your tasks?	2	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2			1	1	1	1	1	2	1	2	1
33	Are you incentivized by the other benefits of the company?	1	1	2		2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	1	1	1		1	1	1	1	1	2	1	1	2
34	Do you usually do any activity after working hours with other company members?	1	2	2	2	2	2	1	1	2	2	2	2	2	2	2	1	2	2	2	1	2	2	1	1	2	2	2	2		2	2	1	2	2
35	Are you interested in doing activities after working hours with your teammates?	1	1	1	1	1	2	1	3	1	1	2	1	2	2	2	1	2	1	2	1	2	1	1	1	2	2	2	1		1	2	1	1	1
36	In your opinion, which option best describes the work environment of the company?	1	1	4	4	1	1	1	3	1	1	2	3	2	1	1	1	2	4	4	1	4	1	3		1	1	2		1	1	2	1	3	1
37	Are you usually involved in different projects at the same time?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1
38	Are you usually involved in different roles at the same time? (Project management, design, marketing, etc)	1	1	2	2	2	2	1	1	2	1	2	1	1	1	2	1	1	2	2	1	2	2	1	2	1	1	2	1	2	1	1	2	2	2
39	How many projects are you involved in right now? ___________________________	2	15	3	4	1	2	5	7	4	6	3	8	8	5	7	10	3	4	5	5	3	3	9	3	6	7	2	3		3	7	3	2	5
40	Do you work closely with other departments of the company involved in the same project as you? (design team, managers, project engineers, etc)	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2
41	Do you usually know exactly who else is working on the same project as you?	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	2
42	How long have you worked for the BHS industry? ________________________________	4	17	1	1	1	14	26	7	9	21	2	21	19	34	23	15	40	20	8	9	2	8	25	13	9	1	32	8	17	33	2	27	3	1
43	Are you challenged by your supervisor to use your best judgement?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1
44	Do you have your supervisor's support for technical questions?	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
45	Do you usually get a straight answer from your supervisor to solve a problem, or are you encouraged to consult standards or other resources as a guide?	1	2	2	2	1	2	1	1	1	1	2	1	1	2	2	2	2	1	2	1	1	2	2	1	1	1	2	1	1	1	2	1	2	1
46	Indicate your experience in the company or other company in the BHS industry ***(check all that apply):***	1,2,3	3,4	1	3	1,2	4	2,4	1,2,3,4	1,2	3,4,5	1,2,3	2,4	3,4	3,4,5	1,2	4	2,3,4	1,2	1,2,5	1,2,3,4	3	1,2	2,3,4	3,4	1,2,3,4	1,2,3,5	4	3,4,5	1,2	1,2,3,4	3	1,2,3	4	2,3
47	Do you usually get feedback from the customer after a deliverable that requires a revision?	1	1	2	1	1	1	1	1	1	2	2	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1	2
48	Do you hold a fluid communication with the customer through the development of the project?	1	1	2	2	2	1	1	1	2	1	2	1	1		1	1	1	2	1	1	2	1	1	1	1	1	1	1		1	1	1	1	1
49a	When you are required to do a task: Do you review it with your supervisor before sending it to the customer?	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
49b	When you are required to do a task: Does your supervisor usually ask for modifications?	1	2	1	1	1	1	2	2	1	2	2	2	1		1	2	1	1	1	1	1	1	2	1	1	1	1	1		1	2	1	2	1
49c	When you are required to do a task: If modifications were asked, do you usually go through a second revision with your supervisor?	1	2	1	1	1	1	1	2	1	1	1	1	1		2	1	2	1	1	1	1	2	1	1	1	1	1	1		1	1	1	1	2
50	Are you usually assigned isolated tasks that don’t need explanation of the scope of the project?	2	1	2	1	1	1	1	2	1	1	1	2	1	1	2	1	1	2	1	2	2	1	1	2	2	1	1	1		2	1	1	2	1
51	Do you usually approach similar tasks in the same way?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	2	1	1	1	1	1	1
52a	When involved in a project: Are you usually aware of every aspect of the project? (Scope, timeframe, participants)	2	1	2	2	1	2	1	1	2	1		1	1	2	1	1	2	2	2	1	2	2	2	2	1	1	1	2	1	1	1	2	1	2
52b	When involved in a project: Are you usually involved in a single aspect of the project? (Marketing, design, management, etc.?)	2	2	2	2	1	1	1	2	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	2	1	1	1	1
52c	When involved in a project: Does the project manager provide an explanation of the project scope when involving you in any activity of the project?	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	2	1	2	1	1	1	1	1	1	1	1	1	2
52d	When involved in a project: Are you asked about the tasks you are going to be doing in the day?	1	2	2	1	1	2	2	1	1	2	1	2	1	2	1	2	2	2	1	2	1	2	2	2	2	2	2	1	1	2	2	1	1	2
53	Are you encouraged by your supervisor to make mistakes and learn from them?	2	1	1	2	2	2	2	1	2	2	1	1	1	2	2	2	1	2	2	1	2	1	1	2	1	1	2	1		2	1	1	1	1
54	Are you encouraged to make your own decision for your tasks?	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
55	Do you make a risk assessment study when the task requires it?		1	2	2	1	2	1	1	1	1	2	1	2	1	1	1	1	1	2	1	1	2	1	2	1	2	1	2		1	1	2	1	2
56	Do you usually have a closing meeting with your teammates after a project ends to point out good and bad aspects of what was done?	2	1	1	2	2	2	1	1	2	2	2	1	2	1	2	1	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2
57	Do you usually provide a different approach if the customer wants to modify aspects of the project you are involved in?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
58	Do you use the standards of the industry as a ruling document when the customer requires a modification of a deliverable?	2	1	1	1	1	1	1	1	1	1		1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1			1	2	1	2
59	If the customer requires a modification of a deliverable that is in a grey area of the standard, you: ***(Select one)***	4	3	4	3	3	4	4	4	4	3	4	3	4	1	4	3	3	3	4	3	4	4	3	4	4	4	4	4	4		4	4	4	4