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**Application of Service Design for Business Intelligence
consulting services**

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Master Thesis

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Abstract

In the increasingly complex and digital business environment, organizations gather huge amounts of data in their business operations. With the goal of generating knowledge and insights from this data, companies have high demand for analytical systems that support fact-based decisions.

BI consultancy services play an important role in assisting organizations the design of systems that automate the extraction of knowledge and wisdom through data. However, the context in which this organizations operate mean that the focus is directed at the final product and not always at the service they provide. The project nature, high interaction with the customer and high level of customization may pose challenges for these companies, namely by limiting the replicability and knowledge transmission from project to project and ensuring the consistency of the service throughout all customer interactions.

This study makes use of Multilevel Service Design methods to improve the service of a BI consultancy company and address these issues. To this end, this study adopted the exploration and ideation stages of the service design process to enhance the BI consulting service.

Firstly, customer experience was explored in a qualitative study in which semi-structured interviews with existing customers were made and further systematized in a customer journey.

Secondly, the service systems and service encounters were redesigned through an iterative process by mapping the current situation and modelling the future improved service, while addressing the customer pains identified in the exploration phase. These models bridge the gap between the current service offering and the new improved service system and service encounter.

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List of abbreviations

- BI – Business Intelligence
- CEM – Customer Experience Modelling
- CEO – Chief Executive Officer
- CTO – Chief Technology Officer
- CIO – Chief Information Officer
- IT – Information Technologies
- KPI – Key Performance Indicators
- KRI – Key Result Indicators
- MSD – Multilevel Service Design
- MINDS - Management and INteraction Design for Service
- SD – Service design

Introduction

Context and Motivation

IT consulting businesses thrive on modern day knowledge driven economy and a bigger opening for corporations to outsource new solutions to specialists. Their success can be explained not only because of growing needs of IT services met with global shortage of IT professionals (Gartner, 2020), but also because of increasing number of technologies, IT systems complexity and importance to modern day business.

The same is true when considering a subset of the IT consulting business: Business Intelligence, an area that saw an increase in demand in the past few years partially due to the greater accessibility and awareness of commercial self-service BI and analytics tools, as well as the rise of machine learning use cases.

Many firms operate in this sector specializing in building and maintaining data driven solutions for clients, either by automating system integrations and reporting, mine knowledge from data or using data to predict events and prescribe actions.

These services often consist in providing their clients solutions to complex problems in the form of software development or customization. It is, therefore, a service that depends heavily on client's interaction and involvement during service delivery. Such systems can impact dozens to hundreds or thousands of users, so it is usually seen as a strategic action by the client and many stakeholders with multiple backgrounds are involved.

The unique combination of client, context and consultants in BI consulting services may lead to the isolation of the action to the scope of the project at hand and lack of a common service perspective, leading to over customization and low replicability of solutions to similar problems in other clients. This has negative implications into the reuse of the knowledge developed and of the solutions designed for each client and in the ability to reliably and efficiently scale-up these services.

In parallel, while scope of each action is well understood and managed in consulting, it is usually less common to see consulting businesses that prioritize the customer over the project, with lost opportunities in terms of the relationship with the customer.

In this context, service design, with its human-centred and systematized to the creation of new services (Patrício et al., 2018), can contribute to address these challenges. On one hand, its human-centred approach can help deepening the understanding of customer needs and involving customers in the co-designing the solution (Yu & Sangiorgi, 2018). These human-centered approaches pose an opportunity to re-evaluate the processes implemented and refocus the attention once again to the client and its many stakeholders, enabling a better experience to the customer and a seamless delivery of the service. On the other hand, the service design process, as well as its visualization tools can provide a useful contribution to materialise and communicate the service concept and processes (Diana et al., 2009), therefore helping solidify, retain and share the knowledge gained in each new BI consulting service creation process.

Project Background

This project took place in a consulting firm operating in Portugal since 2006, focused in providing business intelligence and data driven solutions. They offer services that range from tailor made business intelligence solutions, IT systems consulting, training and custom software development, such as web and mobile phone applications. The company has systematically grown in terms of its team, number of customers and projects, in great part due to their portfolio and word of mouth. With about 30 employees, the company is a relatively small player in the BI consulting business when compared to other consultancy companies operating in the region, however their portfolio is rich, containing hundreds of solutions in more than 50 clients, ranging from medium to large national and international organizations.

This company prides themselves of being technologically agnostic believing that the choice of technology should not take place before considering the client's needs and existing software. The consequence of this is that they now have many technologies in their portfolio. Their clients also very diversified operating both in services and industry sectors.

Consulting is a sector that employs a specialized workforce and thrive upon having previous experience to guide customers into a solution for their problem at hand. A key success factor is having a good knowledge management system in place so that the company can capitalize past projects' knowledge and drive new solutions for new problems. The project like nature of the services provided alongside the diversity of both their client base and technologies poses challenges to delivering a consistent experience for their customers.

This project was integrated in the BI department of the company, which is responsible for assessing, developing and delivering customized BI solutions for customers.

A BI solution comprises of several different parts that together function as a system that automates the gathering of data and transformations needed to transform data into insights and knowledge.

As shown in Figure 1, a typical BI System is comprised of four major components. The first one, data sources are enterprise sources such as internal systems, working documents and sensor data or external data such as public or partner data and social interactions with the organization. This data is processed by data pipelines, the second component. Data pipelines transform the original data by performing data wrangling and data cleansing operations. Data is then stored in a data repository, such as a data warehouse or data lake.

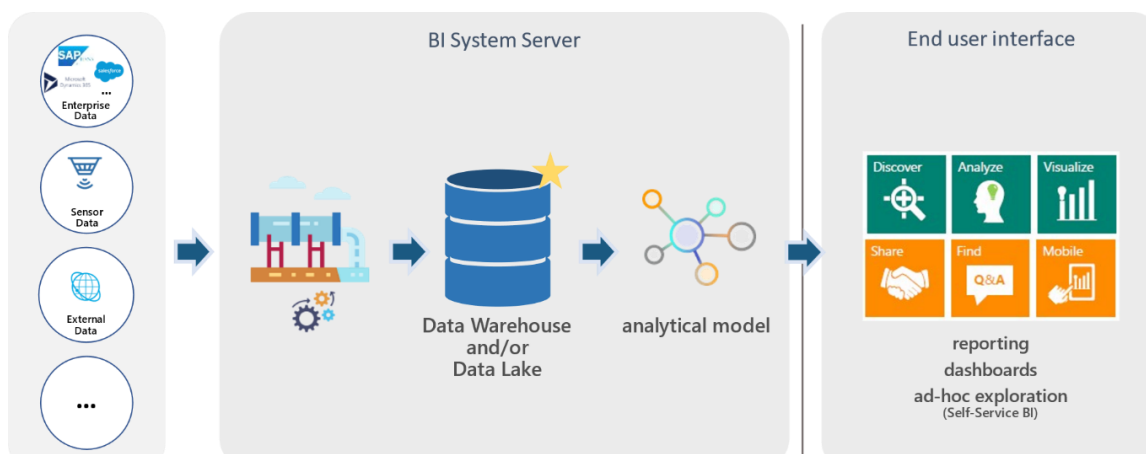


Figure 1 - BI system reference architecture

Users then access this information typically in a analytical data model where KPIs and KRIs are calculated either by using pre-built company reports or dashboards or by performing ad-hoc analysis using data exploration and visualization tools.

This team's services can range from assisting in the development of a whole BI solution encompassing all components, to focusing on the growth or improvement of one or more parts of existing systems to new analysis and data.

The development of such a system implies having a team with a varied skillset. An IT background and experience are required for the development and design of the data pipelines and central repository. Knowledge of source systems can help with the project by identifying where to get data and how to use the data supplied by such systems. Finally, understanding the client's industry, the client's internal processes and analytical needs facilitates the mutual understanding and enrich the final solution delivered.

Because no two customers have the same data sources, technology, internal business processes and data analysis requirements, each solution must be customized. This presents a challenge for the team because the project-like nature of the service and customization limits knowledge transfer, hardening the replication of the same solution across customers.

Furthermore, the scope of action is frequently limited, which might impede the team's capacity to focus on growing the relationship with the customer and scaling and improving past solutions beyond the boundaries of the original project.

The diversity of clients and projects and the extreme customization, without a systematized design of the consulting service process have made it difficult for the company to ensure the consistency of its consultancy service across projects and customers and for the knowledge gained in each project to be subsequently used.

Moreover, despite the high-level of customization, the team recognized the excessive focus on the project and the need for a longer-term management of the relationship with the customer across several projects. As such, a service design approach was proposed to address these challenges.

Research Questions

Given the challenges described above, this dissertation aims at strengthening the customer relationship focus and better reuse of the knowledge developed in BI consulting services through service design. This dissertation adopts a service design approach to reassess the BI consulting services with a human-centered perspective and redesign these consulting services to become more customer-centric and also replicable across projects, enabling the reuse and sharing of the knowledge gained in each project. As such, this dissertation has the following research questions:

- How can BI consulting services be designed in a way that balances the high-level of customization needed for each project and the consistency across different projects along the relationship with the customer?
- How can BI consulting services be designed in a way that systematizes both the knowledge gained from the customer and from the BI solutions developed, so they can provide insights for and be reused in other projects?

Structure of the report

This document is organized in the following chapters:

- Chapter 1 – Introduction: describes the context and motivation, the project background and research project questions;
- Chapter 2 – Theoretical framework: literature review of Business Intelligence services and Service Design;
- Chapter 3 – Methodology: explains the language, terminology and the methods and the type of analysis that will be used to interpret the data and information collected;
- Chapter 4 – Results: key results and findings;
- Chapter 5 – Conclusion.

Theoretical Framework

This section provides a brief overview of past literature related to the case in order to gain a better grasp of the subject. This chapter is divided into two main sections, the first one portraying the state of the art regarding Business Intelligence and BI services and the second one making an overview of Service Design and techniques used to consolidate and communicate the user experience and service design choices.

Business Intelligence

While the term Business Intelligence first appearance is attributed to Hans Peter Luhn (Luhn, 1958), it was popularized by Howard Dresner in 1989 as an umbrella definition for methods and concepts used for enhancing business decision making using fact-based decision support systems (Burstein & W. Holsapple, 2008). When BI was making the first steps, it was not very common to have fully digital business information, however with the emergence of new technologies, business digitalization and increased computing capabilities, the term has evolved to also include the technology and automation typically associated with BI systems.

The term BI is defined as the set of technologies, techniques, systems and applications that are used to analyse critical business data to assist an enterprise in better understanding its business and market and making timely business decisions. (Chen et al., 2012). BI helps drive improvements in the managerial processes of the organization namely by assisting the performance management, process improvement and optimization (Williams & Williams, 2007).

In the early days, BI was used exclusively for strategic planning and decision making, however, organizations have expanded into new business activities, integrating BI systems into more business areas, supporting tactical and operational decision making processes (Elbashir & Williams, 2007).

Not only is BI more ubiquitous in the organization, but also the goals and capabilities of the systems develop into ones that leverage the increasing amount of data, the increased computational processing capacity and breakthroughs in technologies such as advances in distributed computation and machine learning algorithms. As such, BI evolution can be divided into three distinct waves (Chen et al., 2012).

A first wave consists of more traditional descriptive analytics in which the focus is on measuring past enterprise data and present KPIs and KRIs to assess the business processes. Typically, this information is portrayed in reports or dashboards containing a business process analysis delivered to the decision maker.

A second wave of predictive analytics make use of quantitative techniques to predict the future using past data.

Prescriptive analytics marks the third wave of BI, in which the system suggests the optimal course of action to the decision maker using techniques such as optimization and Machine Learning.

These increasingly sophisticated systems are also ones that offer more competitive advantage for enterprises that invest in these systems (Davenport & Harris, 2017).

The creation of BI systems is, not only technologically challenging, but also require a team with a diverse skillset, namely one that has deep analytical skills and Business Knowledge and Communication Skills (Chiang et al., 2012).

Another challenge posed for companies wishing to expand their analytics through the use of BI systems is the global shortage of professionals (Dialani, 2021; Ramachandran & Watson, 2021).

This context is ideal for the proliferation of BI services, namely BI consulting services. Companies outsource BI services for a variety of purposes such as allowing their IT department to spend less time and effort analysing new technologies and solutions allowing them to focus more time on their own systems. They also do so because they perceive these services as hiring experts for system development, reducing both project risk and time (Landy & Mastrobattista, 2008).

By outsourcing the development of these systems to external consultants, companies can also leverage knowledge transfer of the consultants (Bessant & Rush, 1995; Liu & Zhao, 2009), who bring to the organization experience and knowledge in implementing BI systems and other industry practices, thus causing a positive externality of the hiring of these services.

Service Design

Service design is a human-centered, iterative approach to the creation of new services (Blomkvist et al., 2010).

Service design has a human-centered approach, focusing on understanding customer experiences through deep qualitative insights into customer journeys and individual needs, supporting the generation of service concepts that are inspired by the user's contextual and holistic experiences (Yu & Sangiorgi, 2018). Service design also offers a systematized approach and a set of tools to support the creation of new service offerings or the improvement of existing ones (Patrício & Fisk, 2013).

Service Design is a multidisciplinary field that integrates contributions from related areas such as marketing, operations, interaction design, through a holistic approach and making use of design thinking (Joly et al., 2019). Service design involves an iterative process of exploration, ideation and reflection (Stickdorn & Schneider, 2010).

The exploration phase involves the study of the customer experience.

Customer experience can be viewed as the internal and subjective response customers have to any contact (direct or indirect) with a company (Meyer & Schwager, 2007). Customer experience encompasses every aspect of a company's offering (Zomerdijk & Voss, 2010) and therefore understanding the customer experience in the exploration phase is a crucial step for creating new services (Patrício & Fisk, 2013).

Service design approaches involve deep-dive qualitative investigations into customer unique experiences, considering customer holistic experiences across the service and neighboring services (Yu & Sangiorgi, 2018). To this end, service design uses qualitative approaches such as interviews and observation (Patrício & Fisk, 2013).

The deep and rich insights gained through qualitative approaches can then be systematized for better communication and inspiration for the ideation phase. To this end, customer journeys can be used to visually represent the processual and experiential aspects of the service from the

customer point of view (Følstad & Kvale, 2018). These customer journeys can also be enriched with elements of Customer Experience Modelling (CEM), namely the activities, experience requirements, actors and artifacts with whom the customer interacts (Teixeira et al. 2012).

CEM makes use of several contributions such as Human Activity Modelling (HAM), Customer Experience Requirements (CER) and Multilevel Service Design. CEM is used in the early stages of the service design process through abstraction of complex realities, easing the transition for service designers in their task of designing service solutions (Teixeira et al., 2012).

As such, these approaches for understanding and systematizing the customer experience can provide valuable support to strengthen the customer-centricity of BI consulting services. However, their application to BI services has not been studied.

The ideation phase involves the generation of new or improved service concepts, architectures and blueprints that explore and define the service offering.

While, the exploration phase involves a deep understanding of customer aspirations, activities, contexts, artifacts used and people involved, designing new services requires envisioning and orchestrating new service concepts and system (Patrício & Fisk, 2013). The creative transition from understanding the customer experience to envisioning new service solutions is at the heart of service design and can be supported by the use of models for systematizing the customer experience and visualizing new service concepts and systems such as in the bridge model adapted to service design (Dubberly et al., 2008; Patrício & Fisk, 2013).

The bridge model is a design process that depicts the path from analysis to synthesis, in which the current situation (analysis) is represented through a model. This “model of what is” is used to generate new models of the recommended solution (synthesis). Since models are an abstraction and simplification of reality, using them facilitates communication of knowledge (Teixeira et al., 2012) in the exploration of possible hypothetical scenarios for the future (Dubberly et al., 2008).

To this end, a multilevel approach can support the integrated design of the service offering, zooming in and out of designing the service concept for the customer value constellation, designing the service system through the service system architecture and navigation and the detailed interaction at each touchpoint with the service experience blueprint (Patrício et al., 2011). Multilevel Service Design is a method that bridges the customer experience study and the future reality through the use of models at three distinct levels: service concept, service system and service encounter.

The service concept represents the benefits provided to the customer in the context of their broader experience as part of their customer value constellation (CVC). It portrays the positioning of the service regarding the CVC, which may include other service offerings from other firms (Patrício et al., 2011; Teixeira et al., 2017).

The service system defines how people, technologies and other resources interact to create value as part of the desired service concept. Service system architecture (SSA) is a visual representation of the customer activities and how they interact with the service interfaces and are supported by backoffice processes or technologies. Service system navigation (SSN) is a representation used to communicate how such activities are orchestrated (Patrício et al., 2011).

Lastly, the service encounter can be defined as the touchpoints or interactions between the service and the customer through physical or other interfaces. To design the service encounter, one needs to define the interactions, processes triggered by those interactions and the role of each participant. To this end a service experience blueprint depicts a detailed representation of the interactions and actions taken place by the participants on frontstage and backstage (Patrício et al., 2011).

This multilevel approach has been further evolved to design technology enabled services through the MINDS method (Teixeira et al., 2017). The MINDS method is an interdisciplinary service design method that combines the management and interaction design perspectives to leverage “the role of technology, fuel service innovation and enhance customer experience” (Teixeira et al., 2017). MINDS builds upon the three levels of MSD: designing the service concept, service system and service encounter.

In addition to the usage of MSD tools MINDS makes use of affinity diagrams as tools to represent the service concept, enhances the SSN with storyboards to communicate the intended user experience and wireframes and other interaction design models to represent the service encounter for technology enabled services (Teixeira et al., 2017).

Table 1 summarizes the three levels of the design process of the service offering both in MDS and MINDS and the tools used to map and represent the abstraction models of the current and future service.

Table 1 - comparison between MSD and MINDS tools to map the multiple service levels

	Level	MSD	MINDS
Service concept	Map benefits the firm offers to the broad value constellation experience	CVC	CVC, affinity diagrams
Service system	Define the customer activities, technologies, frontstage and backstage processes to deliver value to the CVC	SSA, SSN	SSN, Storyboards
Service encounter	Detail the touchpoints with the service and the dependencies between the service frontstage and backstage	SEB	SEB, interaction sketches

Both MSD, MINDS are methods containing representations that enable a detailed visualization of what will be offered to the customer (value proposition in the customer value constellation), how the service system and respective processes will be designed to support the value proposition (SSA and SSN) and a detailed view of the different interactions through the service blueprint. These models can enable visualization and detailed understanding of the existing BI service offered (AS IS), identifying the roots for the customer pain points by relating the SSA and SSN with the customer journey. This analysis, together with the insights gained from the understanding of the customer experience, can support the generation and visualization of new service concepts architectures and encounters to enhance the customer experience. Supporting the ideation stage with these models also enables to systematize, materialize and retain the information gained about the consulting service process and the developed solutions for each project, in a way that can be reused in future projects.

Service design can therefore help addressing the challenges faced BI consulting firms, by consolidating the focus on the long-term relationship with the customer, as well as by systematizing and materializing the intangible service processes and outcomes of the BI consulting business. However, the application of service design methods for the creation and improvement of BI consulting services still needs further work.

Methodology

This study aimed at using service design methods and tools for improving the BI consulting services, so that they can be more centred on the long-term relationship with the customer and the process can be systematized in a way that enables retention and reuse of the knowledge gained in each project. Considering these research objectives, this dissertation used a service design approach, focusing on the exploration and ideation phases.

Exploration: Qualitative study with BI consulting customers

The exploration phase involved the study of the customer experience with BI consulting services, using a qualitative approach. Considering the holistic nature of service design and customer experience, this approach allows for deeper understanding of the factors underlying the customer experience and value cocreation through the service. Qualitative approaches are considered adequate to gather a rich set of data that goes beneath the surface of subjective life (Charmaz, 2006).

Following a qualitative approach, a total of eight interviews with BI consulting customers were made with the goal of understanding the activities and touchpoints along the customer journey, as well as customer perceptions on the positive aspects and main pains with the service provided.

The sample was designed to cover a diverse set of customers in terms of different projects, profiles, roles, industry sectors and relationship length with the company, to provide a better understanding of the customer's pains and needs. A breakdown by company role, size, industry sector and relationship time can be found in Table 2.

Table 2 – Interviewed customers' characteristics

Interview	Company role	Has been a customer for:	Company Size	Industry sector
A	Administrator	1- 2 Years	]1;50] employees	Non-profit education
B	IT team leader	5 - 6 Years	> 1000 employees	Consumer retail
C	Project manager	5 - 6 Years	]250;1000] employees	Pharmaceutical
D	CEO	2 - 4 Years	]50;250] employees	Wholesale distribution
E	Accounting / controller	3 - 4 Years	]250;1000] employees	Automotive
F	CIO	< 1 Year	]250;1000] employees	Transformation industry
G	Project Manager	2 - 4 Years	> 1000 employees	Financial services
H	CTO	3 - 4 Years	]250;1000] employees	Automotive

The interviewees played distinct roles in the service and interacted differently in the projects developed. While some interviewees acted as key users, the primary beneficiaries of the BI system, others acted as project sponsors, someone who is not a primary user of the solution being developed but acts as a sponsor, recognizing the importance of the system and proposing the project to other internal stakeholders such as the administration and shareholders. Table 3 shows the breakdown by project roles and reveals that some interviewees have played both roles in previous/current projects.

Table 3 – Breakdown of interviewed customer roles in projects

Role in project	Nr. Interviewees
Project sponsor	6
Key user	5
Total	8

Data collection involved semi-structured interviews, with an interview protocol covering client organizational activities and needs when hiring BI consulting services; evaluation of the BI consulting service including positive aspects and pain points and suggestions for improvements (see Appendix A for the interview protocol).

The interviews were conducted via video call and recorded for analysis taking an average of 43 minutes and totalling 5 hours and 51 minutes. The video was parsed into audio files and literally transcribed using Google Cloud Platform’s machine learning assisted speech-to-text API calls, followed by a manual analysis to ensure accuracy and completeness. Appendix B contains the script used to call the Google Cloud Platform speech to text API.

The transcript and video were imported and analysed with the support of NVivo, which enabled the categorization of the needs, activities and touchpoints with the service, as well as the respective pains and gains.

The interviews were coded in two steps: first, by adding first-level codes identifying the customer's pains and values, as well as service touchpoints and gaps and second, by categorizing similar codes into higher level categories to generate knowledge.

These results were then systematized through a customer journey mapping to visualize the journey of the BI consulting customer, adapting customer journey mapping (Følstad & Kvale, 2018) and Customer Experience Modelling tools (Følstad & Kvale, 2018; Teixeira et al., 2012) to visualize customer activities, touchpoints with the services and most important pain points.

Ideation: Redesigning the BI consulting service

The second stage of the study involved the redesign of the BI consulting service through the use of service design methods and tools particularly MSD (Patrício et al., 2011) and MINDS (Teixeira et al., 2017).

Because the goal is to improve the existing service and not to re-equate the service concept, only two levels of the MSD will be designed - the service system and service encounter.

To this end, first the representation of the current situation was modelled in a service system architecture to understand the activities, frontstage and backstage actors and systems across the different touchpoints with the service. The interactions with the customer and frontstage and backstage were further explored in the service system navigation.

These AS IS models, together with the insights from the study of the customer experience and the customer experience journey enabled the generation of new TO BE ideas to improve the service and addressed the customer pains.

As part of an iterative process, new SSA and SSN models were designed. A detailed look into the most critical touchpoints was also done by modelling the service experience blueprint of the new activities of the service (Bitner et al., 2008).

Throughout the project, periodic meetings were held with the administration to retrieve feedback on new ideas and generate new suggestions for improvement.

After having modelled the current reality and the proposed TO BE improved BI consulting service, the results were individually presented to 2 key internal stakeholders of the company (CEO and project manager). Based on this feedback, the service models were further revised and improved.

Results

This section contains the findings of the study conducted to redesign the company's BI consulting services. It is divided into two sections that correspond to the service design process's exploration and ideation phases.

Exploration: understanding the Customer Experience with BI consulting services

4.1.1 Results of the qualitative study with customers

To enable the extraction of knowledge from the semi-structured interviews, a first level coding process began by identifying several categories such as customer perception, pains, positive aspects of the service and touchpoints. These were then grouped into higher level codes that enabled the better understanding of the customer aspirations, pains and experience throughout the service.

Table 4 summarizes the higher-level coding for the customer's perceptions throughout the service experience (see Appendix C for a list of all codes). As shown, most of the feedback is positive (55 percent of references, 8/8 customers) or very positive (31 percent of the references, 5/8 customers).

Table 4 - Interview coding - Customer perception regarding the services provided

	Interviews	References
Very positive	5	24
Project impact in the organization	3	3
Team characteristics	2	2
Overall experience	2	2
Exceeded expectation	2	2
Team interaction	1	5
Positive	8	46
Team interaction	6	25
Team characteristics	3	7
BI System characteristics	3	5
Negative	3	9
Team interaction	2	2
Project goals	2	3
Interaction with other partners	1	1
BI System characteristics	1	1
Very negative	1	2
Team interaction	1	1
Expectations were not met	1	1

Most of the positive and very positive perceptions are related with the team of consultants. This is shown by the number of references to the consultants' characteristics, namely for their technical and business knowledge and adaptability and the consultants' interactions with the customer such as communication, availability and knowledge sharing.

A total of six customers praised the solution developed and organizational impact, diverse aspects such as the quality of the solution found, quality of life improvements and positive impact in the customer's internal processes.

The negative perception relates to situations in which the service fell short of expectations. Table 5 shows the number of mentions in each interview related to the perception of the customer throughout the service.

Table 5 - Customer perception by interview

Interviwee	Very negative	Negative	Positive	Very positive
A		33%	33%	33%
B			60%	40%
C	40%	40%	20%	
D		21%	50%	29%
E			100%	
F			100%	
G			73%	27%
H			50%	50%
Total	3%	11%	55%	31%

Unlike the positive perceptions, negative perceptions tend to be customer specific.

Customer C has the least positive perception of the service. This customer had an experience in which both the project deadlines and goals were not met. Also, the customer feels that knowledge about the customer and the solution developed was too heavily dependent on the consultant developing the solution. This meant that when the consultant was unavailable the customer was left out with no support. Positive aspects pointed by this customer relate to characteristics of the consultant dealing with the project.

“... [the project] took far more time to develop than expected while not fulfilling the expected requirements...”

“I feel that sometimes knowledge belonged to a single person. If that person went on vacation, became unavailable or exited the company then I would have had a problem.”

- Customer “C”

Other negative perceptions relate to excessive usage of technical terms, damaging communication, the solution's interface and the fact that training and post deployment support was limited, making the customer feel abandoned.

Table 6, contains a summary of the codes portraying the customer gains. It is clear that the most positive impacting moments in the customer experience are related to the development and post deployment phases.

During the development phase, half of the customers value the development in shorter cycles, meaning that they wish to see results quicker.

“... those ‘beta’ versions allow us to understand and visualize how the end result would be.”
– Customer “G”

This desire relates to other customer needs such as transparency, having task tracking system and the physical presence of the consultant in the customer premisses, as they all inspire thrust in the team and show progress of the developments throughout the development process.

Other aspects valued by the customer is knowledge sharing regarding the BI solution and methods used to develop the system and the availability and proximity of consultants, namely by assisting in supporting the BI solution.

At the first glance, this contrasts with the desire of autonomy after the project implementation (to extend the solution to new analysis and to maintain the solution without need for intervention), however this desire for autonomy in the evolution of the service does not mean that the customer wants to be fully autonomous and therefore requires assistance for certain subjects.

Table 6 – Interview coding - Customer Gains

	Interviews	References	Touchpoint phase
Short development cycles	4	5	Development
Knowledge sharing	4	5	Post deployment
Autonomy to build new analysis	3	4	Post deployment
Availability and proximity of consultants	3	3	Development; Post deployment
Expertise and knowledge from consultants	3	3	Development
Physical presence of consultants	2	2	Development
Autonomy in the maintenance of the BI solution	2	2	Post deployment
Informal communication	2	2	All
Support and availability to improve the system	2	2	Post deployment
Task Tracking System	1	2	Development
Transparency and honesty	1	1	All
Periodic progress meetings	1	1	Development
Initiative in suggesting improvements	1	1	Post deployment
Flexibility to accommodate scope changes	1	1	Development
Well tested, bug free software	1	1	Project Validation

The customer needs and pains that were listed in Table 7. Some pains are common to several customers interviewed and some are intensely felt.

The most referenced pain is not having a place to follow up on tasks being done, the time being spent and knowing which pending actions are blocking the development. This correlates to another pain, not being aware of the evolution of the developments.

Other pain mentioned in half the interviews regards the amount of information key users need to provide during the analysis phase. Regarding this pain, some customers mentioned the need for changing scope during developments and their inability to know the full requirement list at the beginning of the project. Further insight can be found if this pain is linked with the previously mentioned need for shorter development cycles (see table Table 6).

Another pain relates to the evolution of the BI system and how the system is maintained. Regarding this issue, in the current service setting, customers need to take initiative to make corrective and evolutive changes in the system.

This means that, not only the customer needs to be aware of other business areas and analysis in which the BI solution could expand, but also the possible system evolutions from a technical point of view. Furthermore, asking for corrections or changes mean that the gap between the current needs and system capabilities must be sufficiently felt for the customer to require the intervention, making the customer frustrated if the need is not strong enough to initiate the process (and, therefore, never solved) or the need is so strong that requires immediate attention.

“Instead of acting by customer request, the company should suggest improvements to the system (...) by using their expertise in other projects with other customers. (...) This way, we would not be reacting to fix issues (...). Furthermore, [the company] should propose improvements where they have more know how than us (...) [to] broaden our horizons and make more complex interventions that will bring more efficiency and results”
- Customer “H”

This pain relates to others mentioned such as the need for having someone dedicated following up on them and the need for better support after the project is completed.

Customers mention that onboarding new users in their organization to the BI system is usually a pain, mostly because they are unassisted during this phase.

“(...) training [on the system] was done, (...) but there should be a follow up the week after in which [new users] get asked if they are using the system, if they have difficulties (...) and then the following week do this again which is the work that I did [when the system was deployed]”
- Customer “D”

Other mentions are related to communication being too technical, the total project time and effort during the testing phase, the consistency of teams throughout the projects and other customer-specific pains.

Table 7 - Interview coding - Customer pains and needs

	Interviews	References	Touchpoint phase
Not having a place to manage and track tasks and change requests	6	16	Development; Post Deployment
Having to take the initiative to evolve the system (Company should proactively propose improvements)	4	11	Post Deployment
Knowing every detail at the beginning of the project is hard and time consuming	4	4	Initiation & Analysis
Taking too much time until results are available for testing	3	4	Development
Inciting user adoption without assistance	2	10	Deployment
Not always being aware of the evolution of developments	2	4	Development; Post Deployment
Need better support after project	2	2	Post Deployment
Not knowing with whom they should discuss new initiatives (Should have an account manager)	2	5	Post Deployment
Not understanding technical terms and jargon used by consultants	2	3	All
Not having the same team of consultants throughout projects	2	3	Development
Total project time was too long	2	4	All
Testing is too time consuming	2	2	Project Validation
Not enough deliveries before final product	1	4	Development
Need better design and user interface	1	2	Development
Not delivering a project closing document containing lessons learned	1	2	Post Deployment
Having to deal with ticketing systems	1	1	Development; Post Deployment
Cost of the services	1	1	All
Better project management and communication	1	1	Development
Not involving end user (other stakeholders) in the development process	1	1	Development

4.1.2 Systematization of results of the study of the customer experience

The interviews results were systematized in a customer journey. This customer Journey represents the experience and touchpoints of a customer who is considered the key user in the customer's organization and functions as a pivot between the company and the customer organization (Følstad & Kvale, 2018). This customer journey was enriched with the activities performed by the customer as used by CEM (Teixeira et al., 2012).

Figure 2 contains the customer journey of the key user, consisting of 5 distinct phases: initiation & analysis, project development, project validation, solution deployment and post deployment.

During the initiation and analysis phase, customer requirements for the BI system are gathered and compiled. During this phase the key user is very involved and actively participates in codesigning the solution. The first contact is in the kick-off, when the project is presented and timelines explored. During the workshops both functional and technical requirements are gathered and compiled into a document. Because of the nature of BI systems, some systems may have hundreds of final users and involve other stakeholders from different areas and as such, the key user functions as a proxy for those stakeholder's needs, causing pain for this key user. As mentioned, customers feel they do not have enough information or have difficulties providing all the information required to clearly define the scope of the project during this phase. The document describing the scope of the project, technical and functional requirements of the system is then reviewed and approved by the customer.

During the project development phase, the key user plays a passive role and, as such, the main pain is not having deliverables for some time while the infrastructure is being set up and data pipelines are being built. During development, progress meetings are held to give visibility of the project's progress and feedback on intermediate versions is collected to address new needs that may have risen, but long development cycles and are still referenced as something to improve in the service.

After development is complete, the key user performs tests in the solution. This is typically a phase very demanding of the user time and effort and an intensely felt pain referenced by some customers.

After this phase, the BI system is ready for deployment. The key user receives training on the solution and starts using the system to perform the tasks for which it was designed. This is the first time the user is fully taking advantage of the solution. Here onwards the key user also acts as a pivot between other stakeholders inside the customer's organization and the company providing the service. Because of this, the key user is typically the main driver of new users into the BI system and he acts as a product owner, dealing with change requests and system evolution. Typically, he is the one that presents the BI system to other internal stakeholders through roadshows or other presentation methods depending on the organization's size and culture. During this activity the customer feels unsupported and takes on a lot of effort to introduce the system to other users.

From this point onwards, other internal stakeholders start using the system. It is at this stage that new needs arise and previously undetected bugs may appear. The key user transmits these requests and follows up on them. These actions constitute the post deployment phase. During this phase the main pains consist of not having visibility of the developments in an autonomous way and having to take initiative in dealing with system evolution, namely not knowing which changes should be implemented to incorporate new analysis or technologies to take full advantage of the system.

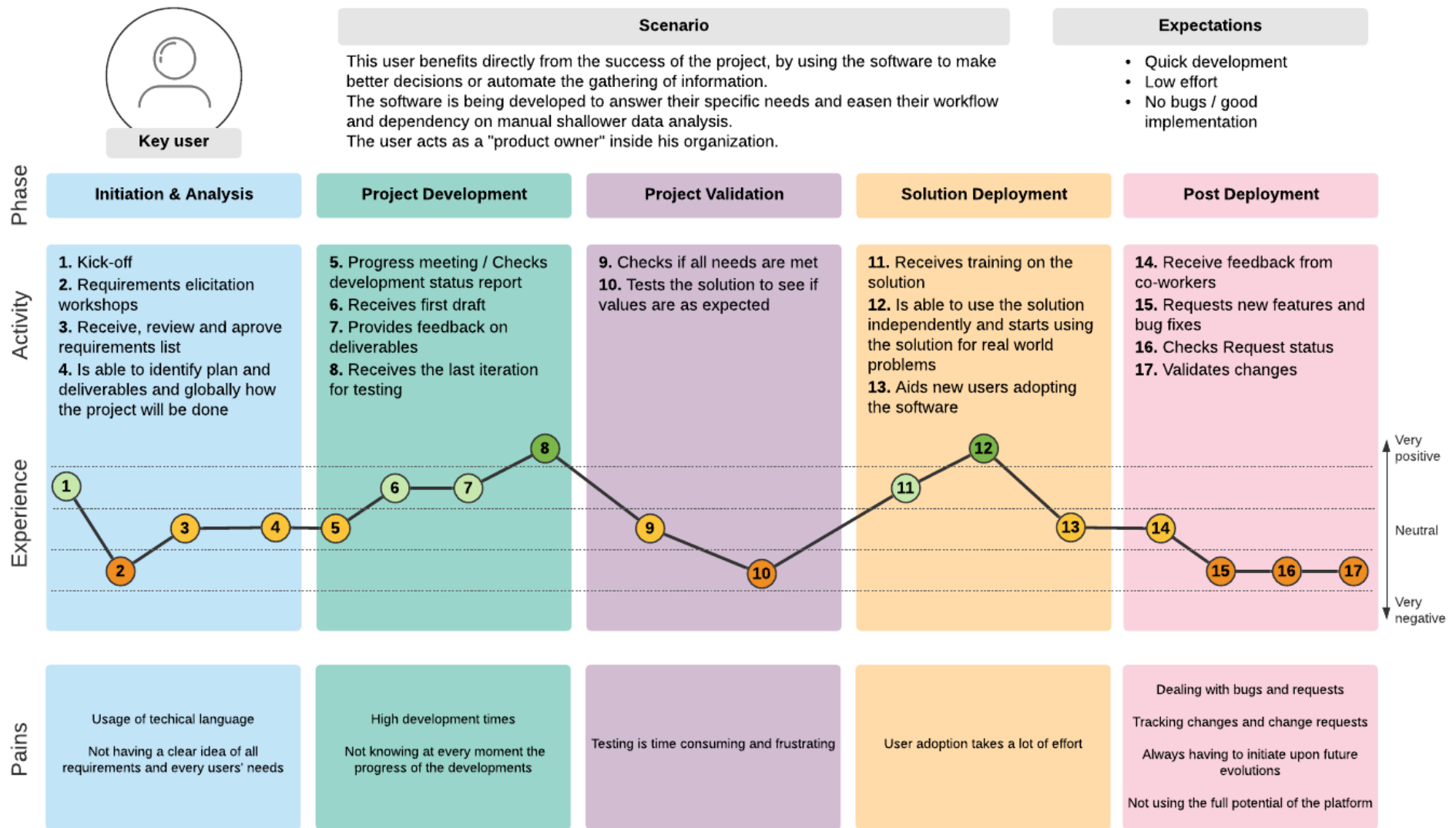


Figure 2 - Customer Journey Map

Ideation: Generating new concepts for BI services

The exploration phase has given insights over the customer experience throughout the service that will be used in the creative process to generate new service systems and service encounters. The focus on these two of the levels of MSD is justified because the goal of this project is to enhance the service offering and not redefine the service concept.

4.2.1 Service System design

To design the service system, both SSA and SSN were used to depict the current reality of the service and explored to build alternate SSA and SSN representing the improved future service system.

Even though the development phase is the one of the most referenced throughout the interviews, it is also one when most positive feedback was gathered. The pains not currently being addressed in this phase can be fixed by adapting the software development process, for which there are many methods in current literature that focus on minimizing those problems.

This contrasts with the solution deployment and post deployment phases, in which the experience is quite positive in the first activities, but quickly degrades over time. This is especially concerning because these are the final phases of the customer journey. Therefore, there is a greater potential and impact for redesigning these phases and addressing and thus improving the customer experience. For this reason, the focus of the new service systems and service encounter for BI consulting services is targeted at the final two phases of the customer journey.

The SSA (see Figure 3) was designed considering that the service operates in a context where multiple stakeholders exist on the customer organization. The focus of this SSA is the key user, however, the existence of other internal stakeholders is relevant for this customer because of his action as a pivot between the service and their organization's stakeholders.

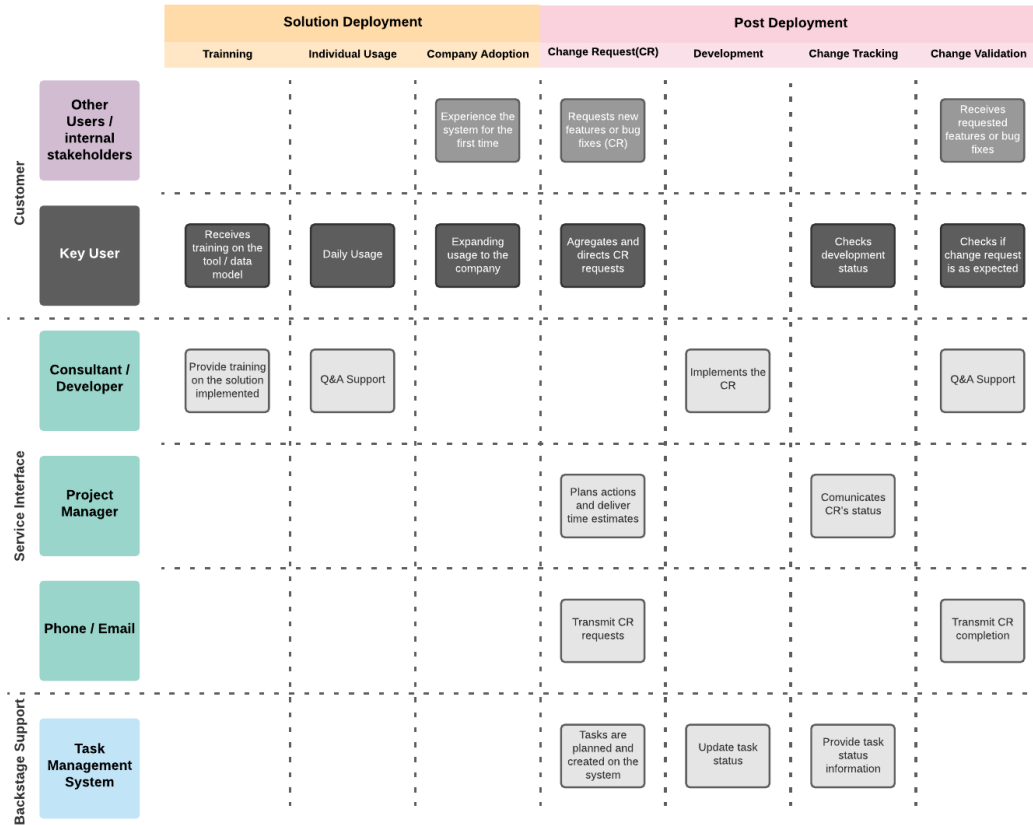


Figure 3 - Service System Architecture AS-IS

The service interface also distinguishes the roles of consultant/developer and project manager. Due to the nature of some actions developed it not uncommon that some projects have one person playing both roles in the service delivery.

The orchestration of service actions and tasks, interactions between the customer and the service through the service interfaces and backstage supporting processes are modelled in SSN AS-IS (see Figure 4).

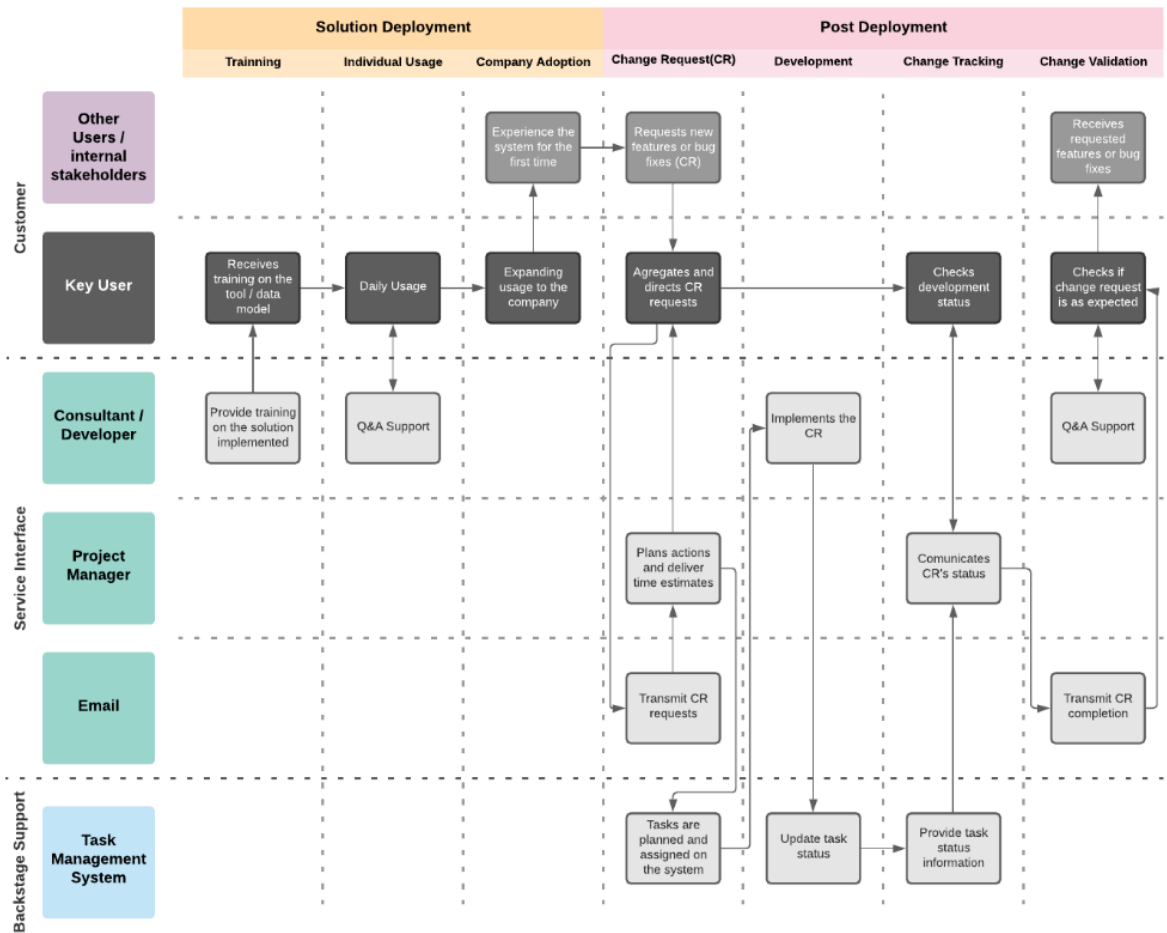


Figure 4 - Service System Navigation AS-IS

By mapping the current service to SSA and SSN it becomes clear that some pains identified in the exploration phase are not being dealt with and thus there is room for improving the service.

To begin, the customer has activities in which he is unsupported by the service. This corresponds with a pain identified during the exploration phase regarding difficulties with the system adoption to other stakeholders. In this activity the key user is completely independent in driving new users into the system. By allowing the customer to act in isolation, the customer not only has an increased effort in doing this activity, but also the company providing the service lacks control of this key aspect that directly contributes to the success of the service.

In addition, there is no service interface in which the customer can independently track the development progress. This was a pain that customers referenced frequently. While there is a task management system used by the team, this is a backstage support system and thus, below the visibility line of the service. In the current setting, the customer is reliant on the project manager for status updates, waiting for progress reports or meetings and all requests are routed via email or phone calls, resulting in a lack of desired trackability.

Another step in which the service falls short is in the passive nature of waiting for requests to deliver changes. Several customers had referenced that there should be more initiative to propose improvements in the BI systems implemented. By not overseeing the system, changing business needs that would require change can either lead to user abandonment or to the creation of change requests to increase system functionality that are born from internal pressure and a sufficiently strong gap between system functionality and user needs.

Finally, another aspect that is currently being glossed over is how to manage knowledge inside the consulting firm. This item was first identified in internal project meetings. Having good knowledge management in place has deep impacts in the consistency, replicability and velocity of future interactions with the customer.

By not having tasks to retain knowledge to the organization the service is heavily reliant on the consultant as an individual. Consequently, if a new consultant starts working with a new customer, no prior knowledge exists but their own past experiences and, if a consultant leaves the company, knowledge regarding the customer, the business, systems and processes is lost. By designing a phase in which this knowledge is retained, the service can grant better consistency and quick start the integration of new consultants in existing customers. Furthermore, the inclusion of an activity to store and disseminate knowledge will transfer knowledge from one project to another, enhancing both the technical solutions and the overall experience for the customer.

These findings are the building blocks for the proposed expansion of the service through the inclusion of a new service interface, a new backstage system, new activities and tasks. The new service system architecture is illustrated in Figure 5, with the new tasks, activity and systems highlighted in shades of red.

At the beginning of the solution deployment a new activity “project closure” was added. This activity represents the capture project information to generate knowledge regarding the customer and the solution developed. This knowledge is stored in a new backstage system – a customer knowledge base. To this end, project specific documentation is gathered, such as systems administration manuals, business concepts and a closure document portraying lessons learned.

Another change is the inclusion of a new service interface: the customer portal. This portal acts as a gateway for the customer for autonomous discovery of information stored in the knowledge base and task management systems, giving the customer visibility over the current actions taking place, pending actions, blockers and effort and also the system documentation and other documents produced during the service delivery. This portal should also allow for the submission of change requests so that customers have a new way of addressing new requests if they wish to do so.

More tasks were added to assist the company adoption activity. This way, the customer is more supported addressing the pains the customers had with the task of expanding the user base to other internal stakeholders.

A new step was also included in which a systematic review of the BI solution is performed and a follow up session is scheduled to suggest improvements. By scheduling follow up sessions or triggering these sessions by event driven metrics such as decrease in utilization or slower performance, the company can act preventively by avoiding system degradation. The company can also proactively propose solutions to new problems that may have arisen, drawing on the knowledge of the consultants in the solution, the business and transferring knowledge from other customers to suggest new applications and features of the BI system.

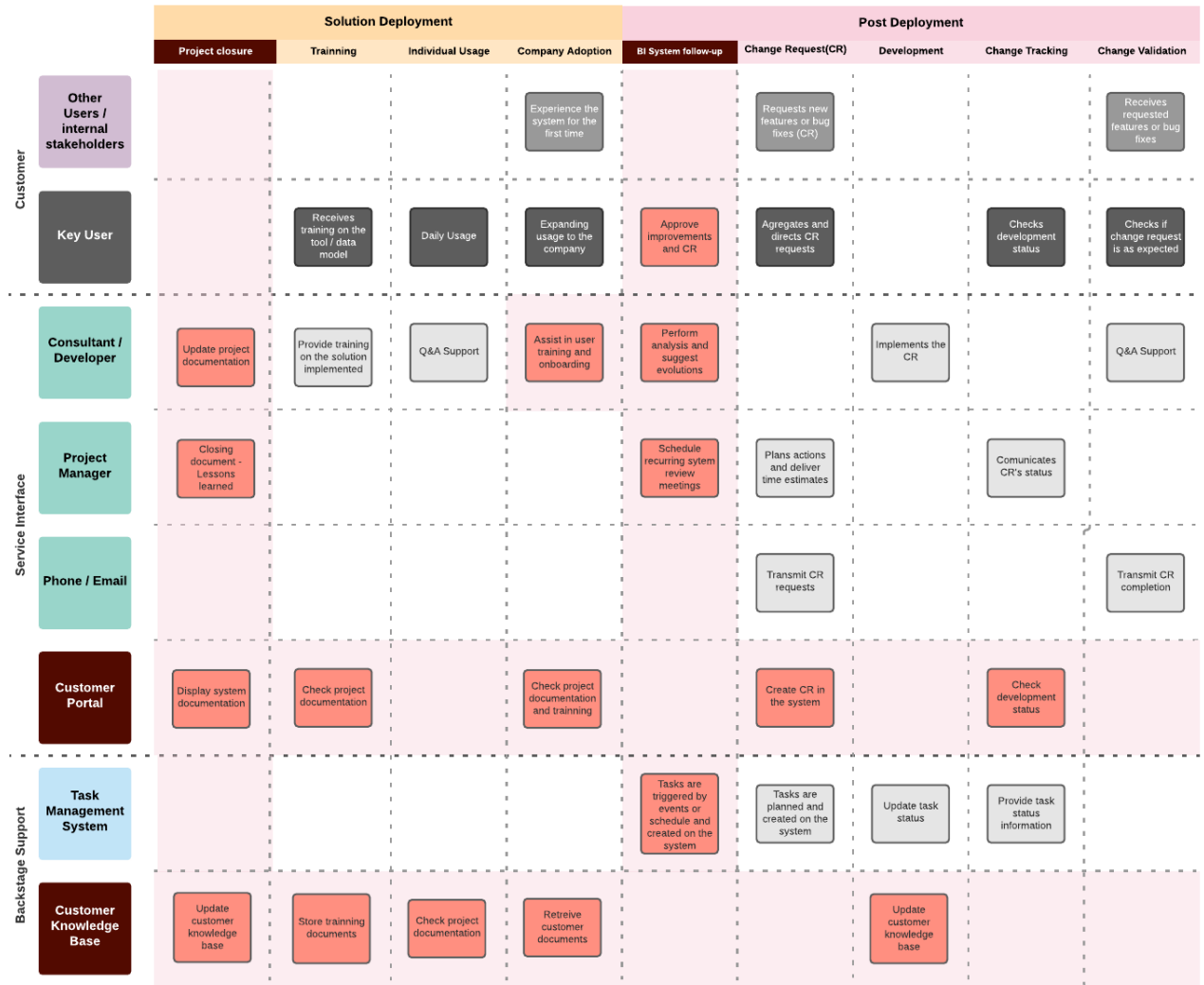


Figure 5 - Service System Architecture TO-BE

This step contrasts with the current experience the key user has in which every change or evolution of the system is proposed by him as a change request. This means that the customer must feel enough internal pressure from changing needs to request changes and has to be able to identify the system potential and gaps to expand the solution to other capabilities. By taking the initiative, the company is easing the identification of new needs, establishing a connection with the customer and ensuring the full potential of the system is being used, enhancing the value of the service for the customer.

Considering the new activities, tasks and systems, Figure 6 represents the redesigned service system navigation that systematizes the proposed orchestration of the service system.

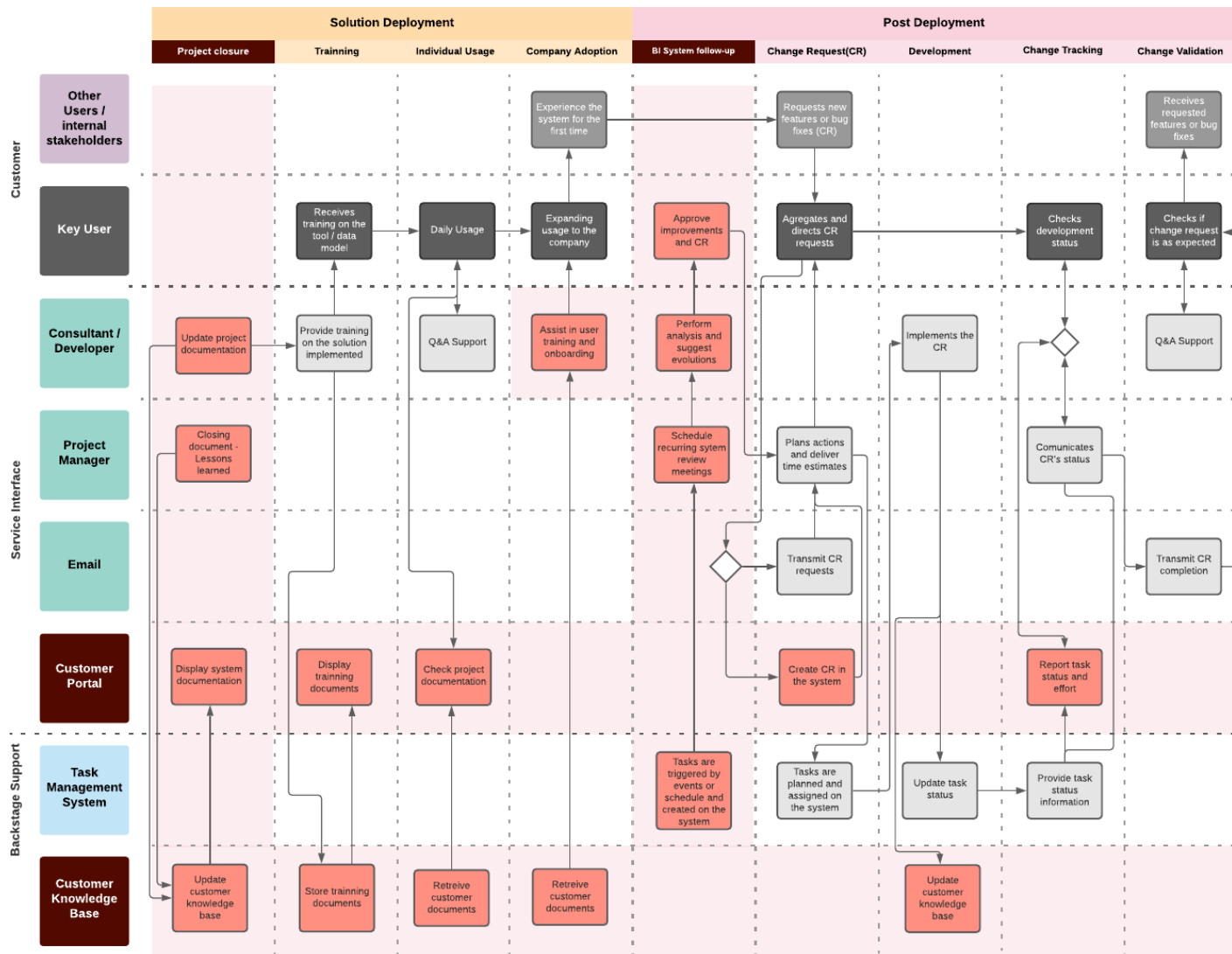


Figure 6 - Service System Navigation TO-BE

4.2.2 Service Encounter design

Considering the new activities and systems proposed in the SSA and SSN, a detailed Service Experience Blueprint for the BI system follow up and part of the change request activities was drawn (see Figure 7.). This model allows for a more detailed definition of the customer interactions with the service. The SEB also clarifies the flow of service tasks, the existence of dependencies between frontstage and backstage systems and actors, as well as the corresponding failure points and waiting points.

This SEB is triggered by the task management system, by checking if either the date corresponds to a scheduled system revision or by an event in the customer's system. These events may be, for example, slower system performance, consecutive data pipelines failures, reduction of user utilization, or low disk space.

When triggered, an internal review process of the system is done by the consultant and project manager and an analysis containing the issues found and possible solutions are presented to the customer. These findings are stored in the knowledge base for future reference.

The customer makes the decision of whether to make the changes suggested by the team. If they choose to do so, they approve the changes and requests a budget, triggering internal tasks needed to address the customer request.

The budget is sent to the customer for approval. Presuming the customer approves the budget, a new development is made and the status is constantly updated and displayed on the customer portal.

The customer may end the process if they reject the suggestions or the budget presented.

During the development of the proposed changes to the BI system, the user is autonomous to check the status of the developments without the need of human interaction if they wish to do so.

When developments of the new features are complete, the user is updated of the status change and can verify if everything is working as expected.

A final stage consists of formally closing the process by ensuring that new information regarding the changes implemented in the system is uploaded in the customer knowledge base and that all tasks were performed as expected.

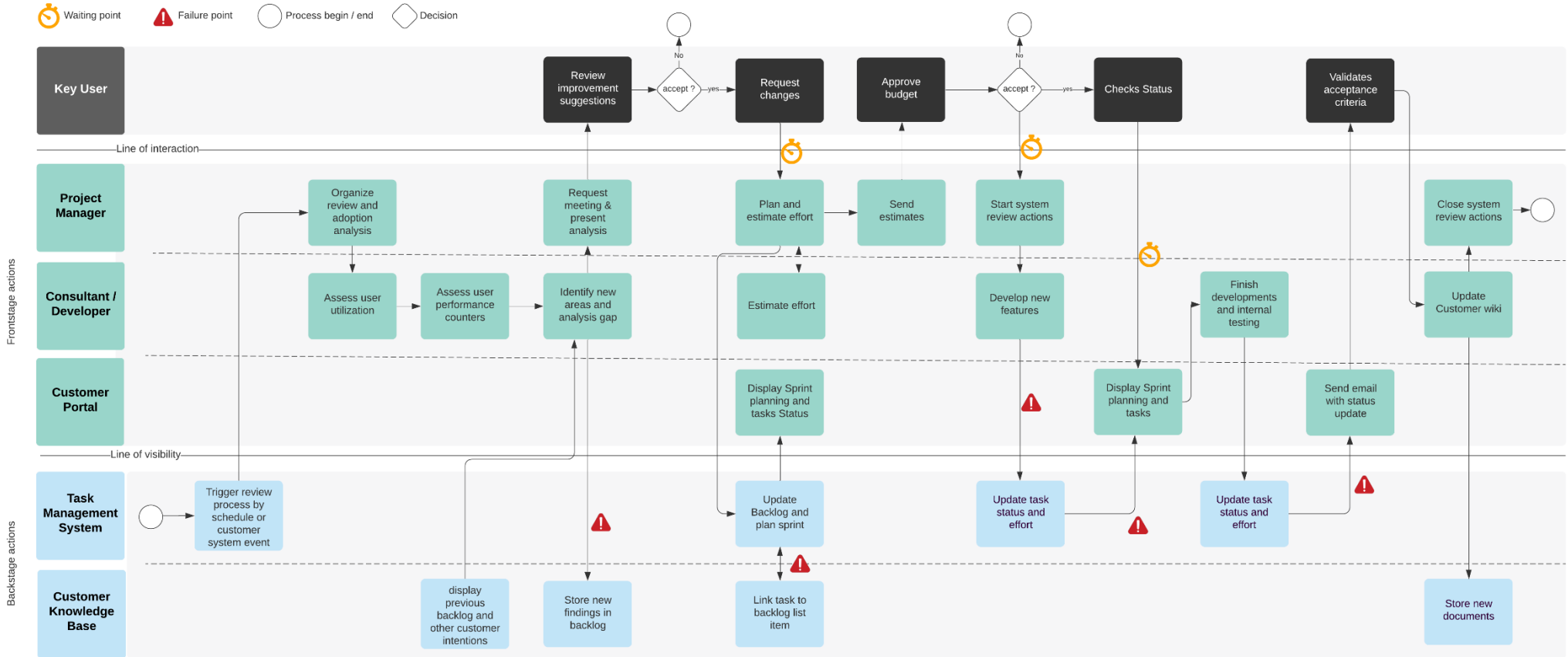


Figure 7 - Service Experience Blueprint for BI system follow-up

These models are the result of an iterative process in which the AS IS and TO BE models of the BI consulting service were individually presented to the company CEO and project manager and reviewed to further improve the service.

The feedback was positive, having both acknowledged the customer pains identified and recognized the gaps in the service that allow for their existence. One valued aspect was the proposed activity to keep proactively following up on the customer after the project delivery.

Other ideas such as the existence of a new service interface (customer portal) were deepened to increase functionality.

“The idea of a customer portal is something we have thought of in the past, however we couldn’t justify building up and maintain such a system only to serve as a ticketing platform, because not many customers are willing to use such a feature and the human contact will prevail in being a more direct route to make requests”

- CEO

While other methods to disseminate knowledge exist in the organization, such as periodic sharing sessions, the inclusion of a knowledge repository is something that came from the iterations on these sessions. This and other use cases for the customer portal helped increase the value for the customer and the viability of this interface for the company.

Conclusion

With the increasing amount of data generated by the digitalization of our society, companies have increasing demand for data driven decisions. The democratization of BI mean that the existence of these systems is not exclusive to high executives making strategic decisions. BI encompasses a great range of people and systems that function in a coordinated way to deliver insights to every decision maker in the organization.

The challenge of building these systems is well understood by organizations because, not only they require specific technologies and processes, but also people with the right skillset and business knowledge. For this reason, many companies opt to hire professional services to assist them in the implementation of BI in their organizations.

BI consultancies face an even bigger challenge. They must not only deal with the same issues as their consumers, but they must also deliver a service with a positive customer experience. Because of the numerous aspects that BI consulting businesses must be attentive of, as well as the project-like nature of their interactions with customers, it is easy to focus just on the solutions that are being created at the time while ignoring the service that they are delivering.

Service design addresses these issues by recentring the attention on the customer. By designing the BI consulting service, through these methods, a conscious decision of the is being made in which the customer plays the central role.

The redesign of the service in the BI consultancy company at study was done considering that the service needed to overcome the challenges posed to this sector, namely the ones concerning the need to ensure consistency of a tailor-made service across different interactions with the customer and the knowledge transfer across different projects.

These issues were addressed by designing a new service offering in a way that is replicable and consistent, while considering the existence of activities that aim to support the knowledge management inside the organization.

To this end, as part of the exploration phase of the service design, semi-structure interviews have provided insight regarding the customer experience, pains and the touchpoints with the service. These results were systematized in a customer journey map making use of the activity concept from CEM.

The service was then modelled using MSD and MINDs methods and tools, namely by using SSA, SSN and SEB models to bridge the gap between current reality and future service. These models were reiterated internally to further improve their response to the identified gaps, addressing the main customer pains and the challenges of BI consulting services.

By addressing these challenges with service design methods, the subject company begins the journey to provide an improved service offering, delivering a more consistent service while addressing their customers' pains.

Following up on this redesign process, further steps should be made to prototype and implement the designs described in this document.

The same design process can also be replicated to other business areas of the company and further enhance the experience for their customers.

BI consulting can also benefit from this study. While the results of the study are specific to the company's context, it was shown that service design can be a valid method to enhance the BI consulting service offering. The results of this study can be used as a baseline for their service (re)design process. Future studies could be done replicating this model to other IT consultancy services with different contexts and challenges.

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APPENDIX A: Interview Protocol

1. Summary description of the study

1.1 Project Name

Application of Service Design for Business Intelligence consulting services

1.2 Name of the promoter

B2F – Business to Future, Programação Informática, Lda.

1.3 Name of the main investigator of the promoter

Pedro Manuel Almeida Roseira

1.4 Name of the investigator conducting the study

Pedro Manuel Almeida Roseira

1.5 Dates

2020-06-25 a 2020-07-12

1.6 Participants

It is intended to interview between 8 and 12 clients with diverse job descriptions and with different experiences and direct involvement in the hiring and execution of services provided by the company

1.7 Benefits for the participants

It is expected that with the realization of this study it will be possible to collect actionable feedback and thus use this knowledge in the redesign of services, resulting in the improvement of the service provided by the company.

1.8 Risks and inconvenientes for the participant

There are no risk to participants identified.

The drawback will be the time spent in the interview, which is estimated at 30 to 45 minutes.

1.9 Data collection

Interview recorded in audio. The script for the interview is available in point 5 of this document.

1.10 Confidentiality

Recordings will be identified by codes. The results will be reported in aggregate form, never specifying details to identify the study participants.

1.11 Informed consent

Before the beginning of data collection, participants will be given informed consent that must be read and signed by them and by the researcher. This consent form is available in point 4 of this document.

2 Study goals

Use of service design tools and process modeling as a diagnostic tool for identifying services currently offered by the company, namely in the area of consulting in Business intelligence

- Identification of opportunities and potential redesign of services using Service Design methodologies.
- Ideation of internal tools and processes to meet customer needs
- Ideation of new complementary services to the company's offer.

The project will be developed in a *service design approach*, in an iterative and creative process centered on the customer.

Based on the results of this first phase, services design methods and modeling tools will be used to facilitate this design and discussion.

3 Customer experience study

This study is qualitative in nature and aims to understand the experience of each of the actors, their activities and interactions with the other actors and their needs for information and technology-based services. This study will serve as the basis for the specification of requirements and the redesign of the concept of services provided by the company.

3.1 Data collection and analysis

Data collection will be carried out through individual interviews. The interviews will be semi-structured, according to the script presented in paragraph 5. This script aims to guide interviews and information gathering, while maintaining the flexibility to explore other topics that will emerge spontaneously and prove relevant.

To allow for in-depth analysis of the data, individual interviews will be recorded in audio. The recordings will later be transcribed literally for content analysis. The data collected during this study will be kept strictly confidential. The analysis of the data collected in the study will always be carried out anonymously. Confidentiality issues are safeguarded in the informed consent presented in point 4, which will be signed by the interviewee and the investigators before the beginning of the interview.

The data collected through the interviews will be literally transcribed and subject to a content analysis with the support of the NVivo software. This analysis involves an iterative cycle of codification of the texts of the interviews and of analysis of the categories and their restructuring. Based on this analysis, the results will be systematized and used for the subsequent steps of the investigation.

3.2 Expected results

The exploratory study will have the following expected results:

- In-depth characterization of customer experience and needs in relation to technology-based services offered by the company (BI).
- Systematization and evaluation of the experience of different clients with past projects
- Identification of current gaps in the services provided and opportunities for improvement.

This exploratory study will be used to specify and assist the design of the solutions to be developed to improve BI services.

4 Informed Consent

We are requesting your participation in a study in the context of the services provided by B2F.

This study aims to evaluate the needs and experience of the different actors related to the development of B2F services in order to improve the service provided or develop new services that meet the needs of its customers. In this sense, your participation will provide important information for this project.

These interviews will be recorded to enable your transcription and in-depth analysis. We will only start recording after your agreement, expressed by signing this informed consent or indicating the same case of the interview is held remotely.

The information collected is strictly confidential and will only be used in the context of this study. The results will be reported in aggregate, without identifying the interviewees individually. The information may be used for reports, presentations or scientific articles, but your name will not be identified.

Your participation in this study is voluntary, so you can interrupt it at any time. In this case all information collected so far will be deemed unusable.

For any further clarification, you can contact pedro.roseira@b2f.pt, or jorge.amaral@b2f, from B2F, based at Rua Dom Afonso Henriques, 1736 4435-003 Rio Tinto and by phone +351 229 740 393.

The researcher:

Name: Pedro Roseira

Signature: _____ Date ____ / ____ / _____

Participant:

I declare that I have read and understood this document, as well as the verbal information provided and agree to participate in this investigation. I allow the use of the data I provide on a voluntary basis, trusting that it will only be used for investigation and with the guarantees of confidentiality and anonymity given to me by the investigator.

Name: _____

Signature: _____ Date ____ / ____ / _____

THIS DOCUMENT IS DONE IN DUPLICATE: ONE FOR THE PARTICIPANT AND ONE FOR THE INVESTIGATOR.

5 Interview script for the study of the experience

Sociodemographic data (and/or use of the service):

- a. Job role
- b. Previous projects involvement
- c. Number of projects the interviewee has participated in
- d. How long has been a customer

The objective of this exploratory interview will be to understand the needs and how the client typically interacts with services in the area of BI & data Analytics, how it evaluates the services provided by B2F and what needs to be met or improvements to be implemented.

This interview fits into the context of a master thesis in the Master of Services Engineering and Management of FEUP and will initiate a process of redesign of services, focusing attention on the client, thus hoping that it will translate an improvement of the service provided and an increase in the efficiency of B2F's internal processes.

I previously shared the informed consent form. I would like to ask if you have read it and agree to the recording and processing of data for the purposes of this study.

I'll start the recording.

Q1 What are the greatest difficulties you feel in the BI area, particularly in integrating treatment and dissemination of business information?

- Access
- Governance
- Performance
- Organizational culture
- Knowledge

Q2 When you hire BI consulting services, what do you value the most?

Q3 How do you see the future of BI in your organization?

Q4 What led you to look for B2F as a partner for BI development?

Q5 Overall, how do you evaluate the services provided by B2F?

- Response time
- Technical capacity
- Recommended solution
- Communication

Q6 Could you tell me a little bit about the main actions you have had contact with B2F?

- Have the objectives of the actions been achieved?
- What's the level of involvement?
- Was the estimated time exceed?
- Have you met your goals?

With regard to the actions undertaken,

Q7 Was it clear at the start of the project what would be developed and the dates foreseen for delivery?

- Transparency/perceptibility of the action plan
- Architecture/actions to be developed were clear?

Q8 Was a first version of the development presented? If so, how do you rate it?

- How do you find the time it took to have visible results (high/low)?
- Do you consider that the degree of finishing was sufficient for the first version?

Q9 Were you satisfied with the final outcome of the action?

- Were the requirements/expectations met?

Q10 How important is it to you to pass knowledge of the implemented systems/solutions?

Q11 Globally, how do you evaluate the B2F consultant team?

Q12 How do you consider involvement with the project team?

- How do you rate the level of interaction with the development team?
- Do you think this involvement was appropriate? (should there have been greater intervention/greater autonomy?)
- Was it clear what would be implemented before developments began?
- Did you feel that the state of developments and blockades was clear at every moment?

Q13 How do you often address requests (information, bug fixes, adjustments, new developments)? How do you evaluate the team's response to them?

- Do you think the team gives adequate feedback to the status of requests?
- Response time
- Response result

Q14 How do you think the team has handled changes in requirements or scope?

Q15 Do you consider that at the end of the project you have a clear idea of the actions taken, decisions taken and changes in scope?

Q16 How could B2F improve the service provided?

- Technical solution
- Relationship
- Information provided / Communication

Q17 Do you think b2f should play a more interventional/preventive role in maintaining the systems/solutions implemented?

Q18 Do you consider it relevant to have a greater detail about actions developed?

How do you think it's the best way to do that?

Q20 Would you consider the existence of a customer area with this pertinent information?

If so, what information should be included?

Q21 What other features should this portal have? (integrations with internal portals, ...)

Q22 What else would you like to see improved in the relationship with B2F?

How could we respond to this need?

APPENDIX B: Interview transcription using GCP Speech to text script

Master thesis interview analysis - Speech to text.ipynb ☆
File Edit View Insert Runtime Tools Help Last edited on 15 September

+ Code + Text

Setup and imports

Imports

```
[ ] !pip install --upgrade google-cloud-speech

import pandas as pd
from google.colab import files
from google.cloud import storage

from google.cloud import speech
from google.cloud import speech_v1p1beta1 as speech
from google.cloud.speech_v1p1beta1 import enums
from google.cloud.speech_v1p1beta1 import type

from datetime import datetime
```

Google Cloud Platform (GCP) Authentication

```
[ ] from google.colab import drive
drive.mount('/content/gdrive')

import os
os.environ["GOOGLE_APPLICATION_CREDENTIALS"]="/content/gdrive/My_Drive/Tese/GCPkey.json"
```

Make GCP API Call

Define API Call Function

```
def transcribe_gcs(gcs_uri):
    """Asynchronously transcribes the audio file specified by the gcs_uri."""
    resultados = []
    client = speech.SpeechClient()

    audio = speech.RecognitionAudio(uri=gcs_uri)
    config = speech.RecognitionConfig(
        encoding=speech.RecognitionConfig.AudioEncoding.FLAC,
        language_code="pt-PT",
        use_enhanced=True,
        enable_speaker_diarization=True,
        diarization_speaker_count=2,
        # sample_rate_hertz=16000,
        # audio_channel_count =2,
        enable_automatic_punctuation =True,
        # enableWordTimeOffsets=True,
        # model= "video" # nao existe em PT-PT
    )

    operation = client.long_running_recognize(config=config, audio=audio)

    print("Waiting for operation to complete...")
    response = operation.result(timeout=3600)

    # each result is a part of the audio file
    for result in response.results:
        alternative = result.alternatives[0]
        # print("Transcript: {}".format(alternative.transcript))
        print("Confidence: {}".format(alternative.confidence))

        wordcount =0
        for words in alternative.words:
            wordcount=wordcount+1
        wordcount=wordcount-1

        start_time =str(alternative.words[0].start_time)

        end_time = str(alternative.words[0].end_time)

        start_end_time = str(start_time) + '-' +str(end_time)
        speaker = alternative.words[wordcount].speaker_tag
        resultados.append([start_time,end_time,start_end_time , alternative.confidence, speaker,alternative.transcript])

    #Save to file
    df = pd.DataFrame(resultados, columns =['Start_Time' , 'End_Time', 'Start-End_time', 'Confidence', 'speaker', 'Transcript'])
    df.to_csv(fileName + ' transcription.txt', encoding='UTF-8-sig', sep=',', quoting=0, index=False, header=True)
    files.download(fileName + ' transcription.txt')
    print("Done!")
```


▼ Call API for flac files

```
[ ] List=["FileName1", "FileName2"]
for FileName in List:

    FileExtension="flac"

    FileURL="gs://tese-entrevistas/Shortened/"+FileName+"."+FileExtension

    transcribe_gcs(FileURL)
```

```
Confidence: 0.8928051590919495
Confidence: 0.9328165054321289
Confidence: 0.920143723487854
Confidence: 0.8873947858810425
Confidence: 0.9203881025314331
Confidence: 0.9349139928817749
Confidence: 0.9234874248504639
Confidence: 0.9022467732429504
Confidence: 0.9246835708618164
Confidence: 0.9182108640670776
Confidence: 0.9213762283325195
Confidence: 0.9291063547134399
Confidence: 0.914186604286194
Confidence: 0.9155466556549072
Confidence: 0.9124841094017029
Confidence: 0.8973009480667114
Confidence: 0.8936741352081299
Confidence: 0.9155852794647217
Confidence: 0.9057145714759827
Confidence: 0.9170883297920227
Confidence: 0.9260039925575256
Confidence: 0.8663493394851685
Confidence: 0.9073169827461243
Confidence: 0.9320744872093201
Confidence: 0.9177757501602173
Confidence: 0.892593502998352
Confidence: 0.9280487298965454
Confidence: 0.9025706648826599
Confidence: 0.9277194142341614
Confidence: 0.9249030947685242
Confidence: 0.8709496259689331
Confidence: 0.925748884677887
Confidence: 0.9289689064025879
Confidence: 0.9153176546096802
Confidence: 0.9178251624107361
Confidence: 0.9291508197784424
Confidence: 0.8941303491592407
Confidence: 0.9160318374633789
Confidence: 0.9137136340141296
Confidence: 0.911205530166626
Confidence: 0.9263529181480408
Confidence: 0.9163833856582642
Confidence: 0.9085008502006531
Confidence: 0.9207337498664856
Confidence: 0.8537205457687378
Confidence: 0.0
Done!
Waiting for operation to complete...
Confidence: 0.9162209033960064
Confidence: 0.9158945679664612
Confidence: 0.912767767906189
Confidence: 0.8868447542190552
Confidence: 0.9271130561828613
Confidence: 0.929530918598175
Confidence: 0.916996955871582
Confidence: 0.5723511576652527
Confidence: 0.0
Done!
```

```
[ ]
```

APPENDIX C: Full list of interview coding of customer perceptions

	Interviews	References
Very positive	5	24
Project impact in the organization	3	3
Projects had deep positive impact in the organization	1	1
Solution found was the best one for the problem	1	1
Consultants are impacting and improving internal processes	1	1
Exceeded expectation	2	2
Team characteristics	2	2
Consultants know the customer's internal processes very well	1	1
Extrememe pacience and flexibility from consultants in dealing with scope changes	1	1
Overall experience	2	2
Global evaluation very positive	1	1
Feels there is little room for improvement	1	1
Team interaction	1	5
Consultants are seen as part of the team	1	1
Chooses these services over other competitors because of good relationship	1	4
Positive	8	46
Team interaction	6	25
Good interaction with consultants	6	21
Flexibility to acomodate changes in project scope	4	4
Project Manager communicates effectively project status and pending actions	2	2
Quick response	2	4
Constant support from consultants	2	3
Everything was clear at the beggining of the project	2	2
Clear concise language of consultants	1	1
Good comunication of scope changes	1	1
Consultants share their knowledge	1	2
Consultants work hard and show results	1	1
Deadlines were met	1	1

Positive (cont.)/ Team Interaction (cont.)	Interviews	References
Task status is clear at all times	1	1
Sales rep. was interested in hearing the problems	1	1
Feels they are adequately involved in the project	1	1
BI System characteristics	3	5
Solution developed is easy to use	1	1
Testing is done on systems with few bugs	1	1
Team characteristics	3	7
Business knowledge	3	4
Consultants were able to overcome challenges and customer's technological gap	1	1
Trusts consultants and their knowledge	1	2
Consultant's technical knowledge	1	4
Negative	3	9
Project goals	2	3
Missed project goals	1	1
Deadlines were not met	1	1
After project abandonment	1	1
Team interaction	2	2
Bad knowledge transfer between consultants	1	1
Communication was too technical and hard to understand	1	1
Interaction with other partners	1	1
BI System characteristics	1	1
User interface is dated	1	1
Very negative	1	2
Expectations were not met	1	1
Team interaction	1	1
Method of work is not flexible	1	1