MESG

MESTRADO EM ENGENHARIA DE SERVIÇOS E GESTÃO

Application of Service Design in the Re-design of a Time Management System

Thaís Paula Neto de Oliveira

Master Thesis

Supervisor at FEUP: Prof. João Alberto Vieira Campos Pereira Claro

Supervisor at Mindera: Engenheiro José Fonseca

U.PORTO

FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

2020-09-25

To the little person who brings the most joy and happiness to this path,
My son, Santiago

Abstract

The constant evolution and increasing competitiveness in the Information Technology market represents an opportunity for companies to innovate in different domains, namely in the use of internal information systems designed to be *human-oriented*, thus improving the experience of the service provided by the company as a whole. Achieving this requires the use of methods that, throughout the process, involve the system development team as well as the users themselves, so that the most appropriate solution can be found collaboratively.

This study focused on the design of an internal information system, using as a case a Human Resources module, more specifically its Time Management submodule, in order to understand the users' experience, including their main current activities and difficulties. Data with relevance for user experience were collected and an analysis of these data was carried out in order to systematize the information and redesign an improved service of the Time Management system submodule.

A Service Design approach, specifically applying the Customer Experience Modeling method, was used to understand the users' experience and accordingly define and map the set of activities related to Human Resources, the Customer Journey for a specific activity and a Customer Value Constellation for the current system offering. Multilevel Service Design was also applied, to define a new concept of the service in an expanded version of the Customer Value Constellation, and the meeting of the service, represented by the Service Experience Blueprint, which details the interactions for a specific task. In the final reflection phase, low-fidelity prototypes were presented to provide a visualization of the redesign of the Time Management service and the design of a new Team Capacity Management functionality.

With this work, the use of methods focused on a human-centered approach made it possible to co-create value with the different stakeholders, from the exploratory phase to the validation phase, which resulted in the development of an improved time management module and the creation of a new service for team capacity management.

Keywords: Human Resources Information System; Service Design; Customer Experience Modelling; Multilevel Service Design; Time Management; Team Capacity Management

Resumo

A constante evolução e aumento de competitividade do mercado de Tecnologia da Informação representa uma oportunidade para as empresas inovarem em diferentes domínios, nomeadamente no uso de sistemas de informação internos desenhados para serem *human-oriented* e assim melhorar a experiência do serviço prestado pela empresa como um todo. Para o conseguir, é necessária a utilização de métodos que envolvam durante todo o processo tanto a equipa de desenvolvimento do sistema como os próprios utilizadores para que colaborativamente se encontre a solução mais adequada.

Este estudo centrou-se no desenho de um sistema de informação interno, utilizando como caso um o módulo de Recursos Humanos, mais especificamente o submódulo de Gestão de Tempo, de forma a compreender a experiência dos utilizadores, incluindo as suas pricipais atividades e dificuldades atuais. Foram recolhidos dados com relevância para a experiência dos utilizadores e foi realizada uma análise destes dados de forma a sistematizar a informação e redesenhar um serviço aprimorado do submódulo de Gestão de Tempo.

Foi utilizada uma abordagem de *Service Design*, aplicando especificamente o método de *Customer Experience Modelling*, para compreender a experiência dos utilizadores e assim definir e mapear o conjunto de atividades relacionadas com os Recursos Humanos, a *Customer Journey* de uma atividade especifica e a *Customer Value Constelation* para a oferta atual dessa parte do sistema. Foi também aplicado o *Multilevel Service Design*, para definir um novo conceito do serviço representado numa versão expandida da *Customer Value Constelation*, e o encontro do serviço, representado pelo *Service Experience Blueprint*, que detalha as interações para uma tarefa especifica. Na fase final de reflexão, foram apresentados protótipos de baixa fidelidade para proporcionar uma visualização do redesenho do serviço para a Gestão de Tempo e o desenho de uma nova funcionalidade de Gestão de Capacidade das Equipas.

Com este trabalho, a utilização de métodos focados numa abordagem *human-centered* tornou possível a cocriação de valor com os diferentes atores envolvidos desde a fase exploratória até à fase de validação, o que se traduziu no desenvolvimento de um serviço de gestão de tempo melhorado e na criação de um novo serviço de gestão de capacidades das equipas.

Acknowledgments

To Mindera for the opportunity to grow and learn so much personally and as a professional. A special thank you to Sofia for the trust she placed in me from the interview and all the support during this master and at work. To José Fonseca, Mindera People developer and who allows me to work on this unique project.

To FEUP and a special thank you to professor João Claro, for his patience and empathy during this rough moment. For the guidance and constant support during the development of this project.

To all my co-workers who participate in this project, for the availability and rich insights to allow the performance of this study.

To my best friends - “sem pace” - that I can call Family who always supported my son and me. A thousand “thank you” will not be enough.

To my co-workers and friends, Renata and Frederico, for the support and friendship during all these moments.

To the friends that MESG presented me, Gurias, thank you for the friendship and support.

Finally, to my son and his father, for the love and support.

Table of Contents

List of Tables

List of Figures

List of abbreviations

CAP – Capability

CVC - Customer Value Constellation

DEV – Developer

DSR - Design Science Research

HR – Human Resources

HRIS– Human Resources Information System

IT – Information Technology

MSD - Multilevel Service Design

People Processes – Similar to HR team in a traditional company

PO – Product Owner

SSA - Service System Architecture

SSN - Service System Navigation

1 Introduction

1.1 Motivation

In a world where Information Technology (IT) companies are growing so fast and where software products are emerging every day, it is essential to understand that only having the right resources is not enough. Thinking strategically but in line with the values of the company is crucial to bring a competitive advantage to a business. For a long time, it has been known that an information system within a company is a "must-have" tool. This fact can result in an increased volume of available data and also facilitate the decision-making process. Another critical advantage is the facilitation of communication, transparency, and connection among collaborators (Piccoli & Ives, 2005).

Some factors concerning this subject are worthy of study and reflection: the opportunity to identify, analyze and learn behavioral patterns of collaborators in a company, that can potentially elucidate the reason for the levels of turnover, lack of motivation, health issues, and dismissals; also, the opportunity to give self-managing tools to a collaborator and work in an environment of trust and reduce the time spent in some processes, tasks, and make them automated.

Despite the end goal, the end-user must know the system and understand how to use it and also trust it with the flow of the information. Not only related to functionality but with the overall experience of using the system, according to Shaw and Ivens (2002), companies are increasingly working on customer experience to obtain a competitive advantage in the market. In such a competitive IT market, a company with this knowledge can leverage a sustainable and growth position, but more than that, it is giving the right tools for the people within the company to manage their time and also manage the capacity of their teams. Only with high customer adoption it is possible to bring out the system relevant information that can be used in different ways (Reich & Benbasat, 1990).

As a case study to investigate this, a software product developed in a company for its own utilization was used. This work was developed based on the framework of human-centered design, mainly applying service design methodologies.

1.2 Study Goal

The study was carried out in an IT start-up company located in Porto. The goal was to make an in-depth study to understand the user experience of the system and then develop an improved solution. To achieve that the use of Service Design and human-centered design approach was chosen. These methodologies require an in-depth study of user experience and a great understanding of user needs, hence the involvement of multiple actors along the process. The work emphasizes specifically one part of the entire system, in this case, the Human Resources (HR) management module – specifically the submodule Time Off Management.

Initially, the exploration phase was performed, which consisted of applying qualitative research to understand the user experience and find out the main activities and system core-services. Therefore, contextual interviews were conducted and analyzed, which resulted in meaningful data that allowed the definition of the current flow of information of the Time Off Management

module and Customer Experience Modelling. At the end of this stage, the customer value constellation (CVC) for the current service offer was well defined. Then following a design science research methodology, a set of models were developed to propose an improvement. At this moment, a beta version was launched with some incremental features and changes in this submodule, and even a new part, a new submodule for Team Capacity Management. Finally, a co-creative online workshop (divided into two moments as explained later) with five key actors was held to refine, re-design, and validate the new service concept launched on the beta version. Multilevel Service Design (MSD) was also partially applied to the module and mockups were defined to illustrate how this new refined service potentially could be delivered.

Concerning the rationale for the chosen module, it can be underlined that it is a module with a direct impact on all collaborators – from founders to operations, and IT teams – and also an immediate effect on the core business of the company that is related to the IT services provided to external clients (Business to Business market).

1.3 Research Questions

The main objective of this work was to understand the overall experience of managing time off in an IT company and potentially transform into an active tool, improving the current experience and creating a new service concept through service design principles, especially using Multilevel Service Design.

A framework of human-centered design was followed as an interactive way to:

- understand and specify the context of use - user experience, needs, and also the actual pain points of the usability of the system;
- specify the organizational requirements of the system and prioritize them;
- co-design and validate the solution with key actors through a workshop;
- produce a new feature related to the main module that was defined as Team capacity management.

This required the following questions to be addressed:

1. *How is the user experience of managing Time Off in an IT company?*

To achieve this, a relevant number of contextual interviews with a "master-apprentice" approach were done and analyzed, followed by customer experience modeling and the definition of the current customer value constellation.

2. *What is the gap between Time Off information and Team Capacity Management in an IT company?*

To answer this question, a co-creative workshop was performed with key actors to find, validate, refine and fill the gap.

3. *How can Team Capacity management be re-designed using Service Design techniques, especially Multilevel Service Design?*

For this question, Multilevel Service Design was partially applied and then low fidelity mockups were exhibited.

1.4 Outline

This work is expected to contribute to the understanding and application of service design techniques during the improvement and conception of a new service provided by an internal software system.

Having in mind the importance of the collaborator's adoption to the system, this work could help other companies in this IT market segment to develop an internal tool that can be used to make the whole business scalable utilizing a resource that already exists in the people inside the company.

This thesis is composed of six main sections, structured according to the way the work was done:

1. Introduction: comprises the background and the overall context of the work. It presents the research questions and also how they will be addressed through the work done.
2. Literature review: provides the state of the art of the topics addressed in this work, from the importance of using an internal system in a company to service design methodologies.
3. Methodology: comprises the presentation of the distinctive possible approaches for development of this work and the explanation of the one chosen—the reasons and the applicability within the context of this dissertation.
4. Case Study Description: the problem characterization describes the company and a more detailed context of the work. It includes also the reasons why the work focused on some modules and why this is relevant from the company perspective, and the issues addressed during research, the exploration phase results, and customer experience modeling.
5. Results: this chapter presents the final version of the results of this work. All the frameworks and maps are given, including the rationale to reach the new service and respective mockups.
6. Conclusion and future research: As the final chapter, the difficulties found during the journey are shown and suggestions for future work are provided.

2 Literature Review

This chapter presents a relevant literature review about the topics that supported the development of this work: Human Resources Information Systems, Employee Self Service, Human-Centered Design and Service Design, including Customer Experience Modelling, and Multilevel Service Design.

2.1 Human Resources Information System (HRIS)

Historically, human resource information has mostly been seen as a necessary tool in the hiring, administration, and, ultimately, separation of employees. Over the years, these processes have not changed dramatically, but the way the information is gathered and stored has. (Kovach, Hughes, Fagan, & Maggitti, 2002).

Unlike accounting and financial areas, only in the 1960s, HR departments started looking at technological advances and its benefits. So, only then computers were introduced at HR departments. However, they were few and with limited functionalities (Kashive, 2011). In the late 1970s, increase in complexity due to globalization, changing legal environments, and the growing percentage of white-collar workers created an increasing demand for HRISs with functionalities that would provide the company's business managers with management reports giving them HR information relevant to their needs (Hennessey Jr, 1979). According to DeSanctis (1986), "Human Resource Information Systems (HRIS) have become a major management information system (MIS) sub-function within the personnel areas of many large corporations."

The benefits of the information are apparent - the organization would not be allowed to continue in business if it didn't use the information to produce the required reports or payments (Kovach & Cathcart Jr, 1999).

A HRIS is a systematic procedure for collecting, storing, maintaining, retrieving, and validating data needed by an organization about its human resources, personnel activities, and organization unit characteristics. (Kovach & Cathcart Jr, 1999).

It became evident as HRIS took hold in the corporate culture that a quality HRIS could provide valuable information to the organization in managing one of its most valuable assets: the organization's human resources. As top management began to put pressure on HR directors to use HRIS, it was becoming clear that by collecting and processing more and more information promptly, the value-added was in using the data in decision making and not in the actual system used for collection and storage. (Kovach et al., 2002).

According to Kovach et al. (2002), the value of such information is based on two factors:

1. How many decisions will be improved by having the information?
2. How much value will each improved decision produce?

"Through the proper management of HR data, firms are now able to perform calculations that have effects on the business as a whole." ***(Kovach et al., 2002)***

A partial list of such calculations includes health-care costs per employee, pay benefits as a percentage of operating expense, cost per hire, return on training, turnover rates and fees, the

time required to fill specific jobs, return on human capital invested, and human value-added (Kovach et al., 2002).

So, we can consider the two general purposes of HRIS applications as administrative purposes that reduce processing costs and time, and decision support applications that assist HR managers, non-HR managers, and employees in making better decisions. The key is to focus on making better decisions, not just producing data faster (Kovach & Cathcart Jr, 1999).

Benfatto (2010) suggested the following typology for HRIS:

		Three Generations of HRIS		
		1st Generation of HRIS: speeding up	2nd Generation of HRIS: qualitative changes & improvements	3rd Generation of HRIS: things that could not be done before
Function of HRIS	Publishing of information	HRIS major function is the publishing of information and the speeding up of this process compared to traditional HR	HRIS major function is the publishing of information & bringing upon qualitative changes in the way information is published (content of information communicated)	HRIS major function is the publishing of information and allowing HRM to do things in the communication of info that were not possible before (public reached)
	Automation of transactions	HRIS major function is the automation of transactions which are sped up, compared to prior traditional HR (time effective)	HRIS major function is the automation of transactions to which it has brought upon qualitative changes (fewer mistakes and better handling of data)	HRIS major function is the automation of transactions. It allows doing things that could not be done before (e.g. allows employees to choose from several benefit schemes)
	Transformation of HRM	HRIS allows HRM to take up a more strategic role, through the substantial savings in time it achieves	HRIS allows HRM to take up a more strategic role, through better quality	HRIS allows HRM to use tools it did not have before, in order to support the strategic function

Figure 1 - HRIS Typologies

Source: Benfatto (2010)

2.2 Employee Self-service

Today the focus of HRIS is moving to the next logical step: employee self-service (ESS).

Employee self-service, as the name implies, further reduces the administrative workload in HR departments by allowing employees to have updated access to their records. One of the most common methods of granting this access has been moving HRIS from client-server architecture to a Web-based environment. This includes everyday tasks such as updating address information, planning for retirement, updating health-plan information, reporting on life events such as the birth of a child, changing beneficiaries on life insurance, and managing retirement annuities. Merck & Co. has estimated a cost reduction of 86 percent per HR transaction when performed by the employee. Transaction costs were estimated to be $16.96 when performed by HR staff, compared with $2.32 when executed by the affected employee.

Implementation of Major Challenges

There are some main challenges that explain why HRIS has been slow to be implemented at every company. According to Kashive (2011), they can be divided into two types – technical and socio-technical challenges:

- **Technical challenges**
    - **Usability**: most HR systems have been intricate for non-technical professionals to understand and use (Dunivan, 1991). Users have a high level of frustration and anger regarding technology, and therefore universal usability should be the goal to ensure the highest use of technology (Shneiderman, 2000).
    - **Complexity**: Increasing functionality, enhancing features and integrity, increasing the likelihood of programming errors, growing user training needs, and the possibility of overwhelming users in extraneous features also results in decisions made in favor of complexity. McAfee (2003) suggested that the introduction of information technology that includes novel processes distinctively different from the current methods increases the likelihood of resistance in the implementation. Aiman-Smith and Green (2002) stated that more complex technologies have an association to lower use satisfaction of information systems.
- **Socio-technical challenges**
    - **User values:** According to Reactance theory, in cases of mandatory use and strike communication, removal of personal freedom by an authority leads individuals to specific reactions. These reactions are quite often in the opposite direction. This means that users may not have a positive approach for the new system regardless of its properties (Kashive, 2011).
    - **User profiles:** Potential users of a human resources information system are usually either competent at the previous information system but are unwilling to learn a new system or are not qualified but are willing to learn about computers in general and the latest software. Both user-profiles propose a challenge to the implementation, and the process suffers from initial momentum (McAfee, 2003).
    - **User perceptions:** Employees tend to perceive the new system as something bad and stay at a distance as much as possible. Human resources professionals tend to worry that the new human resources information system will result in their replacement, or they will have critics for not already doing a good enough job (Brooks & Nafukho, 2006).

As a result, many organizations still operate manual HR systems. Even the ones who have HRIS are limited and generally maintained by the IT department because the systems are difficult to use and require computer expertise to modify. So the platform “belongs” to IT departments responsible for its support, maintenance, and new features definition and design (Dunivan, 1991).

2.3 Human-Centered Design

As competition intensifies and technological differentiation becomes more complicated, design offers a powerful way to position and differentiate products (Veryzer & Borja de Mozota, 2005).

According to J. Zhang, Patel, Johnson, and Smith (2002) one of the most significant reasons for technology project failures is the lack of consideration of human issues, such as workflow, organizational change, and usability during the design and implementation stages of a project's development process. This is because of a focus on technology and how humans interact with technology, rather than questioning how and why technology may be of service in supporting human work. Designing products suitable to users, focusing on customer needs and interaction, will improve value propositions and market engagement.

The answer to that is human-centered design. Understanding human needs and how system design responds to human needs is essential for human-centered design (T. Zhang & Dong, 2009). It goes beyond a better user interface: it should include considerations of users, functions, and tasks that are fundamental. The human-centered approach is opposed to the traditional, technology-oriented approach, which prioritizes computer-based information processing and technology-mediated communications over humans and their communicative collaboration (Barthélemy, Bisdorff, & Coppin, 2002).

Figure 2 shows the evolution of design since 1950:

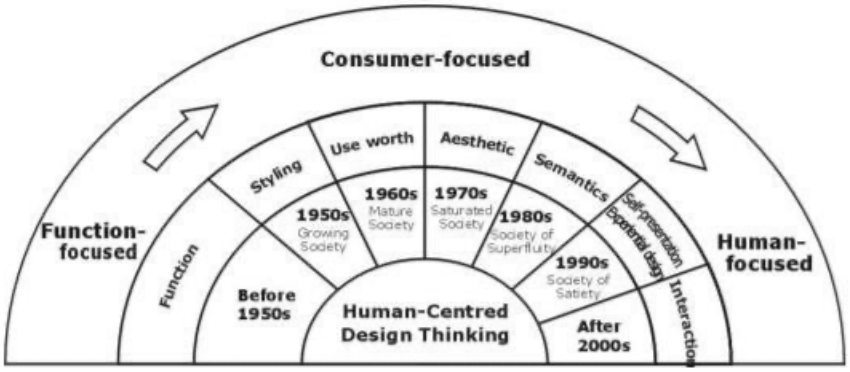

Figure 2 - Design Evolution Since the 1950s

Source: T. Zhang and Dong (2009)

T. Zhang and Dong (2009) summarized the characteristics of Human-Centered design in product design as follows:

- the central place of human beings;
- understanding people holistically;
- multi-disciplinary collaboration;
- involving users throughout the design process;
- making products or services useful, usable, and desirable.

2.4 Customer Experience

As shown by Teixeira et al. (2012), applying Customer Experience Modelling to a service provider helps to the understanding of customer experience globally, gathering relevant data and also supporting their other design process. As defined by MSD, the three levels of customer experience are: value constellation experience, service experience, and service encounter experience, as exemplified in Figure 3.

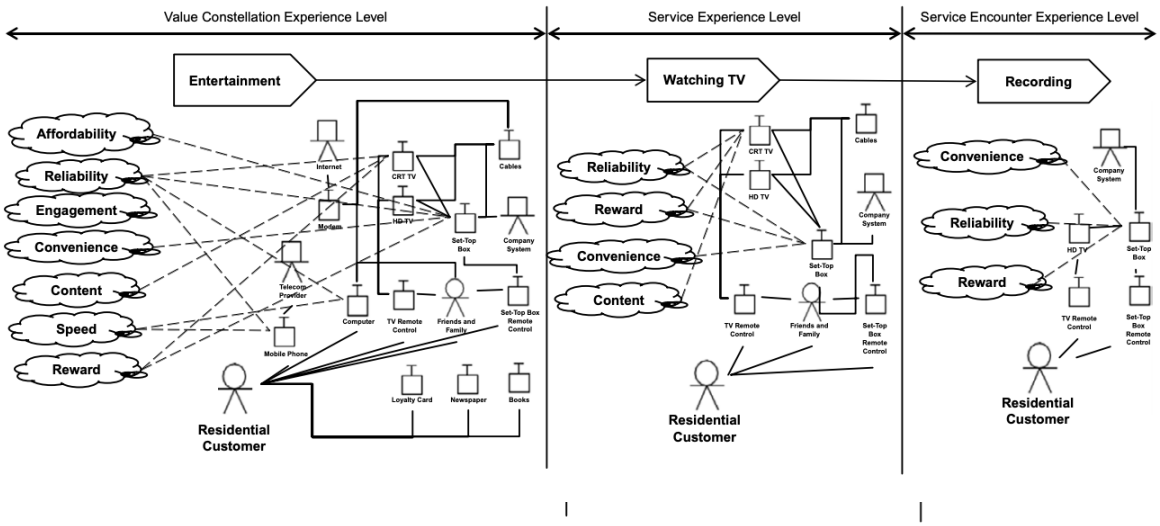

Figure 3 - CEM for a Multimedia Service Provider

Source: Teixeira et al. (2012)

2.5 Service Design

Service design is defined by applying service design methods and principles during the creation of a service (Holmlid & Evenson, 2008). According to Patrício and Fisk (2013), this process should have some stages well explored such as understanding the customer experience, designing the service concept, designing the service system, designing the service encounters, and finally, prototyping the service experience and having as the master of the process the user. Service design should focus on not only the service itself but also the service interfaces to make it more suitable to the final user (Mager, 2009). In the last, the customers do not seek products or services but the best offering to have the best experience (Michel, Brown, & Gallan, 2008).

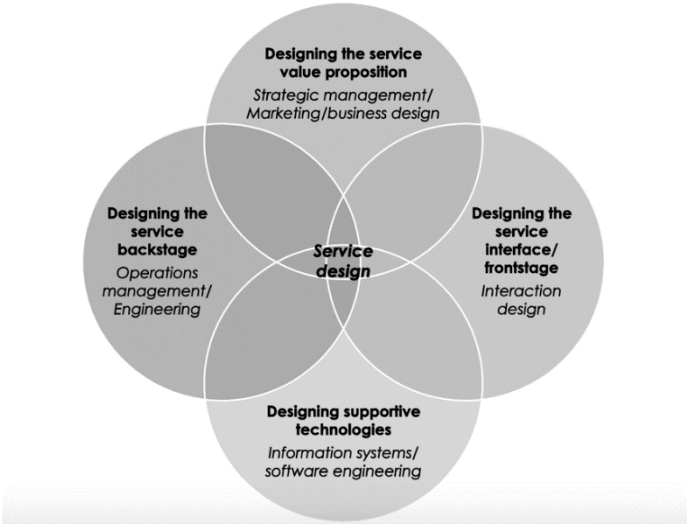

Figure 4 - Service Design as an interdisciplinary field
Source: Patrício & Fisk (2013)

Although the service design principles have changed in time, Stickdorn, Hormess, Lawrence, and Schneider (2018) have aggregated the six beliefs for a successful result using service design, and the process should be:

- Human-centered: the services should be executed through the real customers as so they must be involved in all stages;
- Co-creative: This involved should include the active participation from the different stakeholders, not only the customers but all persons and systems interested;
- Iterative: There are stages to follow; however, these stages should interact with each other;
- Sequencing: Sequence of multiple actions;
- Evidencing: Even intangible services should be able to be visualized through physical evidence;
- Holistic: Consider all environments involved.

As indicated by Dubberly and Evenson (2008) the creation of the models during the design process enhances the search for filling the space between the analysis and the synthesis. But these models can have different shapes making this the most creative process to find the perfect solution (Patrício & Fisk, 2013)

As cited in Patrício and Fisk (2013), Brown (2008) describes service design as an iterative process with four stages: inspiration, ideation, reflection (through prototyping and testing), and implementation (see Figure 4).

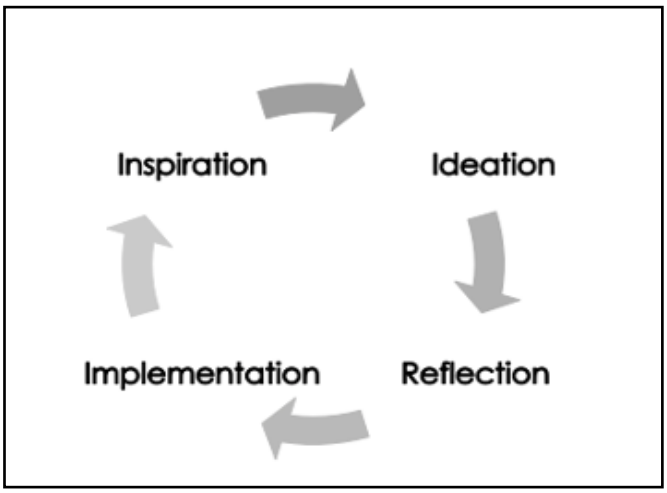

Figure 5 - Service Design Process

Source: Brown (2008), as cited in Patrício & Fisk (2013)

One method that encompasses this rationale of creating models is the Multilevel Service Design method (MSD). This method is presented by Patrício et al. (2011) as an interdisciplinary approach for design from the service concept to the service experience encounter focusing since the first moment on leveraging customer experience. Based on this method, the service or company have the tools to understand what is the customer expectation for the service delivery and also ensure the development of the service system (Figure 6).

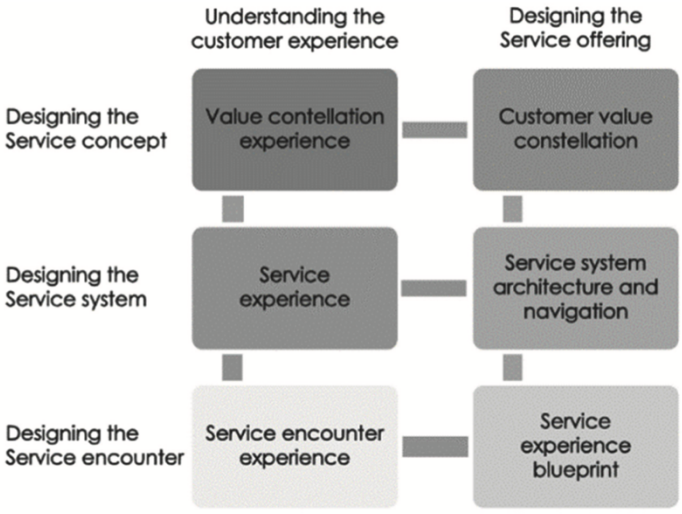

Figure 6 - Multilevel Service Design

Source: Patrício, Fisk, Falcão e Cunha, and Constantine (2011)

3 Methodology

This chapter describes the methodology chosen for this work. It presents the type of research that was used, how data were collected and analyzed, why the used methods were selected, and how they were adapted to fit the needs of this work.

3.1 Multiple Research Methods

As shown by Hevner et al. (2004) there are many possible approaches to do a research study. In this chapter, the focus will be on three categories: quantitative, qualitative, and design science research (DSR). According to Tuli (2010) researchers can use different methodologies to describe, explore and explain phenomena, and the most famous are divided into two methods: quantitative (based on the positivism paradigm) and qualitative research (based on interpretivism paradigm). Queirós, Faria, and Almeida (2017) explain that both can be used for modeling and analysis, but their selection depends on the research questions that command the research activity. The first one tries to obtain accurate measures to allow a statistical analysis while the second tries to explain some reality in a determined context.

Qualitative Research

The qualitative method assumes that reality exists in a determined context but there is not only one reality that is true. This method is more concerned with understanding the meaning of social phenomena and focuses on links among a larger number of attributes across relatively few cases (Tuli, 2010).

Several techniques can be applied, from observations to focus groups, but interviews are one of the best methods for collecting data related to user needs (Patrício & Fisk, 2013). Maxwell et al. (2013) claimed that this method deals with meanings, values, and behaviors that cannot be systematized, such as quantitative methods.

Quantitative Research

This method seeks to collect, quantify, and analyze numerical data in order to quantify social phenomena (Tuli, 2010). This strategy is used for complex experiments involving many variables and treatments (Creswell & Zhang, 2009). Simulations, surveys, and randomization are some of the possible techniques in this type of method, and this could be represented with a large sample to be a form of representation of a determined population (Queirós et al., 2017).

Mixed methods:

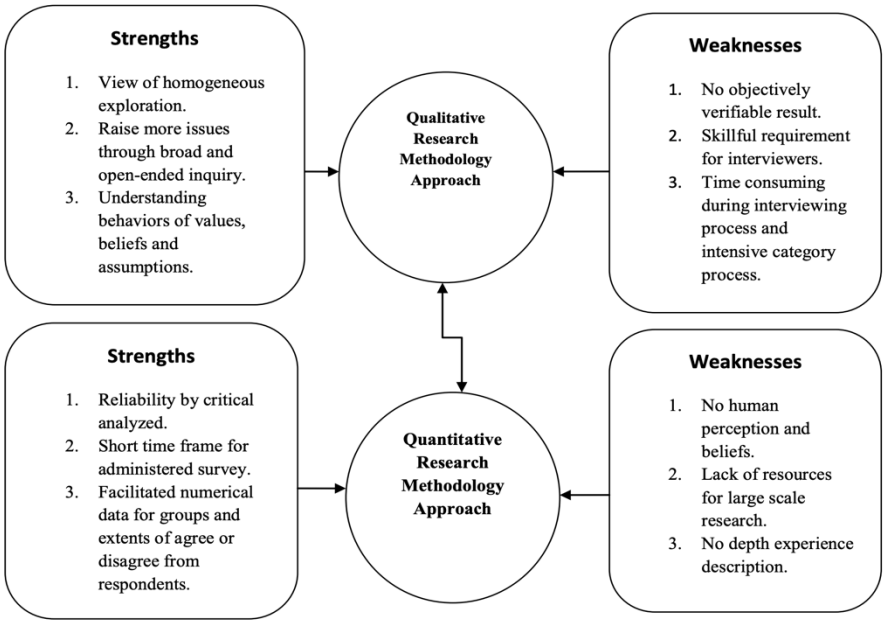

Figure 7 - The model of strengths and weaknesses of qualitative and quantitative research

Source: Choy (2014)

Since both approaches have their weaknesses and strengths, in a team that includes both categories of specialists the research can be conducted as mixed methods (Creswell & Zhang, 2009). When the studies share the same goal, they can complement each other, and this allows us to understand very complex hypotheses (Sale, Lohfeld, & Brazil, 2002). This complementarity could provide better solutions and reduce some limitations (Choy, 2014). However, Neuman (2014) puts forward that this approach is more complex and also more time-consuming.

Design Science Research

Hevner et al. (2004) explain the difference between the behavioral science paradigm and the design-science paradigm. The former wants to develop and verify theories that can explain human behavior. The latter seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts. DSR guidelines should be followed to have rigor and the creation of an effective solution.

Table 1. Design-Science Research Guidelines	
Guideline	**Description**
Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

Figure 9 - Design Science Research Guidelines

Source: Hevner, March, Park, and Ram (2004)

3.2 The method used in this work

This work was developed under design science research principles. It starts by finding out user insights exploring the problem, context, and leading activities. Then those findings were refined and validated through an online workshop with key stakeholders. Finally, a set of artifacts/frameworks were designed to propose a solution.

Understanding the experience of customers and all stakeholders is a crucial step for human-centered service design (Teixeira et al., 2012). To explore this, a set of contextual interviews with an informal observation were conducted in order to find the gap between what people say and what people do. The “Master and Apprentice model” was followed, meaning that the user under research is the master of the topic, and the researcher is the apprentice collecting rich qualitative insights. Due to the ongoing pandemic at the time of this work, all the interviews were done remotely; however, this mindset was kept, and the interviewees were always asked to share their screens and to walk through the system sharing the tasks and services that the system provides. From the first moment, the user was “teaching” how the tasks are done, what needs to be done, and asking Why as much as possible to get a deep understanding of the experience. These outcome-based interviews focus not on what customers would like to see in a new service but on what results they want to achieve in doing their activities. The task of the design team is to create new services that enable customers to attain those desired outcomes (Patrício & Fisk, 2013). To avoid any distractions and to be focused on listening and watching, all interviews were recorded, and no notes were taken during the conversations.

The sample was composed of twelve individuals working at the studied company for different time frames, and in different locations, and roles. Table 1 shows the characterization of the sample.

Table 1 - Socio-demographic data

C0	Socio-demographic Data	12
	Company Time	
	0-6 months	1
	6-12 months	2
	+ 12 months	9
	Role	
	Designer	1
	Develper	3
	Quality Assurance	1
	Operations	
	Founder	1
	Finance Team	1
	People Processes	1
	Office Admin	1
	IT Recruiter	1
	Location	
	Porto	9
	Aveiro	3

The participants were selected to have each role represented. Also, the time frames were chosen to be diverse because some answers could be impacted by the level of experience with the system, and even to understand the impact of the system in a newcomer's life. Inside each role, the representatives were chosen randomly. They were invited through the Slack channel, a communication tool used inside the company.

Each interview took around 30 minutes, and all were done via a Zoom call, and recorded. After being recorded, they went through a full transcription process, and data analysis was then supported by the software NVivo 12. During the translation and codification, similar references about a determined topic were bundled with each other creating nodes. These nodes were then analyzed and interlinked with one another according to their relationship (the tables with the results are included in Chapter 4 - Case Study Description).

As the DSR methodology suggests, it is crucial for the development of design artifacts to continuously evaluate them. Throughout this work, a set of frameworks were done according to customer experience modeling, multilevel service design, as well as mockups co-designed with users in a collaborative online workshop. The validation was done iteratively during all the work, with critical persons such as the founder, the product owner (PO) of the system, and users. In Table 2, it is possible to find the summary of each stage and its related tools used and frameworks developed during this work.

Table 2 - Summary of Stages of this thesis and its related tools and frameworks developed

DSR Stage	Description	Methods/Tool/Frameworks
Problem Relevance and Statement	Literature Review about IS and Service Design Qualitative Research about User Experience and Needs	Literature Review Contextual Interviews (Zoom) Data Analysis (Nvivo)
Requirement Definition	Information flow mapping with Product Owner Customer Experience Modelling	Brainstorming and mapping CEM Customer Journey CVC Before (LucidChart)
Development	Beta version Development	Web Programming
Refinement and Validation	Online Workshop Part I: Co-create new Service Concept Gather new data Online Workshop Part II: Validate and Refine beta version Part of MSD Prototyping	Brainstorming Participatory Design (Miro Colobatorive White Board) CVC Extended Service Experience Blueprint (LucidChart) Miro

4 Case Study Description

4.1 Company Description

Founded in 2014, Mindera started as a software start-up to build scalable software systems, but what most distinguishes the company is its self-management culture. It is a company that is driven to "Build High Performance, Resilient and Scalable Software Systems to Enable Businesses Across Locations", but a structured hierarchy is something that does not exist in the company, and is exchanged by a horizontal and agile structure. There are no managers or supervisors; instead, Mindera is a company driven by Trust, People, and Purpose.

The central office is in Porto, but it has different locations around the globe: Portugal (Porto, Aveiro, Coimbra), UK (Leicester), India (Chennai, Bengaluru), and USA (San Diego and San Francisco).

In total, 499 employees are working in a flat structure organization where all collaborators have responsibility and autonomy to manage and organize the way they work and their time-off and leave management time. Teams and team members work together to deliver value both the company and final clients, never neglecting the individuals or each person's well-being.

Mindera's core business is tech-services, as it shows in the diagram below (Figure 10). Despite that, it also has some Joint Ventures, Spin-offs, and a nonprofit Association.

For this work, the focus will be on the bond between Tech Services and their internally developed product – Mindera People.

"Tech Services" means that Mindera provides a technical service for an external client. Every time a new client emerges, it identifies the needs of the new project, the capacity of the company, and creates a new team. Usually, this Team is composed of Developers (DEVs), Quality Assurance's, Designers, a Product Owner, and an Account Owner, but this might change depending on the tailored needs of the specific new client.

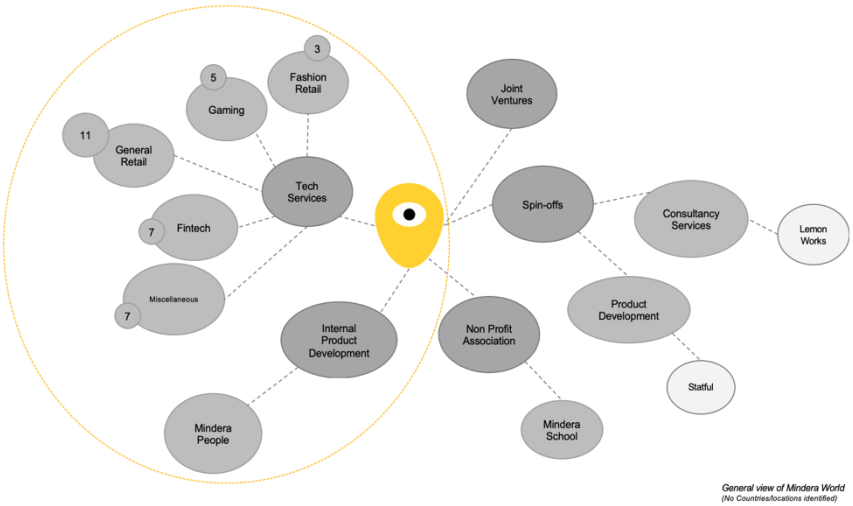

Figure 10 - Mindera World Map

4.2 Mindera People Concept

Five years after its creation, the number of collaborators and projects in the company had massive growth, so it felt the need to integrate data from human resources with business intelligence in order to be able to extract fundamental analysis for the sustainable growth of the company while still ensuring the welfare of its collaborators.

Until last year, an external HR management tool was used by the company to manage its collaborators' timetables. However, in time it realized that this was not the most suitable solution (see Table 3):

- this external tool represented a monthly cost (per user, increasing in parallel with the increasing number of employees);
- Mindera Business Model and Culture are unique, so they always need to re-adapt the information of the system to get the necessary reports;
- it was usual to find inaccurate information from that external tool, and data always needed to be double-checked.

From these needs, the "Mindera People" concept was born, a "People and Business" management system. The platform has several different modules at this time, from managing collaborators timetables to projects allocation (from the various clients) to teams, and also encompasses a Revenue and Cost area where the business earnings and costs are managed and analyzed.

4.3 Problem description

The system under study was developed with a hard deadline. The conception, development, and implementation of the minimum value product (MVP) of Mindera People was done in one month.

For that reason, the platform was generated mostly by the technical needs of daily work at Mindera and to be able to do the work similar to the previous one: collaborators should be able to add their time off and manage their leaves, and the finance team should be able to use the data for invoicing clients and also to do the forecasts.

Due to the short deadline, it was not developed to be user-friendly and genuinely focused on raising the user experience. It was reported by the Operations team and general meetings that the time-off data is usually outdated, and it can lead to conflicts of time off between team members, unprecise forecasts, and less efficient management as a whole. This study represents an understanding of user experience and a discovering of how it can be improved and also potentially create a new service concept if needed. Table 3 highlights the rationale behind the decision-making process while system developing.

Table 3 - System Development Decision Making

C1	**System Development**		**9**
	Decision making at Company Level		**5**
		Cost Reduction	
		Match with Culture	
		Integration with other systems	
		Turn to an active tool	
		Possibility to Analyse Data	
	Decision making at Development Level		**4**
		MVP similar to previous tool	
		Functionality Focused	
		Hard Dead Line	
		Design Tools non considered for launch	

4.4 Exploration Phase Results

From the interviews, informal conversations, and also observation, data were collected to define the customer experience requirements, contextual elements, and activities.

This study allowed us to understand the user experience regarding time-off management, and it includes the definition of the flow of information and the main activities. It gathered the feelings while using the system and user perception from a holistic perspective.

The results were combined into six different categories: System Development (explained previously), Activities, Critical Points, Feelings, Possible Improvements, and User Perception.

4.5 Categories Found

Activities

The first category defined was the group of activities related to the system's use regarding Time Off Management, as shown in Table 4. It was found that Main Activities are similar across the company, and users and support Activities have a different flow comparing each role. From these data, it was possible to map the flow of information regarding these functionalities.

Table 4 - Core Services and Activities

C4	Activities	41
	Main Activities	**25**
	Company Shared Calendar	
	Consulting Personal Time	
	Manage Personal Time	
	Team members Time Off	
	Support Activities	**16**
	Annual Vacation Map	
	Client Invoice	
	Managing Roadmap/Sprints	
	P&L Forecast	
	Timesheets Management	
	Projects/Team Management	
	Payroll Execution	

After collecting these data, a collaborative brainstorm jointly with the Product Owner and Development teams was held in order to develop the flow of the system as represented in Figure 11 and Figure 12. This service provided by the system has an impact on different tasks inside the company. Starting with personal time management, all users can add their time off, and after that they can cancel Future Time Off and See Leaves Summary. People Processes, through this information, can do the analyses of Free Days to manage both the end of the contract process and the annual vacation map. Using the Company Time Off Calendar generated from all time offs added by every staff member, the Finance Team can do the monthly Time Off reports, Profit and Loss Reports and forecasting. Recruitment teams can identify staff members available to interview candidates, and Account Owners can also check the timesheets of their projects according to time off information to invoice final clients. Still in this main activity, Product Owners may check the team availability so that they can manage their capacity and also manage sprints and roadmap.

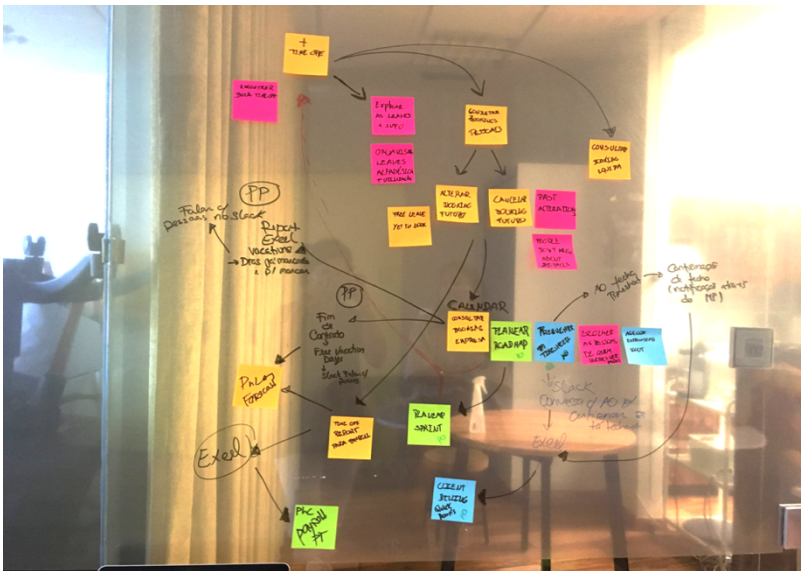

Figure 11 - Results of the Brainstorm on Flow of Information

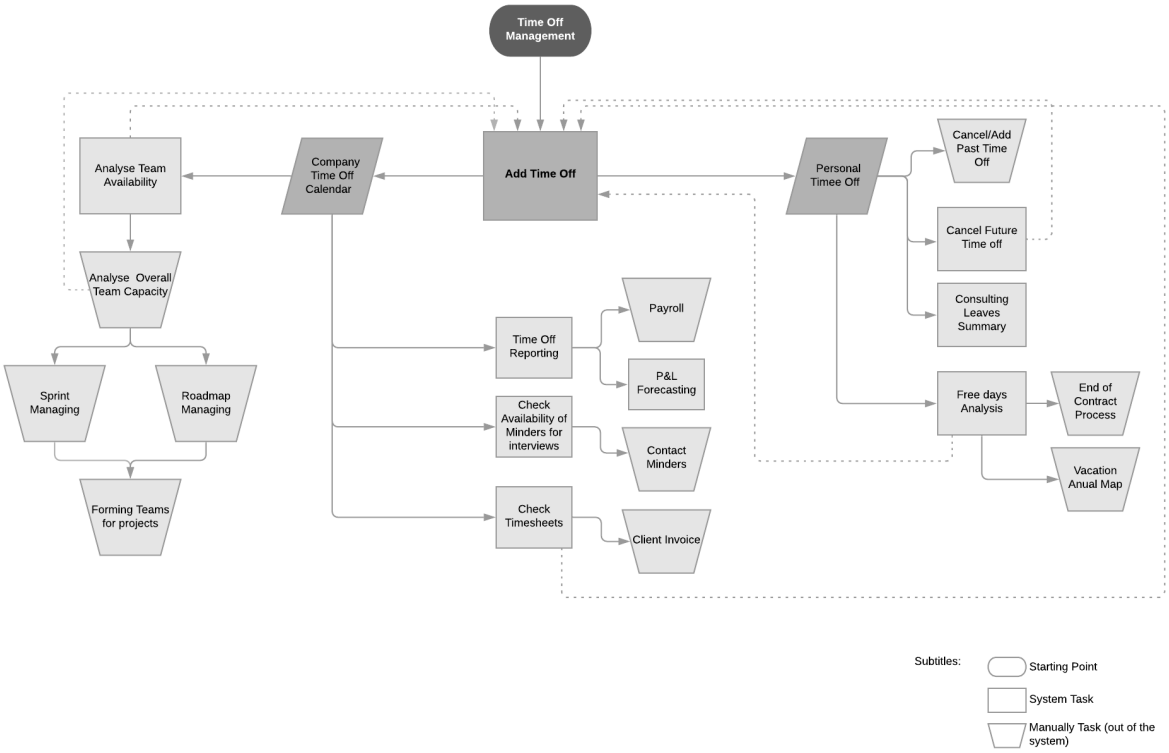

Figure 12 - Time Off Management Information Flow

Critical Points

This exploration phase was mainly aimed at determining the user experience; thus, a category for Critical Points was created. This group of data was subdivided into three frequently mentioned subgroups, as shown in Table 5: reasons for rough experience, reasons behind a possible lack of tool adoption, and finally company culture.

In addition to the previous category, feelings expressed by users were also always detected (Table 6). Although some positive emotions were shown regarding certain parts of the system, it was clear that most of the emotions were negative in terms of the Time off management module. This was not only detected through coding of the interviews, but also with observations while the users were sharing their screens.

Table 5 - Critical Points

C2	Critical Points		18
	Rough Experience		**7**
		Useless Information/Over Information in the system	
		Need of use other systems to finish all the tasks	
		Need to re-schudeled due to overlap	
		Leaves conflit with recruitment agencies	
	Lack of Tool Adherence		**8**
		Lack of UX design on interface	
		Lack of Incentive Cycle to potentiate the creation of data	
		Avoid waste of time in simple tasks	
	Company Culture and People Mindset		**3**
		Self-organization leads to manage time off occasionally	
		Different managing processes between projects/teams/sub-teams	

Table 6 - Feelings Detected

C3	Feelings		32
	Good Feelings		**8**
		Compreensive Information	
		Intuitive/Usefull	
		Satisfied	
	Bad Feelings		**24**
		Uninteresting	
		Confused	
		Frustation	
		Unuseful	

Possible Improvements

One other category that emerged from interviews was Possible Improvements (Table 7). This group includes the different areas that users most mentioned in terms of needs and suggestions

to improve. The three main subgroups were Pop-up notifications, creating an Incentive Cycle of Information, and developing tailor-made possibilities within the system.

Table 7 - Possible Improvements

C5	**Possible Improvements**	**52**
	Pop-up notifications	**18**
	Reminder to book time off periodicaly	
	Alert when exists time off overlap with team mates	
	Alert when overlap with important project milestones	
	Reminder to Personal schedule	
	Incentive Cycle	**25**
	Team capacity snapshot	
	Personal time snapshot	
	Company information snapshot	
	Tailor-made options	**9**
	Option to create sub-teams	
	Option to choose personal dashboard	
	Dinamic Leaves	

The last category created was called User Perception and is presented in Table 8 below. During data analysis from interviews, two nodes emerged and then were interlinked accordingly in a more visual manner to better understand their correlation. One node created was related to the user perception and it englobed the five main characteristics that a customer expected from the services according to Teixeira et al. (2012):

- reliability - confidence in the system data.;
- usability - the idea of having a tool that will be used frequently;
- visibility - understand what can be done with the tool and how it can be used;
- accessibility - the speed and effort put into using the tool;
- legibility - the ease to retrieve information from the system.

These characteristics were mentioned several times during the conversations with a rate from low to high according to the experience with each submodules of the system, and second node. These submodules were mentioned by the collaborators regarding the frequency of use of the and experience. Each submodule represents a specific functionality of the main Time Off module:

- Add Time Off button–the action of adding time off in the system
- My Profile Dashboard –related to the access of their own profile dashboard to see general information
- My Profile Time Off – access their own profile to check personal time off
- My Profile Leave Summary –related to check the balance/summary of each leave type on the Profile page
- My Profile Time Off Usage – consulting the percentage of days off and leaves from previous years

- Lateral Time Off Calendar – access, check and use the information from the company shared calendar
- Lateral Time Off – Time Off - related to the action of access of a Time Off tab from the lateral menu

From this analysis, three submodules were highlighted: My Profile – Dashboard, My Profile – Time off, and the Lateral Time Off Calendar as the ones used with the highest usability and at the same time with a high potential to improve in terms of visibility, reliability, legibility and accessibility.

Table 8 - Matrix Table with Submodules and User Perception

User Perception / Sub-modules	Visibility	Usability	Reliability	Legibility	Accessibility
Add Time off button					
My Profile- Dashboard					
My Profile- Time off					
My Profile- Leave Summary					
My Profile- Time off usage					
Lateral Time Off Calendar					
Lateral Time Off Time Off					

High
Medium
Low

4.6 New Service Concept

This exploration phase was the starting point for understanding the user experience and was crucial to prioritize the following work. Although different ways to improve were pointed out, as the company's core businesses are tech services based on multiple working teams, the flow that was chosen for improvement in this work was related to managing team capacity through time off data, mostly focusing on the three highlighted submodules: Profile Dashboard and Time Off and also the Lateral shared calendar. Most Product Owners analyze the team availability weekly, but this is something that can bring an advantage for the company as a whole.

This decision allowed us to move to the next stage, customer experience modeling for managing team capacity, and then getting a complete understanding from time off management to team capacity management, making it possible to improve the service in a global perspective.

Customer Experience Modelling

This stage is an approach for mapping and systematizing the customer experience to support further stages of service design (Teixeira et al., 2012).

At the time, Product Owners were allowed to take some relevant information, but they were not able to manage that information within the system. They needed to use this information and cross it with the client needs manually to analyze and manage team capacity. This allowed them to manage sprint times, define roadmap projects, and form final sub-teams for projects according to the roadmap.

The design of a new service concept was expected to allow them the opportunity to use this information and manage their team capacity within the system, to make this more efficient for teams, strongly foster the active use of the system, and also make it more user-friendly to enhance the user experience.

From the customers considered in the scope of this work, three main activities were found to describe the system service: business growth, related to the business analysis and forecasts that it is possible to do in the system; HR management, which includes services as leave management, timesheet management, and people allocation; and operations processes, such as groceries orders, travel management, and learning processes.

As explained previously, to follow and match company goals, it was chosen to explore the experience of the services related to HR management, precisely Time Off Management. Most of the features of these core activities were available for most of the customers (some are blocked with security permissions) so that more people could be positively impacted and are represented in Figure 13.

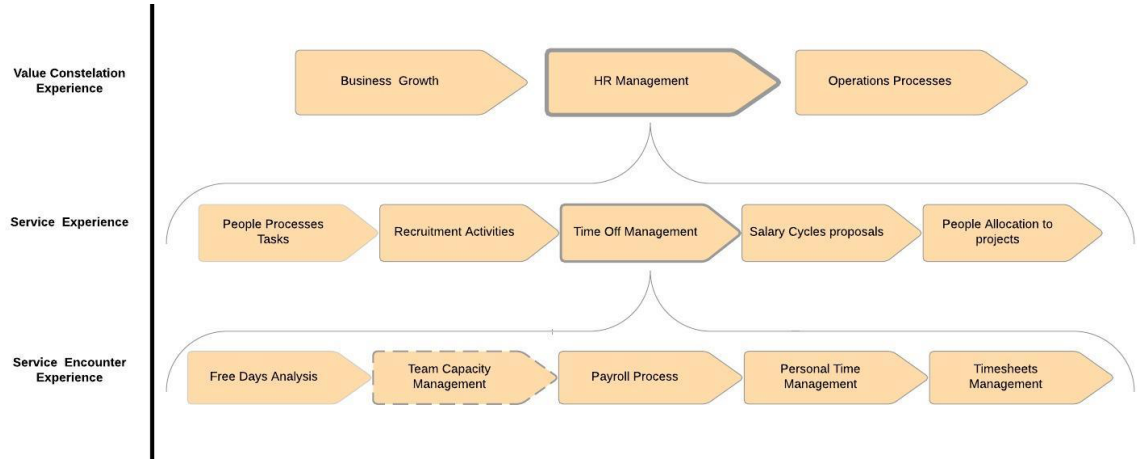

Figure 13 - HR Management Related Activities

A factsheet with the descriptive data resulting from the analysis was created (see Appendix A), and Figure 14 depicts the CEM for the system as a service provider.

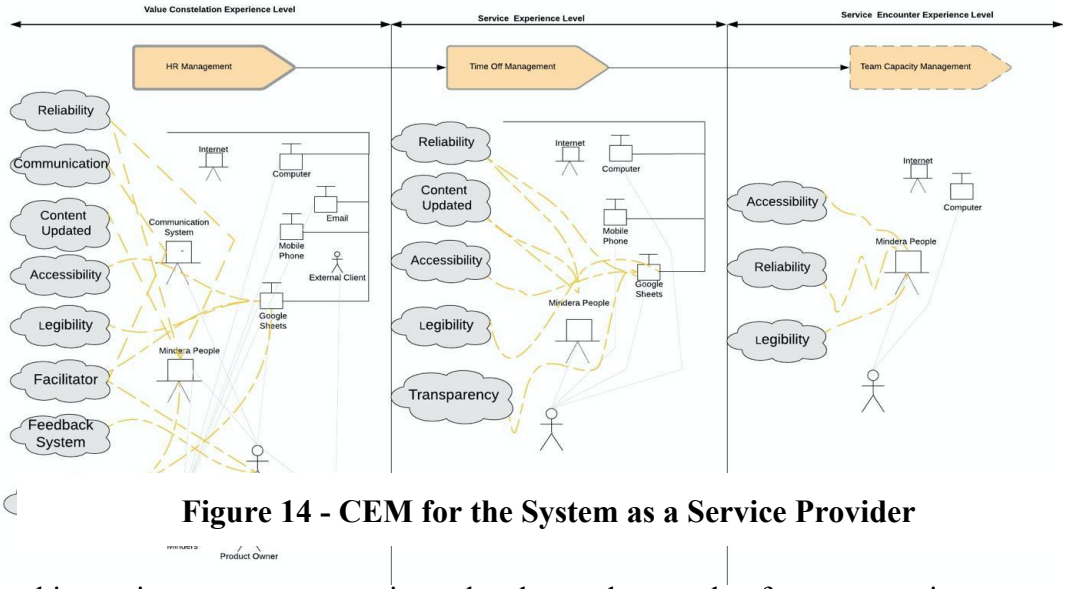

Figure 14 - CEM for the System as a Service Provider

From this service encounter experience level, a real example of a customer journey regarding team capacity management is represented in Figure 15. In this map, the level of experience in terms of feelings, main stages, and touchpoints was defined. It is clear that most of the journey has strong potential to improve in terms of experience and effectiveness. Different pain points were observed, such as outdated data and the need to use additional documents to be able to extract actual results to manage the team.

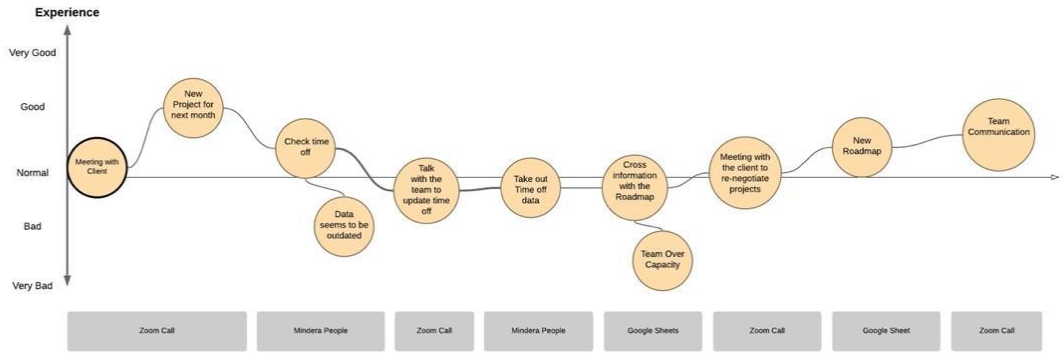

Figure 15 - Customer Journey for Managing Team Capacity

From the interview results and the development of the experience modeling frameworks, it was possible to create an adaptive Customer Value Constellation for the current service offering (Figure 16) to be used as a starting point. At this moment, this new service concept is outside the system, as shown below.

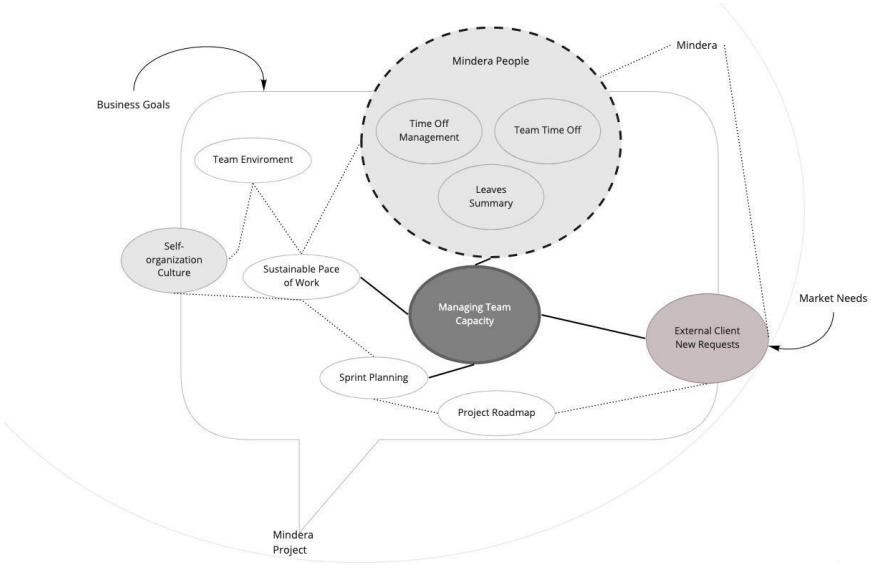

Figure 16 - CVC for the current offer for Team Capacity Management

From the exploration phase and customer experience modeling, the next step should have been the design of a new service. However, the company decided to launch a beta version for this new feature (see appendix B). Both system architecture and navigation were done by the Dev team and Product Owner based on all data gathered from previous stages. As shown in chapter five, in order to achieve the main goal and create a solution focused on users and their needs, this version was used to gather richer insights from a group of Product Owners that are critical stakeholders for this service. The beta version was used as a model to refine and improve the final solution. Due to the time constraints and the company's pace in moving this to production to be used by its staff members, it was decided not to develop new SSA and SSN since the system already existed and was already being operated for a significant time. For these reasons, this work had three more stages: a Collaborative Workshop to have more rich insights from key actors; Service Encounter - Service Experience Blueprint for a product owner managing its team time off; and the Prototype for this improved experience.

5 Designing the New Service Offering

This chapter will show the final results of this study. To achieve that, part of the MSD method was followed by creating different models: service concept with the extended customer value constellation and the service experience blueprint. Finally, a mockup is shown as an improved version.

To validate previous insights from interviews, an online collaborative workshop was held with five Product Owners. This workshop was done via Zoom Call, and it was divided into two main moments. The first one consisted in a brainstorming phase to gather more rich additional perceptions related to this new concept and also create an extended version of the CVC. The second was to validate the beta version, discuss and refine it (see appendix C).

It started with an explanation of the results from interviews and also showed the current CVC (Figure 17). The idea was to co-design with the Product Owners, so a collaborative online platform was used, Miro White Board (miro.com). This platform allows the actors to interact and place post-its with key ideas regarding this subject (see appendix B).

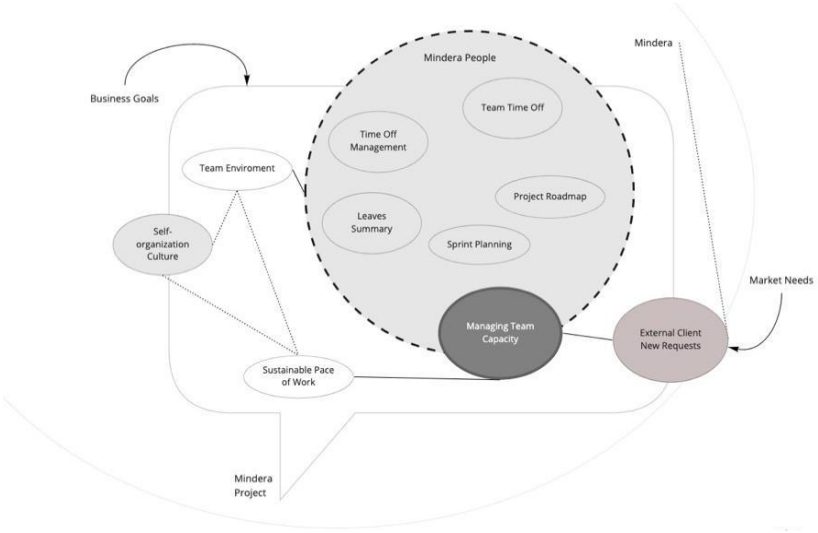

Figure 17 - Extended CVC for Team Capacity Management

This adaptative constellation is aggregating different activities from the system, project, company, and also external inputs such as business goals and market needs. During the second moment in the workshop, it was possible to go through the new functionalities the system provides and discuss them.

Some things that were highlighted in this new service were the following (see images in appendix B):

- the opportunity to create a personal dashboard and choose different modules to display:
    - My Time Off Calendar;
    - My Time Off Summary;
    - My Time Off Summary Chart;

  - My Upcoming Time Off;
  - My Team Capacity;
  - other models related to HR management but not associated with time off.
- adding Time off makes it possible to have visual feedback on off days booked;
- on Time Off Profile, the historical data is now more well organized and more intuitive to check;
- on the company shared calendar, now it is possible to search by name, which makes this process easier, since until now the names were disorganized, so if someone needed to check some teammate time off, this could take too much time.
- select a dashboard with specific modules, associated with avoiding the need to create one:
  - Default Dashboard;
  - Time Off Dashboard;
  - People Moves Dashboard;
- have a specific module for Team Capacity management, where it is possible to see the capacity for the next two months, with results displayed according to filters (by the type of role, policy leave, person, team, and location), and by selecting the column of each day, it is possible to see displayed the number of people available and unavailable for that moment.

Figure 18 - Online Co-creative Workshop - Validation and Refinement Beta Version

Although it is possible to filter by team, this feature of "creating teams" is only available for Account Owners. It means that, for Product Owners that are not Account Owners of their project are not able to create teams/sub-teams in the system. Each color of the board in Figure 16 is from a different Product Owner. The idea was to receive as many insights as possible from

people with diverse backgrounds and experiences. The projects that they were involved varied in terms of the number of people (some projects have six team members and the largest have sixty). In terms of organization, some teams need to insert their time in their clients' calendars and they also have different needs in terms of pressure to have this kind of accuracy in capacity data.

Despite project differences, they presented similar interests, and to make the results clearer, all the insights were joined into groups in order to define the new "must-haves" for this service experience, to make this solution more suitable and user-friendly:

- Scrum Details and Organization;
- Push notifications and Reminders;
- Overview and sub-teams (with flexibility);
- Milestones;
- Calendar Flexibility.

At this moment, the work moved to the design of the delivery system - service experience blueprint. This tool was expected to present the activities and how they are supported, interfaces, and also the users' paths through the system.

5.1 Service Encounter – Service Experience Blueprint for Managing Team after a new request

As explained previously, the design of SSA and SSN for the beta version was done by the Dev team, so it was decided to focus mostly on detailing how to make this user experience seamless.

One key activity that deserved being explored in more detail was the flow of the process from new requests until setting up a new team (the current experience was systematized on a customer journey in Figure 13). For this, the Service Experience Blueprint was applied to detail all the interaction between the user and the system, its related backend, and frontend activities. This process is presented in Figure 19.

The trigger action is the request from the client via Email or a Zoom call during a meeting. The Product Owner picks this Capabilities Document (CAP), which usually explains all the details for a new project, including requirements and acceptance criteria, and meets with the team via Zoom call again to create a document with all project needs well defined, i.e., roles and effort with a high-level estimate. The user then accesses the system and selects the range of needs for this new project, which can be the number of people by role, the data range if there are deadlines for the project, and also the priority. The backend system uses this information and starts analyzing the percentage of accuracy in data, and if it finds some possibly outdated data, it sends a notification for team members to update it. If everything is accurate, the system should display all the capacity of the team for that specific range of needs. If the capacity of the team is not enough, the operations team should receive a notification for new recruitment needs. Otherwise, if the capacity is enough, the Product Owner should select which team members should integrate this new team and set the related milestones in the system. The backend system must use this information and send reminders with relevant information for team members such as: to update time off; or if there is some "time-off conflict" with other team members that could

negatively impact the project. With this new team formed, the Product Owner can send through the system a document with all team/project details and a roadmap defined for the client.

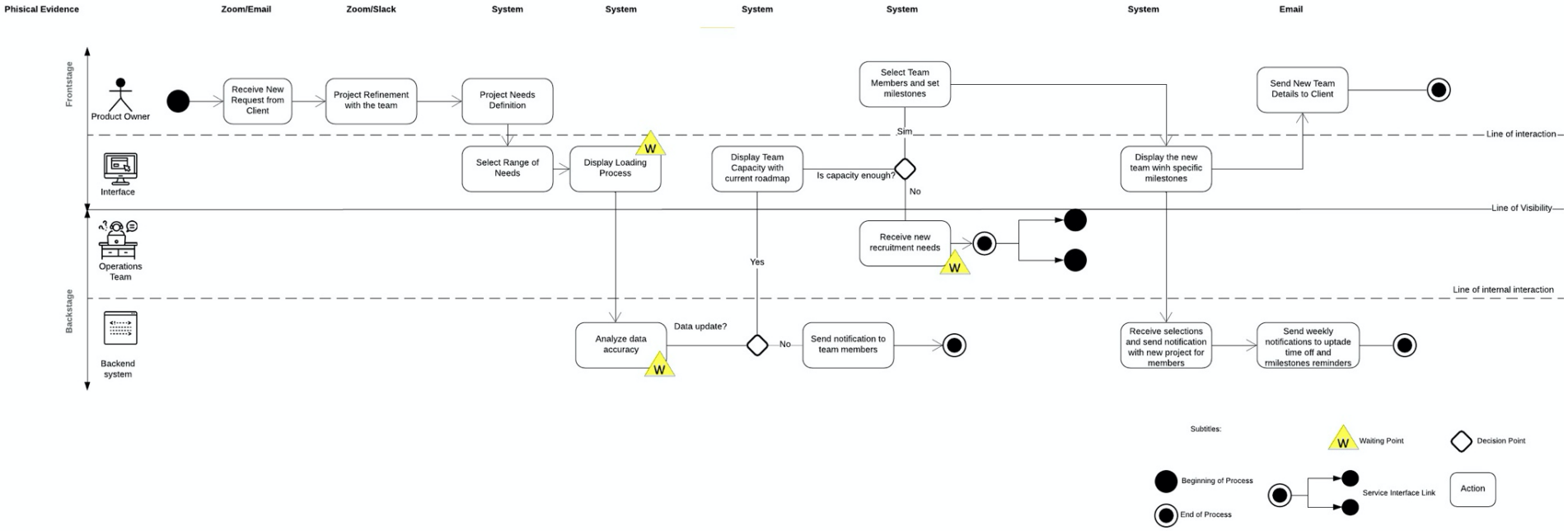

Figure 19 - Service Experience Blueprint for managing team capacity

5.2 Prototyping

This chapter presents the low fidelity mockups prepared to represent the new service concept developed during this work.

The first example, in Figure 20 , shows the module for team capacity with a different view of it – from portrait orientation to landscape orientation: the goal is to make this information more intuitive. Since the user is already used to seeing this information in a calendar view, it was decided that this view is more suitable to their needs. Another detail is the option to split the calendar into sprints on top of it (this sprint planning must be editable as needed). Also, the opportunity to select by labels means that each project can tailor its view. For instance, some projects are organized by backend and frontend teams, and others are organized by Android and iOS teams. In this overview, it is possible to find the milestones for the team as a whole and easily see and access the sub-teams' different tabs. This makes the calendar view more flexible, allowing the user to scroll back and forward in time.

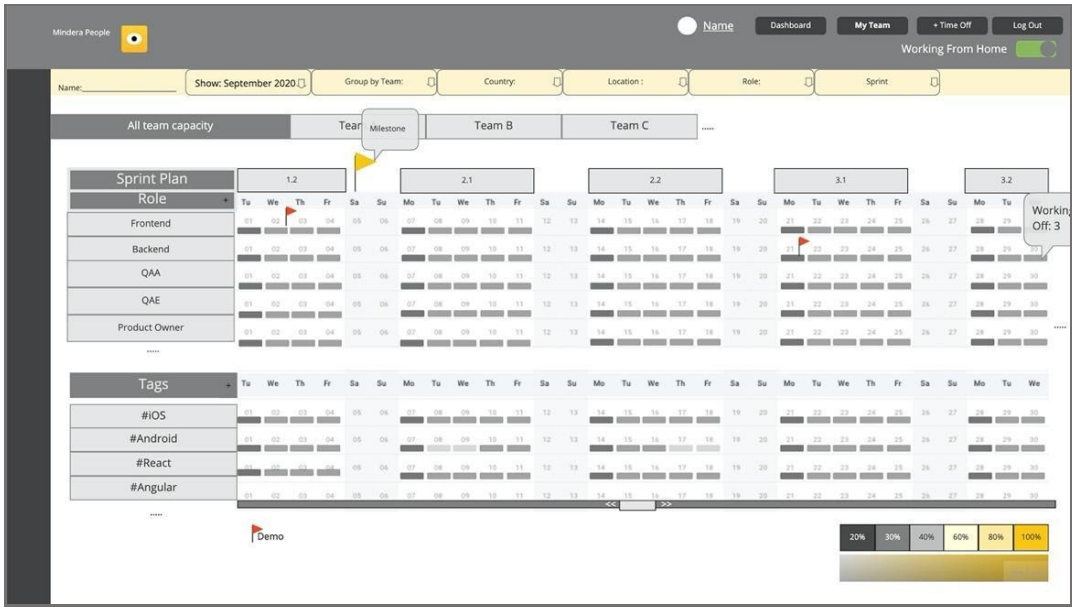

Figure 20 - Team Overview Mockup

Following the service experience blueprint example, after preparing the document with project needs, Product Owners are able to select the range of requirements to filter the possible team members available for the new project (Figure 21). In this case, the selection is the date range, roles needed, and also effort time to develop according to the high-level estimation from refinement. Here, users can select who is going to join and create a new team. This view also makes it possible to see the time off of each member and other details such as on-call members and milestones scheduled for the project. The bottom shows some graphics with relevant information, in this case the percentage of capacity by role. For instance, if there were not enough members available, the system should ask if there is a need to send a request for a recruitment team.

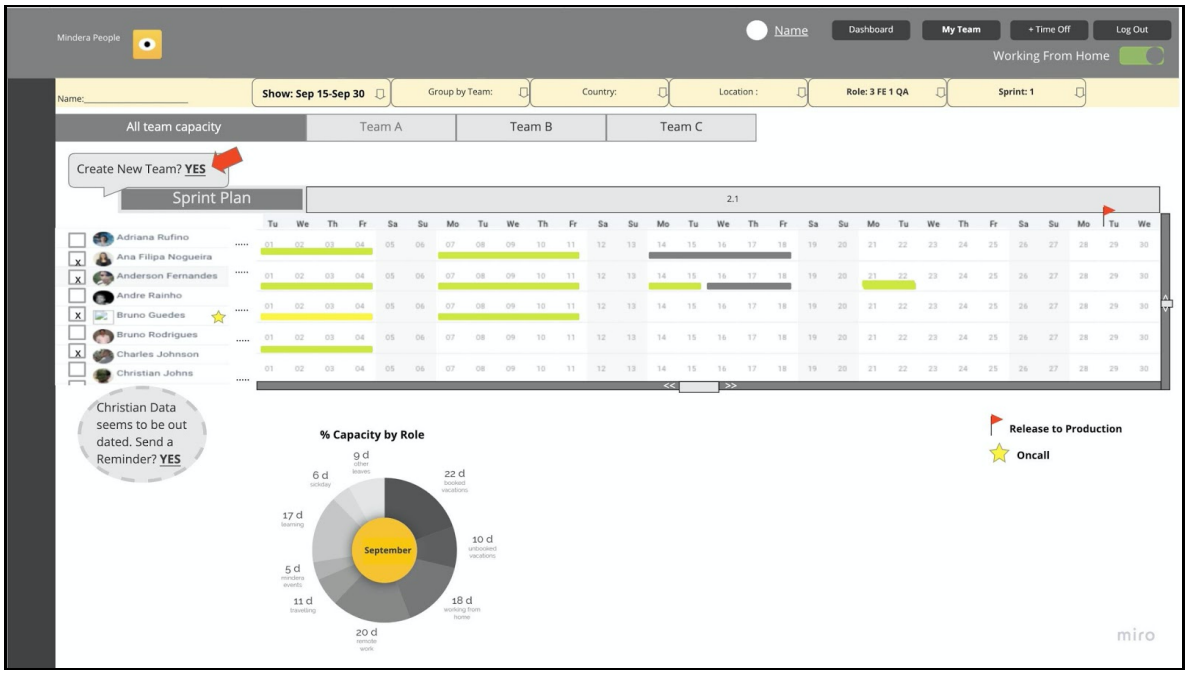

Figure 21 - Mockup for Team Selection from Team Capacity

Once a new team is created, a new tab shows it side by side with other groups (Figure 22). In this new view, more detailed information is brought up to the user's perspective: team time off, upcoming events and also team bookings are displayed. A chat module is also available for direct communication with team members and clients, to send and receive team/project updates.

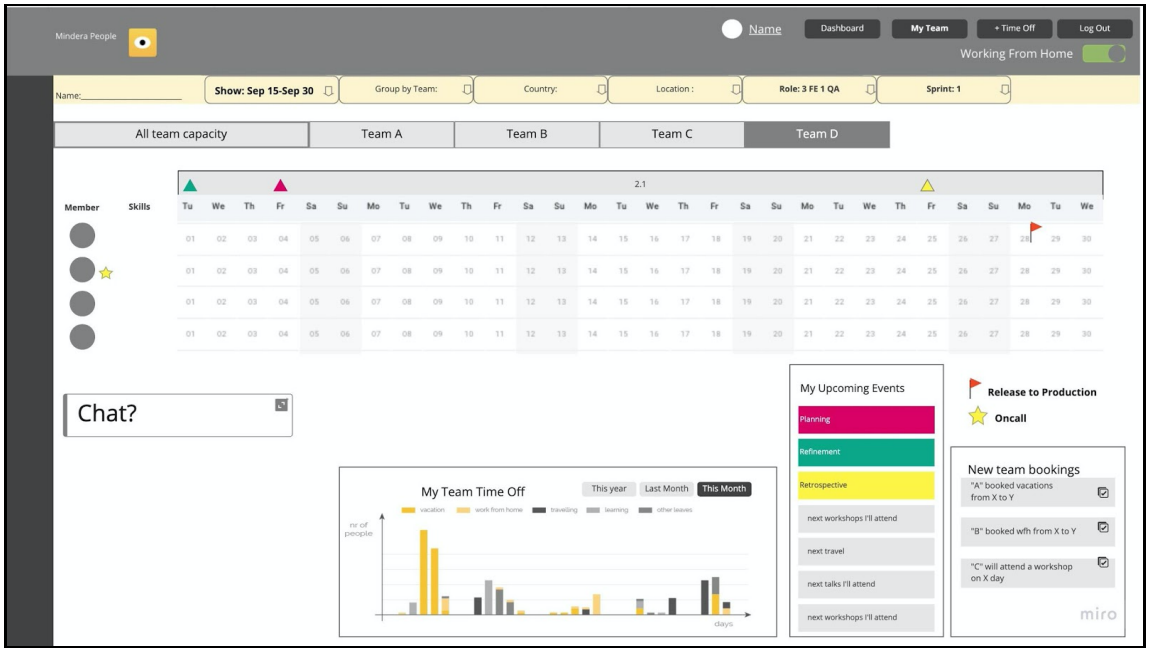

Figure 22 - Managing Team Mockup

6 Conclusion and Future Research

This work was carried out in an IT start-up with a self-organization culture which could be translated into two particularities. On one hand, the system of interest was one that its staff members had to use daily, which means that they were struggling while performing simple tasks, a fact that was enhanced with the pandemic that occurred during the study. For instance, several workers needed to take care of their children almost every day during this period. Also, since all teams were working remotely for the first time, and the company has a unique culture based on self-organization principles, which means (among other things) that there are no restrictions on starting/finishing work hours, this time-off information needed to be updated in the system. On the other hand, the company's operations are based on Agile principles. This means that from the company's point of view, it is essential to perform a continuous delivery to get richer insights from the users and then have the opportunity to refine and test.

This context made this study more urgent since it had the potential to result in a good impact for every staff member, facilitating the aspects of their work-life balance dealing with time off related tasks, and from the company perspective for the management of the teams, seeking not to impact the final client.

This work aimed to develop a deeper understanding of customer experience using the company's Human Resources Management Information System, and use service design techniques to improve and turn its potential into an active tool.

The first objective of this work was concerned with understanding the users' experience, their needs, and all activities, and it was successfully achieved. The approach chosen to conduct the interviews focused bought out very relevant results for the study and the company. The data that were gathered and analyzed allowed some incremental improvements on the product not only related to time off but also other modules. Regarding the Time Off module, most of the users saw it as an essential tool, however they felt that there was much to improve. From all seven submodules of the time-off system, the users felt that for only two the usability was low. For the other five, the frequency of use was mostly high. However, from these five, at least three were ranked medium to low in terms of visibility, reliability, legibility, and accessibility. This finding was crucial to define the steps forward. After this stage, it was decided to launch a beta version of the new concept within other improvements.

The second objective, finding the gap from time off information to managing team capacity, was also achieved. After the exploration phase, when the work diverged into multiple possible improvements for different reasons, it was decided to converge on Team Capacity Management for development within the scope of this study. A co-creative online workshop was then held with key stakeholders to diverge again and gather richer insights, now further in line with this specific goal. The beta version was discussed and refined and it was possible, after customer experience modeling and the workshop, to define an extended value customer constellation and, therefore, the new service concept based on the beta version.

The final objective involved the application of service design techniques, namely Multilevel Service Design to the delivery of the service concept. The service experience blueprint was developed in the scope of this work, while due to the company's evolving time constraints and urgency to launch the beta version and bring the solution to the users, in this case, all staff members, some models were simultaneously prepared by the team allocated to the development of the system. The overall result was optimistic, and the feedback of the users for the new changes was highly positive.

For future work, it would be critical to further study other modules of the system. While it is complete in terms of functionality, it lags in user experience. Doing an in-depth exploration on other parts of the system could bring a significant advantage for the users and the company. It would also be promision to apply service design in a more holistic perspective to involve external clients, suppliers and external recruitment agencies for instance, which was beyond the scope of this project.

Another option for future work is to extend it to other services in an IT company that are not related to technology. In the case of the company where this work was carried out, from cleaning services to a nonprofit association, service design principles have the potential to leverage every experience. Finally, it would be beneficial to have data to measure the gains of this application, in terms of user adoption and percentage of accuracy in data, in line with user satisfaction, a good relationship between company and staff members, and the improvement on business management as a whole.

References

Aiman-Smith, L., & Green, S. G. (2002). Implementing new manufacturing technology: The related effects of technology characteristics and user learning activities. *Academy of Management Journal, 45*(2), 421-430.

Barthélemy, J.-P., Bisdorff, R., & Coppin, G. (2002). Human centered processes and decision support systems. *European Journal of Operational Research, 136*(2), 233-252.

Benfatto, M. C. (2010). *Human Resource Information Systems and the performance of the Human Resource Function.* LUISS Guido Carli,

Brooks, K., & Nafukho, F. M. (2006). Human resource development, social capital, emotional intelligence. *Journal of European industrial training*.

Brown, T. (2008). Design thinking. *Harvard business review, 86*(6), 84.

Choy, L. T. (2014). The strengths and weaknesses of research methodology: Comparison and complimentary between qualitative and quantitative approaches. *IOSR Journal of Humanities and Social Science, 19*(4), 99-104.

Creswell, J. W., & Zhang, W. (2009). The application of mixed methods designs to trauma research. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies, 22*(6), 612-621.

DeSanctis, G. (1986). Human resource information systems: a current assessment. *MIS quarterly*, 15-27.

Dubberly, H., & Evenson, S. (2008). On modeling The analysis-systhesis bridge model. *interactions, 15*(2), 57-61.

Dunivan, L. (1991). Implementing a user-driven human resource information system. *Journal of Systems Management, 42*(10), 13.

Hennessey Jr, H. (1979). Computer applications in human resource information systems. *Human Resource Planning, 2*(4), 205-213.

Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design science in information systems research. *MIS quarterly*, 75-105.

Holmlid, S., & Evenson, S. (2008). Bringing service design to service sciences, management and engineering. In *Service science, management and engineering education for the 21st century* (pp. 341-345): Springer.

Kashive, N. (2011). Managing today's workforce: Human Resource Information System (HRIS), its challenge and opportunities. *International Journal of Research in Finance & Marketing, 1*(6), 38-66.

Kovach, K. A., & Cathcart Jr, C. E. (1999). Human resource information systems (HRIS): Providing business with rapid data access, information exchange and strategic advantage. *Public personnel management, 28*(2), 275-282.

Kovach, K. A., Hughes, A. A., Fagan, P., & Maggitti, P. G. (2002). Administrative and strategic advantages of HRIS. *Employment Relations Today, 29*(2), 43-48.

Mager, B. (2009). Service design as an emerging field. *Designing services with innovative methods, 1*, 27-43.

Maxwell, M., Harris, F., Hibberd, C., Donaghy, E., Pratt, R., Williams, C., . . . Burton, C. (2013). A qualitative study of primary care professionals' views of case finding for depression in patients with diabetes or coronary heart disease in the UK. *BMC family practice, 14*(1), 1-8.

McAfee, A. (2003). When too much IT knowledge is a dangerous thing. *MIT Sloan management review, 44*(2), 83.

Michel, S., Brown, S. W., & Gallan, A. S. (2008). An expanded and strategic view of discontinuous innovations: deploying a service-dominant logic. *Journal of the academy of marketing science, 36*(1), 54-66.

Neuman, W. L. (2014). *Basics of social research*: Pearson/Allyn and Bacon.

Patrício, L., & Fisk, R. P. (2013). Creating new services. *Serving customers globally*, 185-207.

Patrício, L., Fisk, R. P., Falcão e Cunha, J., & Constantine, L. (2011). Multilevel service design: from customer value constellation to service experience blueprinting. *Journal of service Research, 14*(2), 180-200.

Piccoli, G., & Ives, B. (2005). IT-dependent strategic initiatives and sustained competitive advantage: a review and synthesis of the literature. *MIS quarterly, 29*(4), 747-776.

Queirós, A., Faria, D., & Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. *European Journal of Education Studies*.

Reich, B. H., & Benbasat, I. (1990). An empirical investigation of factors influencing the success of customer-oriented strategic systems. *Information Systems Research, 1*(3), 325-347.

Sale, J. E., Lohfeld, L. H., & Brazil, K. (2002). Revisiting the quantitative-qualitative debate: Implications for mixed-methods research. *Quality and quantity, 36*(1), 43-53.

Shaw, C., & Ivens, J. (2002). *Building great customer experiences* (Vol. 241): Springer.

Shneiderman, B. (2000). Designing trust into online experiences. *Communications of the ACM, 43*(12), 57-59.

Stickdorn, M., Hormess, M. E., Lawrence, A., & Schneider, J. (2018). *This is service design doing: applying service design thinking in the real world*: " O'Reilly Media, Inc.".

Teixeira, J., Patrício, L., Nunes, N. J., Nóbrega, L., Fisk, R. P., & Constantine, L. (2012). Customer experience modeling: from customer experience to service design. *Journal of Service management*.

Tuli, F. (2010). The basis of distinction between qualitative and quantitative research in social science: Reflection on ontological, epistemological and methodological perspectives. *Ethiopian Journal of Education and Sciences, 6*(1).

Veryzer, R. W., & Borja de Mozota, B. (2005). The impact of user-oriented design on new product development: An examination of fundamental relationships. *Journal of product innovation management, 22*(2), 128-143.

Zhang, J., Patel, V. L., Johnson, K. A., & Smith, J. W. (2002). Designing human-centered distributed information systems. *IEEE intelligent systems, 17*(5), 42-47.

Zhang, T., & Dong, H. (2009). Human-centred design: an emergent conceptual model.

APPENDIX A: Factsheet with the descriptive data of analysis

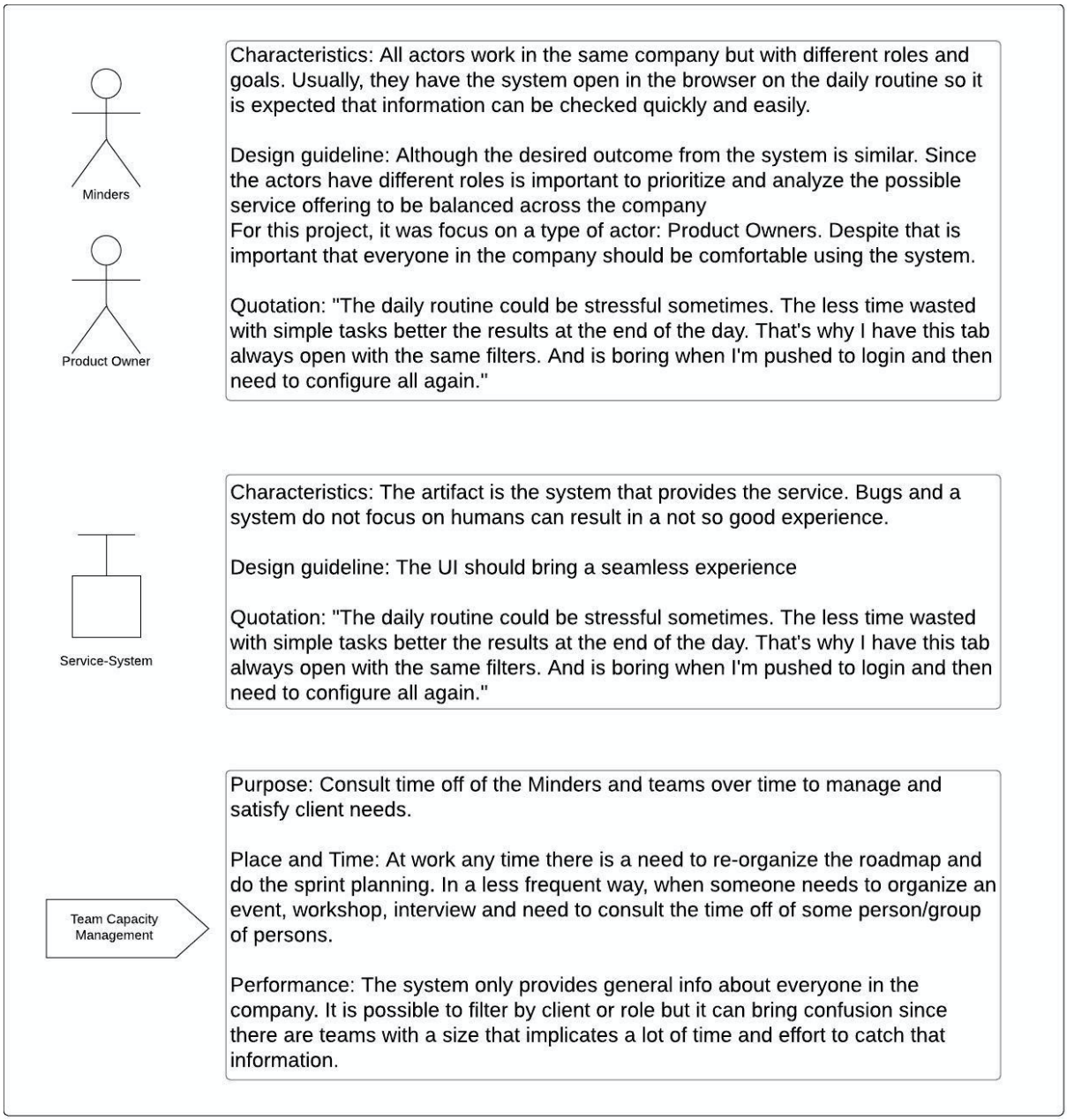

Figure 23 - Factsheet with descriptive data analysis

APPENDIX B: Beta Version Examples

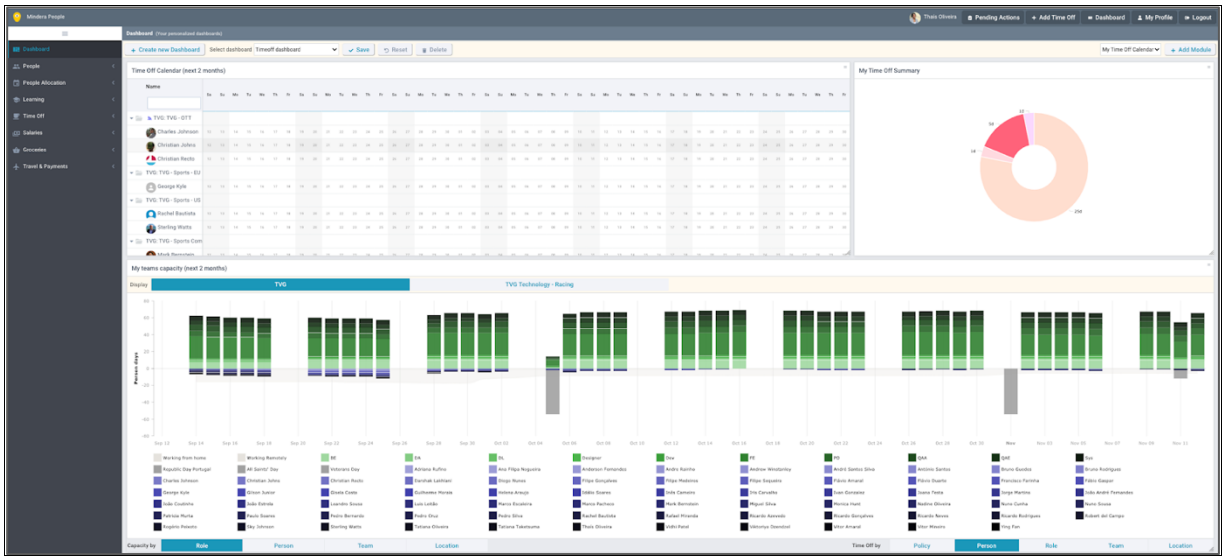

Figure 24 - Team Capacity Management new module

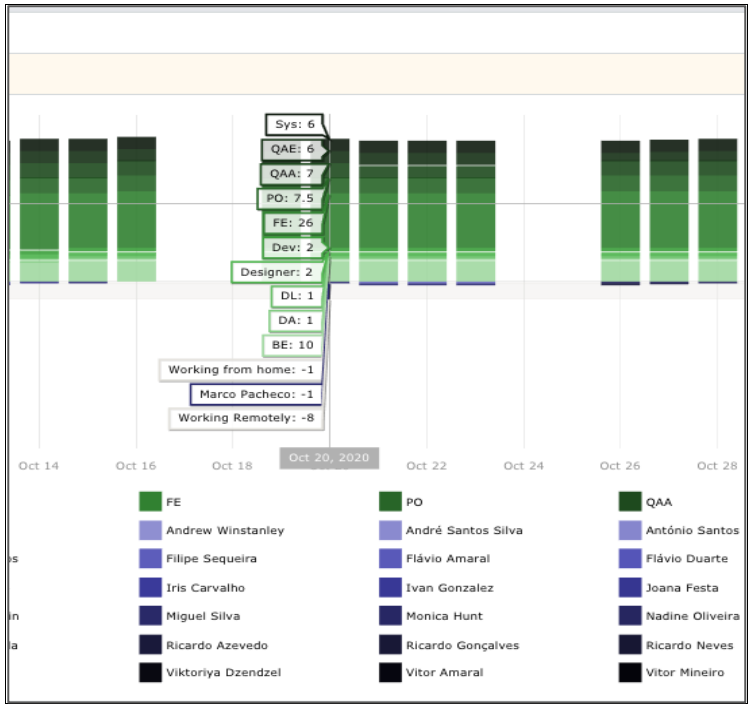

Figure 25 - Team Capacity Details

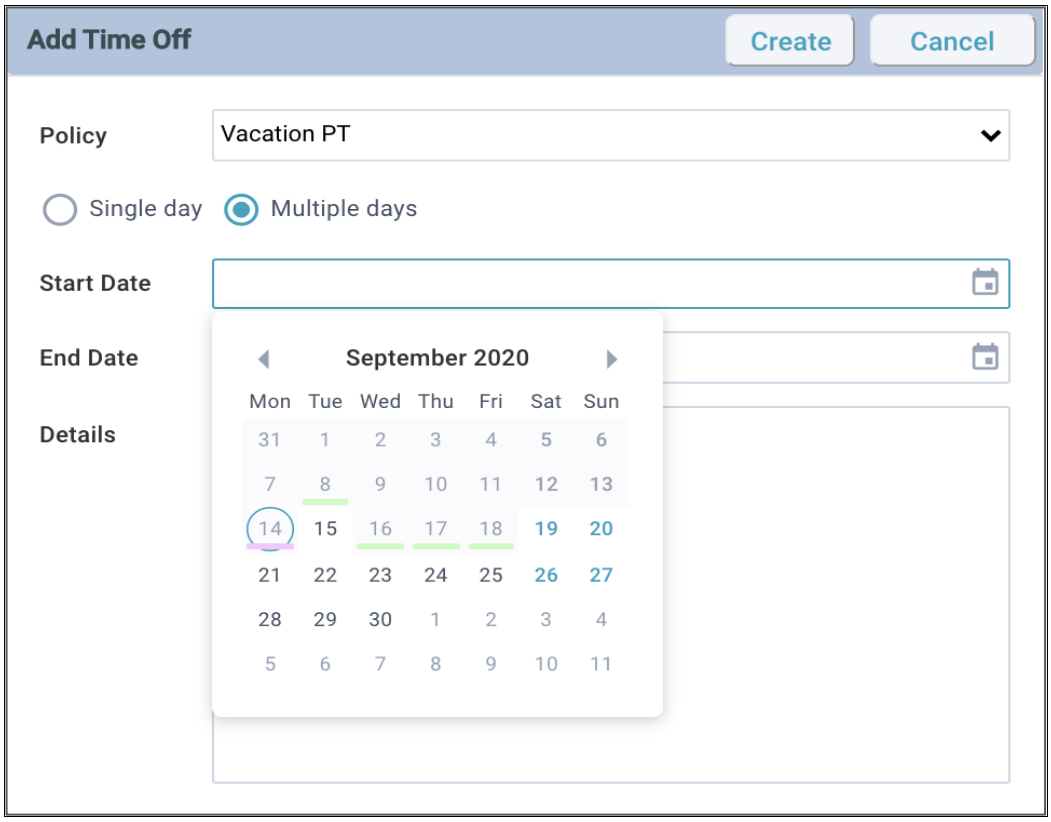

Figure 26 - New view for Time Off Form

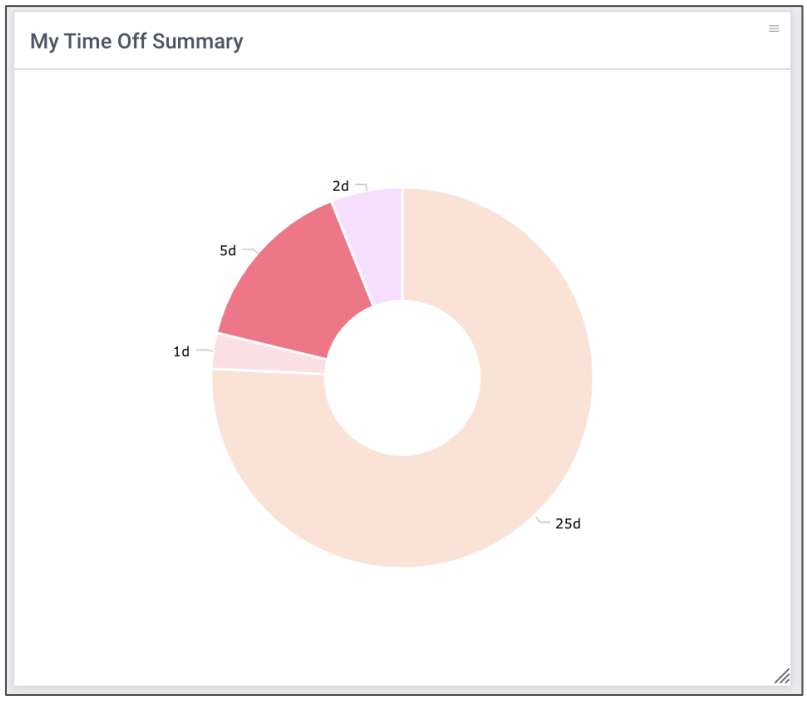

Figure 27 - My Time Off Summary Chart

APPENDIX C: Screenshots of Workshops 1st and 2nd parts

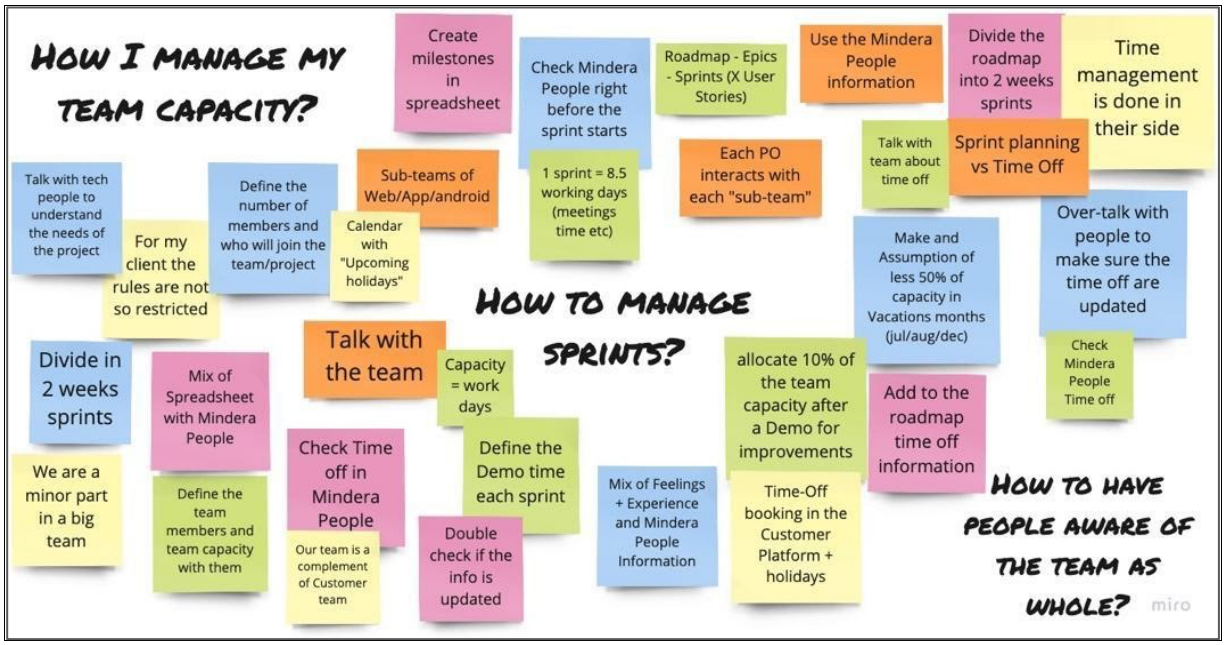

Figure 28 - Online Workshop Part I: Co-creative Brainstorming