Enhancing customer satisfaction towards UI&UX in a Real Estate CRM

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Gostaria de expressar a minha gratidão aos meus pais, que sempre me encorajaram a prosseguir a minha educação e deram-me todos os recursos necessários para o meu sucesso. Eles foram os principais pilares na concretização deste objetivo.

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I can honestly say that I wouldn't be working on this right now if I didn't have such wonderful individuals in my life to help and guide me along the way:

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Resumo

Apesar do crescimento das instalações de CRM, os projetos e-CRM ainda têm uma taxa de fracasso significativa, mesmo após investimentos substanciais na tecnologia de CRM. As elevadas taxas de falhas significam que os atuais requisitos para o desenvolvimento e conceção de CRM precisam de ser analisados. Não basta olhar apenas para os resultados relacionados com a eficiência de um serviço; é também crucial considerar o impacto na experiência do utilizador e o seu nível geral de satisfação. Dado que o CRM é uma estratégia empresarial centrada nas pessoas, é pertinente questionar quanto progresso pode ser feito num campo igualmente centrado nas pessoas, como a Área Imobiliária, através do desenvolvimento e utilização de uma abordagem de conceção centrada no utilizador.

Este estudo visa integrar um sistema móvel de gestão da relação com o cliente (m-CRM) com um sistema eletrónico de gestão da relação com o cliente (e-CRM) para aumentar a lealdade, satisfação e desempenho do cliente através de uma interface de fácil utilização. A investigação dos utilizadores, entrevistas preliminares, cinco entrevistas de usabilidade, e inquéritos de satisfação confirmaram a funcionalidade implementada e para cada iteração, um especialista foi utilizado para avaliá-la. Cada entrevista contribuiu para o modelo de DSR utilizado para criar e avaliar o artefacto.

Foi determinado que a solução para esta interface Desktop pode melhorar a facilidade de utilização de CRM e a satisfação do utilizador, beneficiando assim a indústria imobiliária através de ligações reforçadas e de uma supervisão mais direta e fácil do desempenho dos profissionais.

Palavras-chave: Sistemas de Informação; Setor Imobiliário; Customer Relationship Management; Experiência do Utilizador, Interface do Utilizador, Design Centrado no Homem.

Abstract

Despite the growth in CRM installations, e-CRM projects still have a significant failure rate, even after substantial investments in CRM technology. High rates of failure mean that the current requirements for developing and designing CRM need to be analysed. It's not enough to just look at data related to a service's efficiency; it's also crucial to consider the impact on the user experience and their overall level of satisfaction. Given that CRM is a people-centric business strategy, it's pertinent to wonder how much progress may be made in a similarly people-centric field like Real Estate through the development and use of a user-centred design approach.

This study aims to seamlessly integrate a mobile customer relationship management (m-CRM) system with an electronic customer relationship management (e-CRM) system to increase customer loyalty, satisfaction, and performance through a user-friendly interface. User research, preliminary interviews, five usability interviews, and satisfaction surveys confirmed the functionality implemented and for each iteration, an expert was used to evaluate it. For this artefact's creation and assessment, the DSR technique was used, with each interview serving as a data point for the model.

It was determined that the Desktop interface solution may improve this CRM's ease of use and user satisfaction, thereby benefiting the real estate industry through strengthened connections and more straightforward oversight of professionals' performances.

Keywords: Information Systems; Real Estate; Customer Relationship Management; User Experience; User Interface; Human-Centred Design

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List of Acronyms

CRM	-	Customer Relationship Management
CSUQ	-	Computer System Usability Questionnaire
DSR	-	Design Science Research
e-CRM	-	Electronic customer relationship management
GL	-	Grey Literature
HCD	-	Human-Centred Design
IS	-	Information System
IT	-	Information Technology
m-CRM	-	Mobile Customer Relationship Management
RE	-	Real Estate
RM	-	Relation Marketing
SFA	-	Sales Force Automation
SLR	-	Systematic Literature Review
UI	-	User Interface
UX	-	User Experience

CHAPTER 1

Introduction

1.1. Context

Nowadays, the ability to share and transfer data easily through the internet and web services, has managed a visible impact on our society, seeing that there is a significant shift in the online presence seen in the modern 21st century [1].

Seeing that the cost of acquisition is five to ten times higher than retention [2], modern companies, are continually seeking the best approaches to gain competitive advantages over their adversaries on the market. Therefore, there is a constant need to build customer-oriented strategies to strengthen long-lasting relationships with current and potential customers to prevent customers from switching to other companies [3], [4]. However, this goal is becoming increasingly more difficult with the fast advances in technology [2], [4] and each company must invest in their own personalized business strategy and information system (IS), to understand their customers' needs and expectations [3].

Customer Relationship Management (CRM), as an extension of Relation Marketing (RM), started getting traction in the 1990s, however its meaning has been gradually changing over the last decades. In the 1990s, CRM was viewed merely as a management concept or strategy that helped businesses retain customers [5], that is, data on customers was still accessed and stored manually, resulting in subpar performance, productivity, and customer suggestions and relationships [1]. A decade later, in the 2000s, it refined into a technique mostly related with Information Technology (IT), often mentioned as a piece of software, a component of e-commerce or a management function for long-lasting relationships with customers. Finally, in the 2010s, it stabilized as comprehensive strategy for customer acquisition, retention, and partnership so to enhance customer value and a higher profitability within a company. It evolves features such as marketing integration, sales, and customer service [5].

The rapid growth of the internet, asked for a necessary CRM adjustment, known today as electronic customer relationship management (e-CRM). E-customer relationship management is a modernization of conventional CRM that employs internet tools for data storage, data gathering, and data processing. The ability to identify the most profitable clients, the reduction of costs connected with managing online customers, the execution of a targeted and individualized marketing strategy, the capability to increase sales, are a few of these features [3], [6].

Therefore, the internet's ability to convey the desired information in such a convenient measure has guided many businesses into an e-commerce status. Real Estate (RE) marks as one of the businesses that benefits from the previous statements, seeing that an e-commerce provides a superior environment for communication and transactions between stakeholders and customers [7]. In fact, before the Internet, the RE commerce was constrained to its geographical area and its marketing restricted to print media, making the industry progress and success extraordinarily limited. The internet allows RE to overcome these issues by granting an international geographical expansion and a prosperous environment for efficient and dynamic collaborations between agents, buyers, sellers, and financiers. Additionally, e-business models are essential for a company's success and translate how they create, deliver and capture value. Understanding what business models will benefit the company and how to establish them becomes mandatory to develop a successful and desirable e-commerce [7].

Thus, since RE prospers from maintaining and creating profitable customer relationships, transactions, and marketing, considering e-CRM for the industry's business model can be beneficial. However, a proper implementation becomes crucial for an e-CRM, since customer loyalty is significantly more difficult to establish in an internet provided environment [5] and so, it is imperative to have a clear notion of the dynamics and best practises within an e-CRM.

1.2. Motivation

Even though, the internet paves a favourable path for CRM implementations as seen previously, it is important to notice that its success lies firmly in a well thought and designed implementation that matches the e-business environment. Thus, e-CRM must be properly tested in its appropriate contexts of use to evaluate the corresponding performance and user engagement [4].

In 2002, research was conducted by Hammill and Stevenson, that stated that around 65% of the projects surrounding e-CRMs failed and that it was estimated that this number was yet to increase to 85%. Additionally, a study conducted in 2004 by Zablah et al., concluded that even though numerous resources are spent in CRM technology, reports still show a high failure rate [4]. Similarly, analysts like Gartner, AMR, and Forrester Research, conducted research from 2001 till 2009, where analyst firms disclosed failure rates in CRMs up to 70%, and more than 50% described expectations were not met. However, between 2002 and 2010, a 22% increase rate was established in CRM implementations, showing a present prevalence [4].

As a result of the high failure rates, it becomes necessary to examine the current development of CRM and what design prerequisites should be required for a visible improvement [8]. Currently, the focus has been on why and how customers interact with the services instead of analysing their performance, usability, and satisfaction [4]. Considering CRM is a human-centred business methodology, it is important to challenge how much value developing and implementing an equally human-centred design (HCD) methodology, with the adequate User Experience (UX) and User Interface (UI) practises, will add.

1.3. Objectives

The major goal of this research is to learn how to successfully transform a mobile customer relationship management system (m-CRM) into an electronic customer relationship management system (e-CRM), with the customer as the focus throughout the whole design process. Having a welcoming interface that encourages long-term interactions will lead to increased customer loyalty, contentment, and productivity.

Taking into consideration, the mixed results presented in the past regarding usability guidelines to follow when developing an e-CRM and the lack of a concrete concern towards standardizing or even acknowledging UX as well as UI practices while conducting a human-centric development of an e-CRM, as stated in chapter 2.4, a RE e-CRM was developed to solve the following research question:

1. What is the best UI/UX techniques to apply in a RE e-CRM?

1.4. Dissertation Structure

Following this introductory material, the study is structured as follows: chapter two is dedicated to discussing the available literature on the subject. After a brief overview of the theoretical foundations, the study goes on to detail the existing research in this area. To improve the useful work presented in this chapter, a rigorous literature review was carried out. In chapter three, the methodology used to conduct this study is described. The suggestions and conclusions drawn from each iteration's discussions, such as the outcomes of usability testing, are given in the fourth chapter. The final chapter describes the most significant findings, the limitations of this study, the essential takeaways, and ideas for further research.

CHAPTER 2

State of the Art

In view of overcoming the disparity and lack of information surrounding the good practices regarding UX/UI during initial research, a Systematic Literature Review (SLR) was conducted to execute a thorough analysis of CRM, and its functionalities and the corresponding UX and UI practises and methodologies.

An SLR is a methodology that allows for a meticulous, transparent, and systematic literature to answer a distinct formulated question and to thoroughly evaluate, analyse, and synthesize the existing work composed by researchers, scholars, and practitioners [9].

Considering, the SLR conducted follows the guidelines proposed by the author Kitchenham [10] and the authors Jane Webster and Watson [11].

The steps taken to conduct the literature review are detailed in Figure 1.
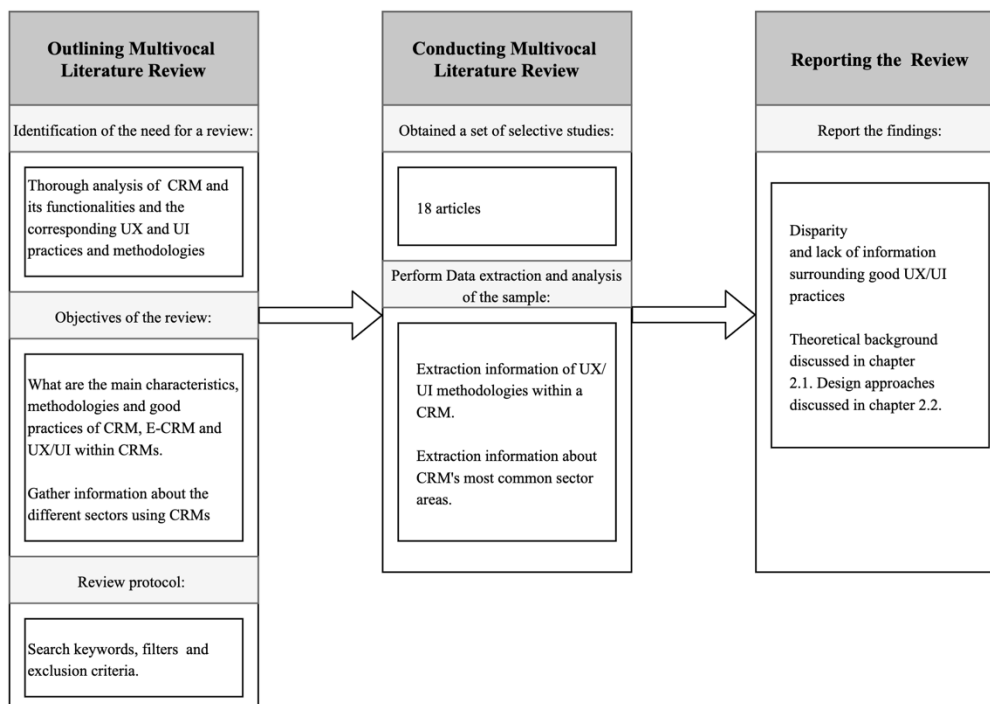
Figure 1. SLR stages

The main goal of this research falls in understanding the sectors adopting a CRM methodology, and the characteristics, advantages and principles of CRM and e-CRM. Additionally, it also aims to understand if there has been a concern for UX/UI within the area, and if yes, analyse what UX/UI methodologies and best practises have been applied so far.

To gather more information on the concerns previously mentioned, a set of online repositories were chosen. Therefore, six repositories were used, where the first three are research databases with an academic interest for computer science and the last three are repositories that administer access to numerous databases. These repositories were chosen to broaden the area scope on account of CRM's versatility.

The repositories chosen are as follows:

- IEEE Xplore Digital Library (https://ieeexplore.ieee.org/Xplore/home.jsp)
- ACM Digital Library (https://dl.acm.org/)
- SpringerLink (https://link.springer.com/)
- Web of Science (https://login.webofknowledge.com/)
- Scopus (https://www.scopus.com/home.uri)
- EBSCO Host (https://search.ebscohost.com/Login.aspx)

For the review, it was only accepted literature written in English or Portuguese. However, this filtration was only performed amid the third filter, that already only contained literature in the desired languages, and because of that it will not be mentioned in the filtration process' flowchart. Due to its recent nature and to perform a full examination of the research around CRM, a date limit was not restricted.

During the research, a specific chain of keywords (addressed below) was applied in the mentioned repositories with the assistance of "AND" and "OR" operators, seeing that CRM always worked as the central keyword.

Keywords: *("CRM" OR "Customer Relationship Management") AND (("UX" OR "User Experience") OR ("UI" OR "User Interface"))*

Initially, no filter was applied apart from the selected keywords. After that, four different filters were created, seeing that each filter had to be adapted to each repository advanced search available commands.

Table 1. Filtration Process

Database	No Filter	First Filter	Second Filter	Third Filter	Fourth Filter
IEEE	36	14	14	12	6
ACM	638	6	6	2	2
SpringerLink	2 676	0	0	0	0
Web of Science	55	36	36	2	2
SCOPUS	2 112	84	84	14	7
EBSCO	340	218	15	2	1
Total	5 857	358	155	32	18

For the first filter, it was decided to apply the selected keywords to titles and abstracts only. This process was successfully performed in all repositories except for Springer Link, where it was only possible to apply the keywords to titles. Therefore, the discernible reduction of literature for this step can be justified as such. For the second filter, literature that was not peer-reviewed was removed through available filtering. It is important to notice that EBSCO was the only repository that offered an existing filter for this process. On the third filter, duplicates and articles that could not be physically retrieved were eliminated, and a quick study of each article's title and abstract was undertaken to determine whether the acronyms fit the intended meaning; if not, they were eliminated. During this process it was discovered that the CRM acronym also stands for different interpretations in medicine, archaeology, and mathematics. Lastly, for the fourth filter, after properly analysing each article in its entirety, the ones which did not prove to meet the research purposes, were withdrawn. SCImago Journal Rank and Conference Ratings were also used to undertake a quality evaluation of the literature; papers with ERA (Excellence in Research in Australia) ranks of A, B, A1, A2, B1 and B2 and journals with Ranks of Q1 and Q2 were excluded. However, this approach significantly decreased the final material and was thus disregarded for the fourth filter. Even though this process ended up not being accounted for, it was able to successfully prove that studying the usability of CRM's interfaces and conducting a proper UX methodology within a CRMs is a lacking theme in the area. Thus, the results of the filtering process can be seen in Table 1, concluding with 18 articles and its respective flowchart can be seen in Figure 2.
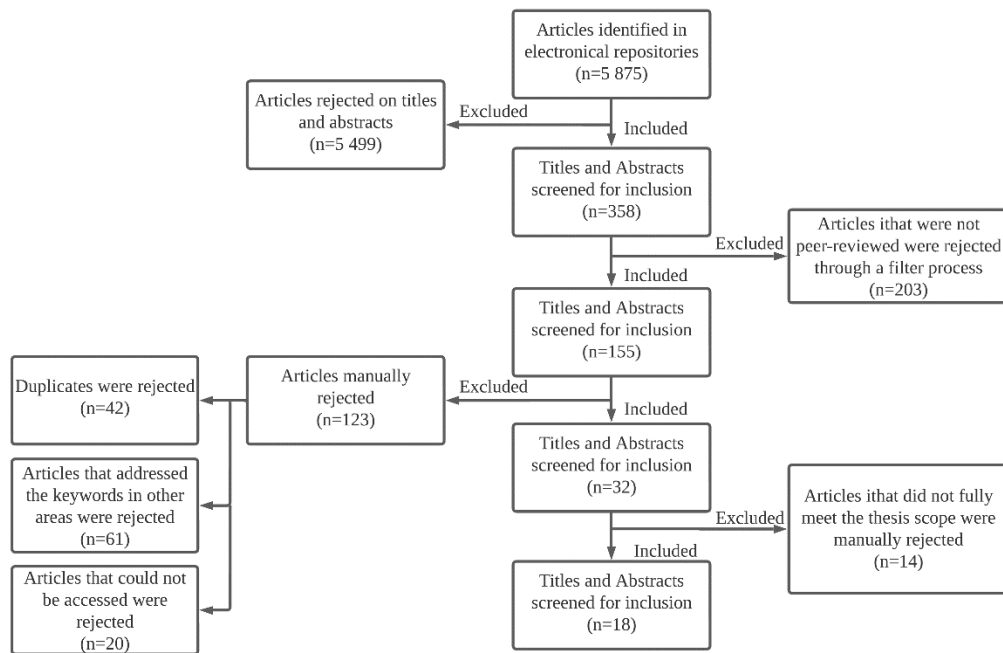
Figure 2. Flowchart of the filtration process

Seeing that no data filters were applied during the previously mentioned process, Table 2 was developed with the literature obtained to better understand the time division of research surrounding UX and UI within CRMs. Thus, it can be observed a 19-year interval between 2000-2019, where 2017 is the year that has the most publication within the dataset and the last 3 years of the dataset amount to a 40% over the entire dataset. Therefore, this information shows these concerns are still of importance and steadily growing over the last decade.

Table 2. Final articles distribution through the past ten years

Publication Year	Percentage [%]	Total
2019	16.66	3
2017	22.22	4
2016	5.55	1
2015	5.55	1
2013	16.66	3
2012	16.66	3
2010	5.55	1
2007	5.55	1
2000	5.55	1
		18

2.1. Theoretical Background

This section is responsible for presenting the relevant concepts and definitions of the dissertation. The following discussed literature was captured and summarized from the 18 articles mentioned previously, and it serves as the guidelines for the research and development of the artefact.

2.1.1. Customer Relationship Management

CRM allows organizations to apply a thorough customer-centric approach within their business philosophy to strengthen customer relationships. This philosophy can be reflected in operations such as marketing, sales, and services [12], [13].

Thus, CRM aims for long-lasting partnerships with customers by applying strategic approaches in their relationship management, to expand, retain and acquire new customers [2]. By analysing customer's data with the appropriate tools, it is possible to successfully determine customer and shareholder's value. This knowledge can be a critical asset in an organization's success, seeing that it can be directly responsible with a rise in customer's satisfaction. This knowledge allows for a faster improvement in the services provided and for a curated marketing strategy for each customer, that consequently enhances customer's loyalty, attracts, and retains profitable customers [1], [2].

From an economics perspective, considering the Pareto Principle, an empirical law that states that for a multitude of events 80% of consequences originate from 20% of the causes [14], it is said that 20% of the customers of a company originate 80% of its profits. Thus, it is important to discern the top 20% of existing customers, to direct the company's focus and marketing strategies to customer retention, rather than spending resources recruiting new customers [1]. It is also considered 5 -10 times more expensive to hire new customers rather than retaining already existing ones [1]. Therefore, CRM resides on the idea that not all customers share the same value for a company, as it aims to discern the most profitable ones between the existing customers. Hence, CRM consists in three different phases, bringing new customers to the company (Acquire), rising customer value (Enhance) and preserving existing customers (Retain) [1].

Regarding the literature chosen, the following tables showcase the different advantages and disadvantages that arise from using a CRM, shown in Table 3 and Table 4, respectively.

Table 3. Advantages of using CRM

Advantages	References
Efficiency in managing customer relationships	[13]
Customer-centric business model	[2], [13]
Enhanced Marketing activities given the customer's data	[13], [15]
Better customer churn prediction models	[15]
Predicts profitability by measuring customer's value	[2], [8], [13]
Improves customer retention	[1], [2], [13]
Better suggestions from sales analysis	[1]
Improves customer services	[2], [15]

Table 4. Disadvantages of using CRM

Disadvantages	References
A lack of CRM strategy, integration, business process and analytical abilities	[2]
Semantic Web does not offer enough tools to hold CRM data easily	[16]
Complex technical implementations	[16]
Often requires additional unfamiliar software	[16]
Expensive installation since specialists are needed to adapt the CRM to the company's needs	[16], [17]
Necessity to quit the CRM system to find information in other modules	[18]
Inconsistent data fields labelling	[18]
Suboptimal visual design	[18]
Complex UIs with unnecessary fields and layouts preferences	[19]

Developing a CRM starts by combining an array of aspects that relate directly to one another such as front office operations, back-office operations, business relationships and Analysis of CRM data [13]. Apart from that, the determinants that allow for a successful CRM with a significant quality can be summed in three functions, a communication function, a transaction function, and a relational function [8].

In conclusion, this type of knowledge within a company is destined to be recognized as a necessity for a company's success, considering the highly competitive environment that exists nowadays regarding maintaining profitable customer relationships. Overall, implementing a CRM methodology in a business, can prove to be cost-effective and beneficial.

2.1.2. Electronic Customer Relationship Management

To begin with, e-CRM is a business strategy that stems from CRM, i.e., still holds the same principles of customer maintenance and retention, although it specifically applies them in an e-commerce environment. Thus, the intention is not to replace CRM but to extend it with the aid of the internet, a system that eases access and sharing of information worldwide [1]. To this end, one can develop a website with e-CRM practices to allow an easier accessibility to the company's products and services, to reach, manage and offer a more personalized and intimate interaction with potential customers and to strengthen long-term customer relationships through faster interactions over the internet [12].

Moreover, e-CMR serves as an automation of the classic CRM, with the extension of an assemblage of concepts, tools and methodologies that help a company maximize online sales and organize their e-business investments through websites, e-mail, call centres and others [1].

That said, e-CRM can also be considered an evolution of the concept Sales Force Automation (SFA), several sales functions which provide an electronically automated workflow that aim for an understanding of their customer's buying behaviour through their sales activities and for a better sales flow prediction [2]. It is common to associate SFA with marketing tools to spread sales opportunities [1].

All things considered, investing on an e-CRM will not only offer CRM's advantages but also a proper methodology for an e-commerce. Nowadays, both combined can offer a stronger impact. With that in mind, understanding how to display the necessary information in an intuitive and accessible way, so not to overwhelm the customer with unnecessary data, becomes crucial to build a trustful and longing relationship. Seeing that e-CRM is a user-centric business methodology, the customer's comfort and inclinations should be ensured and attended. All in all, investing in proper research for both the UI and UX can prove advantageous.

2.1.3. Human-Centred Design

An HCD, as described in ISO 9241-210:2019, focuses on the user's needs and concerns to develop useful and usable interactive systems by applying ergonomic knowledge and usability techniques. By doing so, not only may an increase in human well-being and enjoyment be attained by mitigating negative effects on health, performance, and security, but it can also be the carrier of an efficiency and accessibility benefit for the user. However, this methodology has in consideration a panoply of human factors/ergonomics and usability knowledge regarding the correct way to successfully apply this design with the required level of efficacy. For this

purpose, the following two sections, respecting UI, and UX, serve as a conductor to funnel the fundamental information to administer a HCD in an e-business scope.

2.1.3.1. User Interface

The UI has the important role of connecting the users with a desired software functionality, and thus it is considered a crucial component in software applications. In that regard, enterprise applications, such as CRM, tend to have a need for complex UIs nowadays, seeing that they must cater to different users' necessities, required features and layout preferences [19]. The usability decline and user satisfaction seen in these applications, from the inability to tend to the users' needs, has been a very present concern within the area [19].

Moreover, as stated by Rayipangesti and Fajar [20], UI is the system, product, or service that can be used by a specific set of users to achieve predefined goals with a certain level of efficiency and effectiveness under a specific context of use. A context of use is characterized by its tasks, assets, objectives, users, and environment, seeing the environment must assure its technical, physical, social, cultural, and organizational environment [ISO 9241-11:2018, 3.1.15].

To properly evaluate an interface, a usability analysis must be conducted. Usability is a quality trait that measures how smoothly and painless one can use a given UI, and there are five characteristics to take into consideration [20]:

- **Learnability**: Measures how easy it is to successfully complete a desired task while interacting with the interface.
- **Efficiency**: Measures how quickly a user can successfully complete a desired task while interacting with the interface.
- **Memorability**: The system must be memorable enough for the user to be able to use it successfully after a brief period, without feeling the need to re-learn everything from the start.
- **Errors**: Evaluate how many mistakes the user commits while interacting with the interface, what type of mistakes, and how easy it is to correct them.
- **Satisfaction**: Evaluate the level of satisfaction the user feels while interacting with the interface. Satisfaction can be measured by the ease of use.

It has been shown that the perception of usefulness, ease of use, content quality and trustworthiness in an e-service has been acutely enhanced by socially rich UIs, which consequently causes a bigger adherence to the system [2]. Furthermore, a well-built interface inherently strengthens relationships with potential customers over the internet, since they tend to rely on first impressions to decide if they will continue to browse a system or shift to a competitor one [2].

2.1.3.2.   User Experience

UX is a person's perception over the usage of an existing product, system, or service, i.e., UX is based on a human-system interaction that results from a goal-oriented task performed in each context of use [20], [21]. Additionally, UX is influenced by several factors from various sources directly related to both subjective factors, such as users' tendencies and contextual factors, such as information regarding where, when, and how a specific experiment was conducted [20].

Urrutia and Brangier [21] state that UX can be determined by five different categories, which are, social, cultural, user's characteristics, context's characteristics, and product's features. With that said, UX can be persuaded by the three following factors:

- The user's internal state of mind: which can be influenced by their predispositions, assumptions, needs, motivations, and dispositions.
- The system's characteristics: which can be influenced by its intricacy, purpose, usability, and performance
- The context in which the experiment is conducted: which can be social or organizational, conducted voluntarily or not, meaningful experience or not, etc.

UX assists the management of the previously mentioned usability testing, since users will try to successfully perform an array of tasks in a specific context of use, while researchers' glance at, overhear and take annotations of the experiment. The main goal is to properly identify usability issues and to collect quantitative data to evaluate the user's satisfaction while using the system. If done correctly, usability testing will present the previously analysed and identified issues to both the design and developer's teams before any code is initiated [20].

As previously stated, a CRM is a methodology that is human-centric, and therefore it should be conducted under guidelines that aim for an enhancement in relationships. Appropriate UX testing will give a greater knowledge of the conflicts that consumers are presently experiencing or may experience in the future, which will boost the e-business platform's retention rates.

Consequently, talking with experts before developing the CRM web interface will give a very valuable insight to already existing struggles that can be taken into consideration from the start.

2.2.   Related Work

In respect to the 18 articles, even though a specific chain of keywords containing "UX", and "UI" was applied in the mentioned repositories, only four articles explicitly mentioned the usability practises conducted in their CRMs [2], [12], [22], [23], which affirms the lack of research and standardization in the usability design conducted in the area.

Firstly, Wrobel et al. [23] performed a formative evaluation of acceptance, usability, and UX regarding a trust engine for a group of CRM operators. The first two conditions of the model used were based off variants from the traditional Technology Acceptance Model, and it can be summarized in three conditions:

- **Utility**: Respecting the perceived usefulness, i.e., how much one believes the system will better their performance.

- **Usability:** Respecting the perceived ease of use, i.e., how much one believes the system will be painless to use.

- **Privacy Concerns**: Respecting customers' concerns regarding how their data is saved online.

The solution's performance was evaluated through objective and subjective collected data against the mentioned Technology Acceptance Model developed. Objective data was collected through submitted interaction logs and subjective data was collected through a user questionnaire that incorporated demographic questions, like industry sector and social media experience to assure the correct representatives. The ISO 9241/10 standard was utilised to develop the Likert-scale questions that were used to evaluate the study question, "How successful are data negotiation suggestions based on the specified trust measure as a privacy enhancing technology (PET) inside corporate CRM?"

Secondly, Santy and Hardiyanti [12], conducted research on customer preferences and UI recommendations for an e-CRM interface of an Indonesian Venture. They proposed that a customer interface is a combination of attributes based of the 7C Framework and therefore following this framework allows for a good UI design.

The 7C Framework are Context (layout and design of an interface), Content (text, images, sounds, and videos within an interface), Community (interaction provided within an interface), Customization (interface can adapt to users' preferences), Communication (communication between company and customers), Connection (relationship with other websites) and Commerce (trade transactions within an interface like registration, shopping carts and credit card approval). A conjoint analysis was performed to evaluate the outputs of the 7C Framework, i.e., the consumer preferences for each product attribute.

Thirdly, seeing that business CRMs are extremely vast scale owing to the necessity to adapt to every user's demand, which culminates in a situation dubbed "bloatware," Akiki et al. [22] do research on the simplification of enterprise application UIs through adaptive behaviour. Thus, to overcome this phenomenon, they present the following criteria:

- Providing a system that can grow as needed and has several customizable interface features.

- Adaptive behaviour based on roles, defined using visual and code components and allocated by programmers or IT staff.

- Instead of relying solely on automated user interface creation, it is preferable to keep designers involved in the process.

- Customized, ground-up user interface simplification to reduce learning curves.

Lastly, Alotaibi and Rigas [2] conduct empirical research regarding the corporation of multimedia elements in Knowledge-enabled Customer Relationship Management (KCRM) systems. Therefore, a comprehensive evaluation of user acceptance was performed, considering 5 conditions, the KCRM perceived usefulness (PU), perceived of use (PEOU), quality of contents (QOC), cognitive trust and behavioural intentions. Each condition was defined by a set of items, and they are as follows:

- **PEOU**: ease of use, learning, adaptability, clarity, and interaction.

- **PU**: system usefulness, convenience, time savings, productivity, and accuracy.

- **QOC**: containing quality and correct material, simplicity of understanding, logical and integrated content, sufficient and dependable content, and overall content satisfaction.

- **Cognitive Trust**: vendor trustworthiness, UI appeal, need anticipation, impartial advice, and personal interest.

- **Behavioural Intention**: intention to revisit the web-based system, make a transaction, supply card data, promote personal description, Intelligent analysis resistance.

2.3.   Related Work Synthesis

As mentioned in chapter 1.1, the RE industry can profit from an e-CRM business model; therefore, it was decided to examine if any of the 18 articles that reviewed UI and UX strategies inside CRMs had been used by a RE business.

As shown in Table 5, only seven of the selected articles clearly identified the industry sector the CRM was involved in, and none included RE derivatives, indicating that investing in such techniques within the field can pave an innovative and advantageous path for its successful development in the internet era. In addition, the goals for which CRMs were mostly utilized were gathered, as shown in Table 6, and Sales, Marketing, and Internet Shopping are significant ideas within the real estate business, reiterating the need of questioning this technique within the field.

Table 5. Different industry sector found in literature

Industry Sector	References
Bike Manufacturer	[1]
Call Centre	[18]
Energy Provider	[17]
Manufacturing Industry	[24]
Telecommunication Services	[15]
Travel Agency	[8]
Venture Capital Firm	[12]

Table 6. Different CRM purposes found in literature

CRM Purpose	References
Customer Support	[13]
Internet Shopping	[2], [6]
Enterprise Applications	[19], [22]
Marketing	[2], [13], [25]
Sales	[1], [13], [20]
Service and Inventory Management	[13]

Thus, it was decided to evaluate such a situation for this study, bearing in mind the data about the advantages of an appropriate implementation of usability techniques in an e-CRM, the current void of this technology within the RE industry, and the rapid growth it maintains at the present time.

CHAPTER 3

Research Methodology

For this research, the Design Science Research (DSR) was the designated research methodology [26]. Seeing that problems often rise from challenging and unique designs and considering that IS are constitutionally constructed by adaptable and flexible hardware, software, and human interfaces, they exhort for contemporary, modern, and creative ideas [27]. Therefore, DSR develops, designs or 'builds' new artefacts and its evaluation is mainly concerned with the design science results, along with the respective IS Design Theories and its design artefacts. A thorough and rigorous research is crucial in DSR, and requires an evaluation of the artefact's utility, quality, and effectiveness with the proper evaluation methods, so to explain changes or improvements in the system, people, or organization's behaviour [28].

As described in [26], the DSR methodology incorporates six activities in a nominal sequence, which are presented in Figure 3.
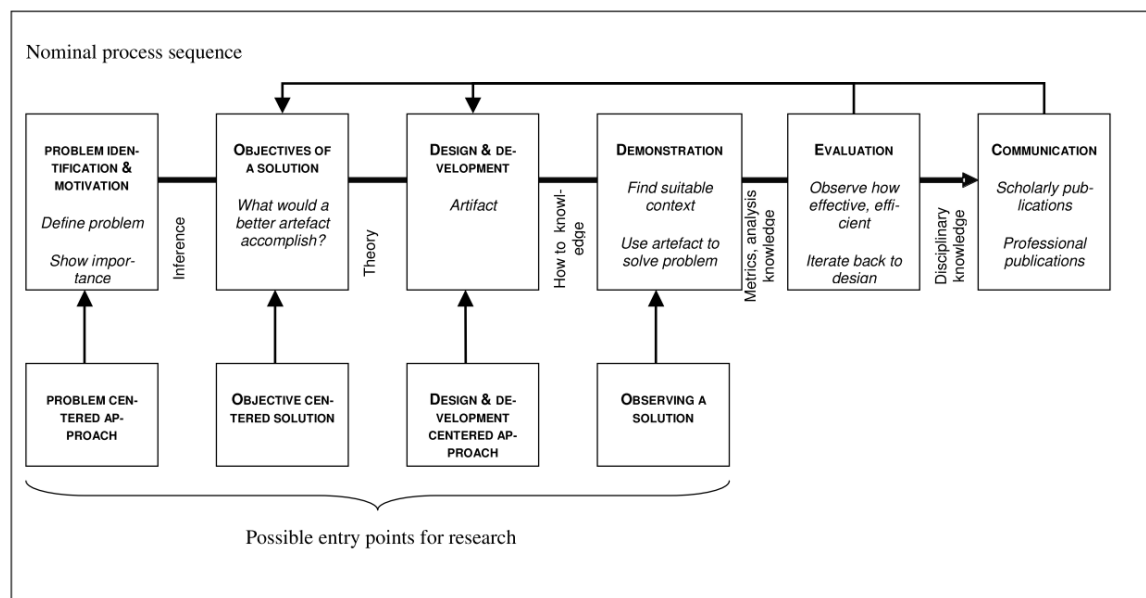
Figure 3. DSR Methodology Process Model [26]

Thus, firstly there is a problem identification, secondly the research objectives are defined, and lastly a solution is proposed. The model can be iterated if new functionalities or requirements are added or to improve performance and quality. In the following Figure 4, the sequence defined for the dissertation is presented. Thus, a thorough HCD evaluation of the existing m-CRM is suggested, to offer a UX and UI methodology for the newly e-CRM. The addition of the RE e-business platform onto the internet, must be of relevance for companies since, now more than ever, they are expected to adapt to market changes, they must be agile towards the different solutions available now, so not to fall below of what competitors are currently offering.

Subsequently, interviews will be conducted with experts and customers who already attend RE platforms, a design methodology will be suggested, low and high-fidelity prototypes will be executed, and a final artefact will be developed. Usability Testing will be implemented iteratively.
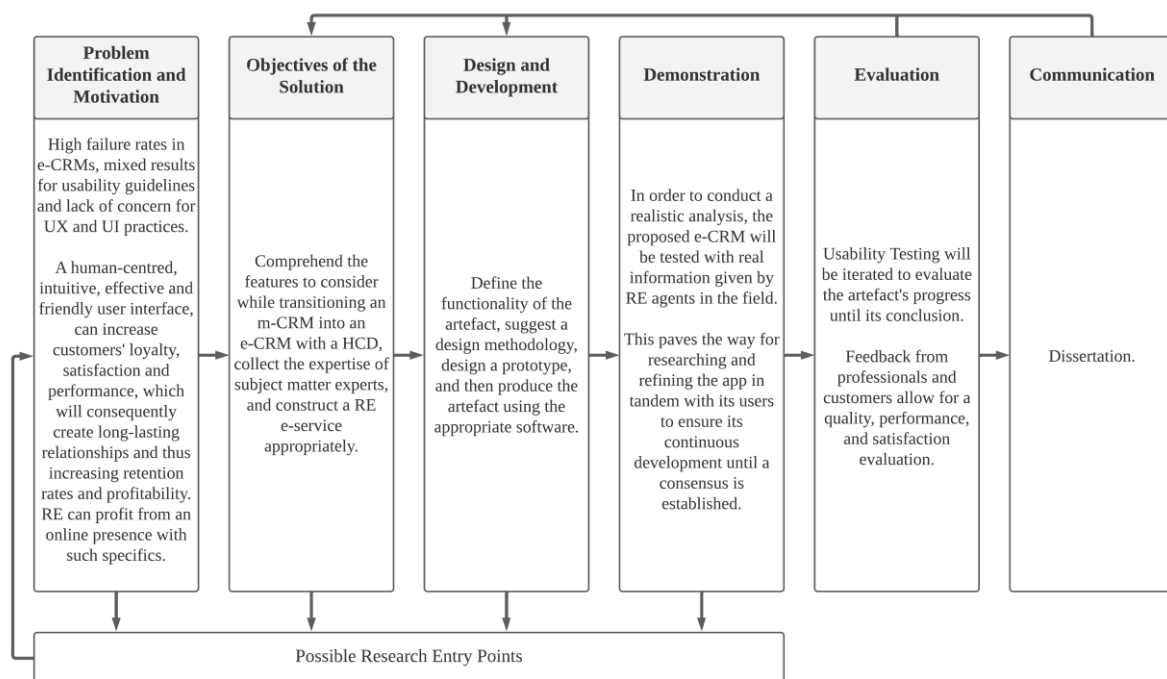
Figure 4. Applied DSR Methodology Process Model (adapted from Figure 3)

CHAPTER 4

Proposal and Evaluation

Following the DSR methodology outlined in Chapter 3, iterations were carried out in a cycle of five. As shown in Table 7, for each iteration, a single expert was consulted for evaluation purposes. Each iteration's development can be seen here.

The interviewee's comprehension of the study's context and confidentiality were ensured by displaying the informed consent letter and introducing the study prior to the interview (see Appendices A and B). A semi-structured interview was made to make sure that all the important questions for the proper production of the artefact were covered. As a result, Appendices D through H contain scripts detailing what should be done in each iteration. The author deviated from the interview's structure only to gather more information or clarify actions. Finally, after completing all the steps in the script, the interviewee was given a satisfaction questionnaire regarding the modules they had just evaluated (see Appendix C).

Due to the global pandemic crisis, some iterative procedures had to be handled remotely, while others were conducted face-to-face. After completing the first two in-person interviews, the interviews were moved on to Zoom video conferences for the next two iterative interviews, each of which lasted approximately 60 minutes. Nonetheless, the user's capacity to freely explore the interface was not hindered by the remote nature of these interactions, as zoom enabled the user to request live access to the other person's computer screen. The interviewee was free to use the interface and click each interactive link as if they were conducting the interview face-to-face, ensuring legitimacy and integrity of the remote interviews. The last interview was conducted in-person.

Thus, experts oversaw the development of the artefact to ensure that it reached a point where all the feedback was consistent, allowing the IS to be deemed an ideal RE CRM at the conclusion of the procedure. This ongoing monitoring ensured the maintenance of the artefact's legitimacy, cohesion, and growth.

Table 7. Interviewees information

Interview's Goal	Gender	Age	Role	Experience	Duration	Iteration
User Research	Male	25	Marketing Director	2 years	90 min	First
	Female	49	RE Consultant	4 years	90 min	Second
	Male	52	Agency Director	20 years		
Usability Testing	Female	49	RE Consultant	5 years	90 min	First
	Male	27	RE Consultant	4 years	90 min	Second
	Female	29	RE Consultant	2 years	60 min	Third
	Male	31	RE Consultant	3 years	60 min	Fourth
	Female	40	Agency Director	10 years	60 min	Fifth
	Female	35	CRM Manager	4 years		

4.1.   First DSR Iteration

As a first step in realizing the DSR, the first artefact was created. To do so, gathering information on the existing mobile app's core features and functionality was essential. Thus, for the discovery and scope definition of the project, the research done by João Antão [29] was considered. Afterwards, the research and design methods were chosen. Finally, the type of testing to validate the artefact was also selected. As such, Figure 5 illustrates the selected design process as a result.
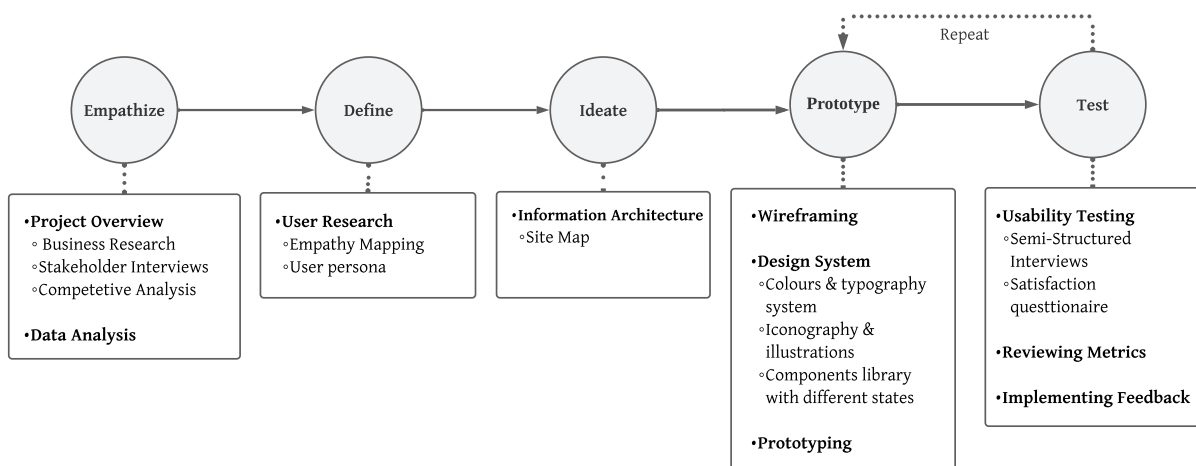
Figure 5. User Centred Design Process

The research's context was, thus, obtained with the help of RE experts that were previously interviewed. During the mobile development of the artefact, 15 agents were interviewed to gain insight into feature prioritization and competitive research. In addition, seven RE experts took part in usability testing during the artefact's mobile development. This information initially guided the desktop e-CRM project's scope.

4.1.1. Defining User Research

To make sense of the prior study [29], the information gathered while interviewing 15 industry experts was analysed. Additionally, an unstructured interview was conducted with a marketing director to further corroborate the data collected, as seen in Table 7. Following this template [30], the empathy map on Figure 6 was formed by fusing these two sets of data.

An empathy map is a visual tool that organizes customers' goals, ideas, senses, and behaviours around a series of questions to promote a more thorough consolidation of user understandings, discovery of research gaps, and personification of the intended audience. They require data that has been collected through research methods [30].

① WHO are we empathizing with?   Goal
- The notepad works, and they do not feel the immediate need for change.
- There is a gap due to the lack of a complete CRM focused on RE agents that include only needed features
- Few agents know or used market-available CRM software.
- Some RE brands have already a generic CRM, so agents do not feel the need to search outside.
- None supplied positive feedback to the brand's internal CRM, noting flaws, unhappiness, and a non-existent mobile component.

What do they HEAR? ⑥
- Not using digital technologies means giving up competitiveness in the market.
- A CRM is vital to acquire client happiness and loyalty by storing customer history and predicting behaviours.
- Traditional methods of collecting information are no longer able to meet the needs felt by professionals.
- Internet and IS are important for agile organizations that can quickly adjust to market developments.
- Notifications and reminders help agents remember appointments and important dates so they can focus on high-profit tasks.
- With the RE market growing and the number of agents rising, competition is increasing and better service is needed.

② What to they need to DO?
- They desire a CRM that requires no major upfront investment and incorporates multiple proven services.
- If a CRM solution met their demands, they'd test it.
- There must be contacts, agenda integration, dashboards, charts indicating agent activity, and client qualification.
- The qualification feature must have the necessary detail while still being effective, and simple.
- CRM saves RE agents time, allowing them to focus on emotional and empathic client relationships.

③ What do they SEE?
- Best practices for a CRM are crucial for its implementation.
- There is no visually appealing tool that can manage both sales and contacts correctly.
- Agents use their cell phone and desktop to manage consumers, business partners, and their agenda.
- Statistical graphics must be engaging, both in terms of type and colour.

④ What do they SAY?
- "If it works, why change?"
- "The mobile phone brings with it notifications about other applications such as social networks, that if we are not totally focused, we will not be able to be so productive."

⑤ What to they DO?
- Some agents are not at ease with handling technological devices and digital tools.
- Some defend using a physical notepad, despite acknowledging the benefits of digital technologies.
- RE agents seek standard CRM features.
- Due to the competitiveness of the RE sector, agents fear losing business by exchanging contact information.
- It is evident that only people within the same team have similar working methods.

⑦ What to they THINK and FEEL?

PAINS
- Very high subscription cost to have the software.
- The use of mobile phones often causes unwanted distractions.
- Lack of interest in researching for new solutions.
- Agents feel that they will be duplicating their work when changing for a CRM.
- Strong time investment to organize their databases.

GAINS
- Boost performance, improve lead management, and foster compassionate, long-lasting client relationships.
- The more knowledge and skills agents have, the more competitive they can be.
- This IS can increase the RE agent's interaction with clients, driving sales.
- Regulated growth of contact lists, qualifying customers, and portfolio customers.
- The offer is no longer geographically limited, creating new commercial prospects.

Figure 6. Empathy Map

At the top of the empathy map's canvas are the goals, split down by who one empathizes with and what they must do. Around the centre of the empathy map, in a clockwise direction, are questions depending on what RE agents under consideration see, say, do, and hear. Finally, at the bottom, there are questions regarding their beliefs and emotions, categorized as pains and gains (needs, wants, desires).
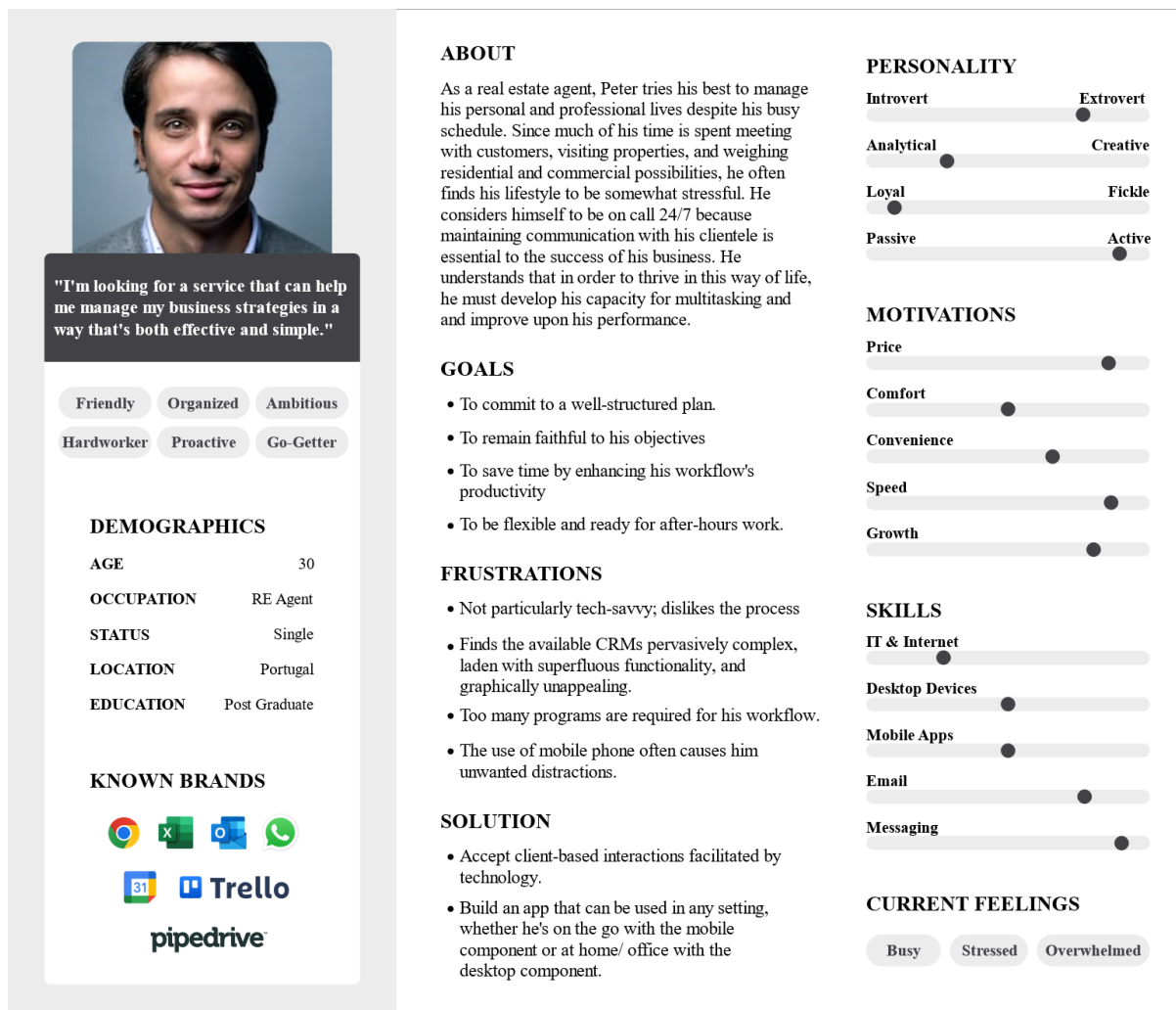
Figure 7. User Persona

Additionally, a user persona was created to facilitate analysis and decision-making concerning the collected data from the empathy map. Using the research group's core objectives, frustrations, personality traits, and skill sets as inspiration, a fictional persona was crafted to represent the group study [31]. As such, Figure 7 illustrates the selected user persona as a result.

Personas can help keep the users in mind from the very beginning of the design process by putting a face and a name to the previously faceless data and percentages gleaned from user research [32]. As such, this user persona served as the basis for the project and was revised as needed.

4.1.2. Feature Prioritization and Information Architecture

During the development of the mobile's software [29], feedback from RE agents and research into grey literature (GL) were used to identify which features would be the most valuable. These features can be seen in Table 8.

Table 8. Artefact features from GL acquired during the mobile's software development

ID	Features
FM.1	*Contacts integration*
FM.2	*Agenda integration*
FM.3	*Smart lists*
FM.4	*Notifications and reminders*
FM.5	*Individual performance management and statistical information*
FM.6	*Client qualification*
FM.7	*Client's documentation management*
FM.8	*Client's pipeline*
FM.9	*Customizable template messages*
FM.10	*Support Settings*
FM.11	*Automated Action Plan*
FM.12	*Lead Aggregation*
FM.13	*Campaigns*

The features FM.11, FM.12, and FM13 were eliminated during the mobile's development since they did not fit the mobile environment; nonetheless, they were highly received when suggested to web platforms. Since the conditions are now favourable for their use, these three elements have been reinstated in this study. The feature FM.10 was also evaluated for the mobile software, but it was ultimately deemed out of scope because the focus of this study is on the web interface's design and usability rather than the software itself.

Thus, after conducting the user research, it became easier to determine which features would be most and least significant in the desktop's application. Quick prioritization opens the path for careful assessment, effective resource allocation, and complete transparency into all activities taken in relation to usability and their desired outcomes [33]. This led to a prioritization of features from 1 (most important) to 12 (least important), as shown in Table 9.

Table 9. Features prioritization

Web Component	ID	Features	Priority
Contacts	F1	*Contacts integration*	1
	F2	*Smart lists*	2
	F3	*Lead Aggregation*	3
Client's Profile Page	F4	*Client qualification*	4
	F5	*Client's documentation management*	5
Calendar	F6	*Agenda integration*	6
Dashboard & Goals	F7	*Individual performance management and statistical information*	7
	F8	*Customizable template messages*	8
Business Funnels	F9	*Client's pipeline*	9
	F10	*Automated Action Plan*	10
	F11	*Campaigns*	11
Notifications	F12	*Notifications and reminders*	12

This ranking was decided upon throughout the mobile app's creation [29] with reference to two primary sources: (1) the priority each was given by the RE professionals interviewed, and (2) the degree to which its relevance was highlighted in the literature.

Additionally, their importance was also chosen around the six key web components discovered by aggregating each prior feature, so that it could be possible to have a completely functional page for each iteration of the usability testing. Accordingly, it was decided that the web application would include the following modules: Contacts; Client Profile Page; Calendar; Dashboard; Goals; Business Funnels and Notifications. Each module contributed to the overall distribution of features, and their relative prominence increased accordingly.

To proceed with the wireframes and prototyping, it was necessary to establish a high-level picture of the information architecture once a solid grasp of the desktop interface's modules and features had been established. Information architecture is the practice of designing structures that people can use to take information and turn it into useful knowledge, skills, and abilities, i.e., arranging structures and data to better facilitate discovery, consumption, and subsequent decision-making and behaviour modification on the part of users [34].

Due to their inherent complexity, website architectures are notoriously difficult to describe in words; a visual depiction of the structure is the most effective way to express the relationships between the site's many sections; consequently, a site map was built to help the research [32]. Site maps provide an overview of the architecture of a website and, commonly, have a hierarchical structure, with links to the more important areas at the top and the less important elements at the bottom [32]. The artefact's site map is depicted in Figure 8.

Except for the client profile page, which is part of the contacts' module, the diagram displays a hierarchical structure with the previously stated modules at the top and the major characteristics of each module defined below them. Throughout the project's duration, the site map was revised in accordance with the feedback from interviews with project stakeholders.
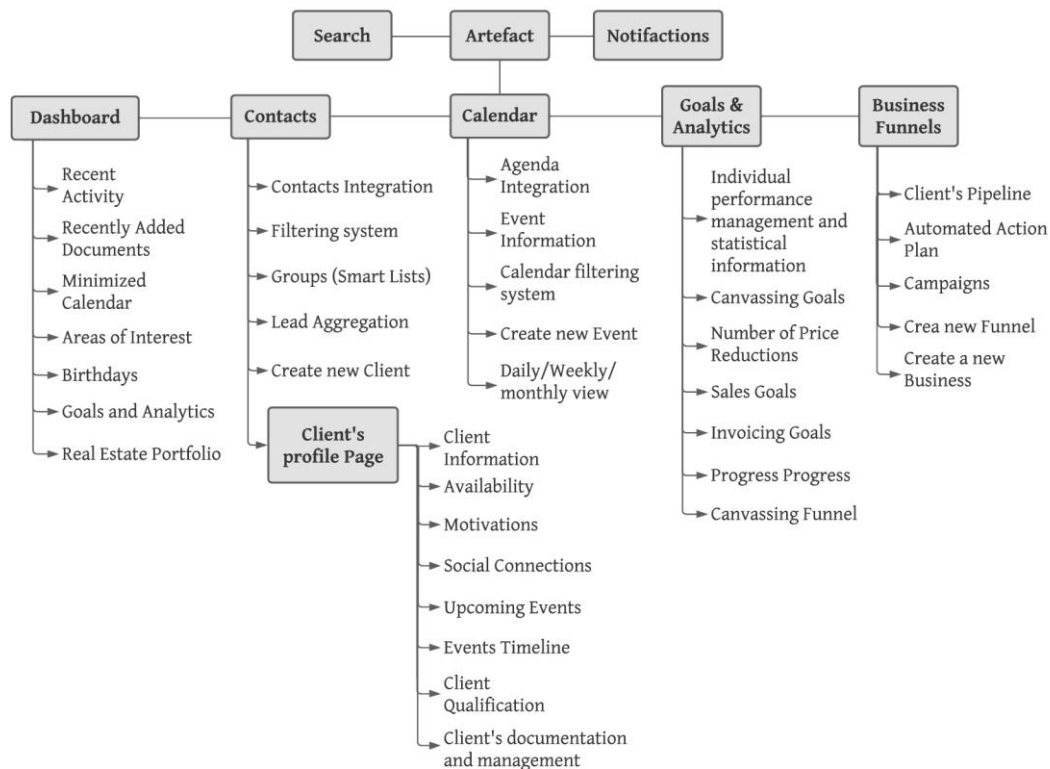
Figure 8. Site Map

4.1.3. Designing and Wireframing

To outline the structure of each page, wireframes were chosen as the preferred design technique. The page layout, which is a combination of information design, interface design, and navigation design, must have all interface elements that are necessary for the page's functionality [32]. Wireframes are simple, black-and-white diagrams of a page and the relationships between its many components, and they are used to centralizing early decisions into a single document for the sake of streamlining the visual design and website deployment processes [32].

The preliminary wireframes were created with the help of 1920·1080px web page art boards, which served as a model for the aspect ratio and proportionate measurements of each wireframe. To represent the most important early interactions that were discovered, a total of fifteen art boards were developed.

After the wireframes were made, two RE experts, who assisted in supervising the user research development of the project, offered direction and modification to the wireframes to ensure they were still on track with the original objectives. This was done so that any necessary changes could be made before initiating the prototype.
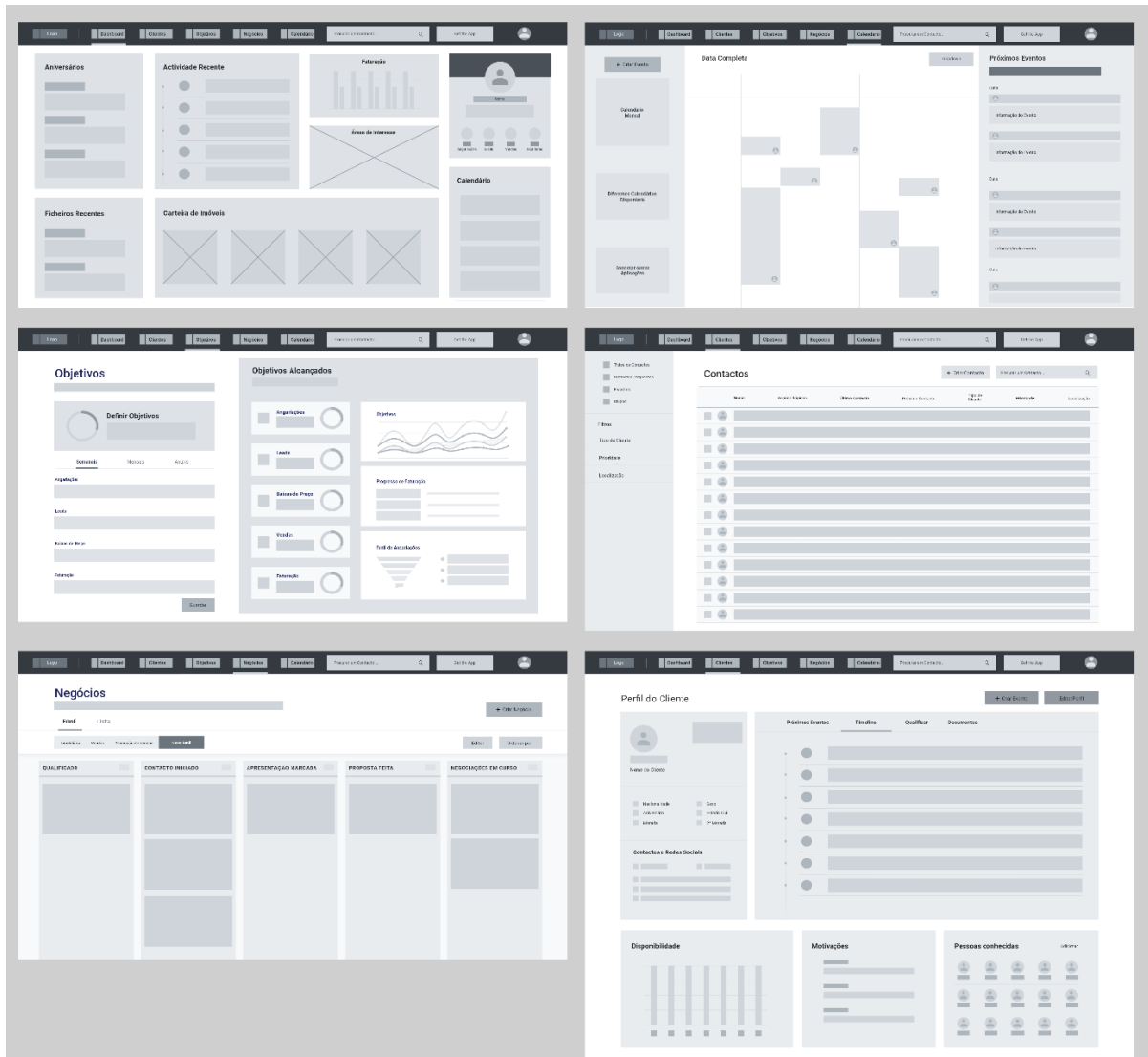
Figure 9. Low Fidelity Wireframes

The wireframe's information architecture was carefully constructed to make the most data-intensive tasks straightforward and easy to understand. With readability as a primary concern, making efficient use of the available space was prioritized. Additionally, its primary focus was also on content structuring, page layout, and space allocation.

In each module's wireframe, it is possible to visualize each feature that the final website will contain, and data and information visualization such as bar and pyramid charts and circular and linear graphs. The wireframes were created with a top navigation bar that described the information architecture and user navigation.

These wireframes lack a colour scheme, and they include some content but not all visuals. Thus, the simplicity of the wireframes was aimed to truly illuminate and analyse the allocation of space without distractions. Figure 9 shows some wireframes created for the artefact.
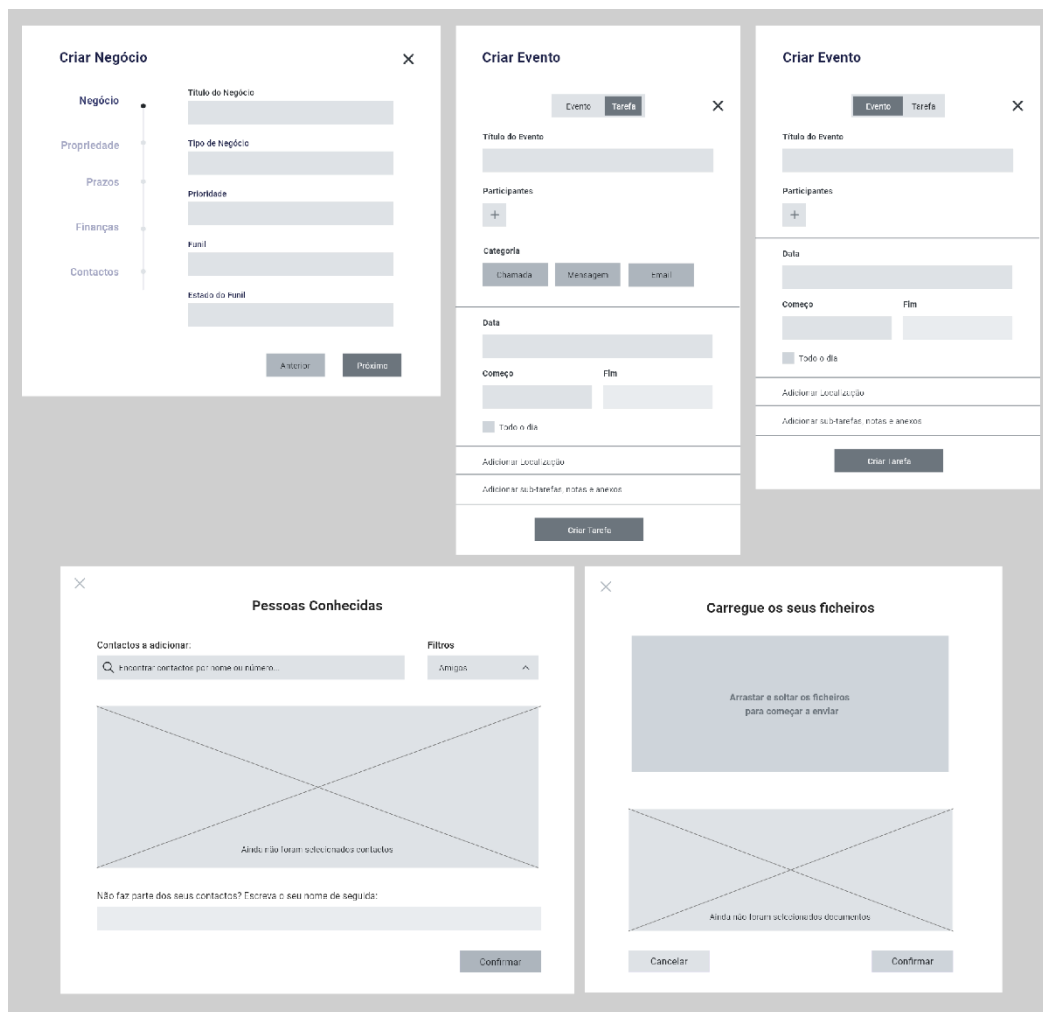
Figure 10. Low Fidelity Wireframes of the artefact's modals

In addition, fourteen modals were developed in which both content organization and content itself were prioritized. Modals are components that appear in the background as the rest of the screen fades in when the user initiates a certain action as part of their user journey. Thus, modals were utilized for specialized workflows like adding people, events, content, and businesses, as well as removing and sharing content. Figure 10 shows some modals created for the artefact.

4.1.4. Artefact Development

A design tool was selected at the outset of this development procedure. Adobe XD, part of Adobe's Creative Cloud, is a vector-based design tool for online and mobile applications; as such, it was chosen as the single crafting application for the design process. The version 44.0.12 of the free basic plan was utilized.

Adobe XD provided a more simplified process, as only a single program was required for the life of the project, and the learning curve gradually flattened as the project progressed.

The usage of components and states allowed for the design system to be dynamically updated. Adobe XD's prototype capabilities—including its usage of components and states—make it possible for a feature to be designed once and then applied consistently across all instances, without having to manually update each board in each iteration. This is feasible because once a main component is established, any modifications made to the main will propagate to all instances. The varying of a single component and the insertion of interactions between components were also made possible by the presence of component states. Hover, click and loading interactions on a button or toggle are examples. By making efficient use of Adobe XD's features, it was possible to reduce the clutter on the canvas and cut down on the number of art boards needed to produce the same results in terms of user flows and visual aesthetics.

As part of the usability testing interviews, the Auto-Animate function was utilized to add animation to the prototype. Adobe XD's in-built intelligence, called Auto-Animate, provides the means to add animation and micro interactions to static layouts. This allows for a more realistic user testing and visual feedback in user flows. Scroll groups, anchor links, and triggers were also incorporated to make interacting with the prototype smoother. The features combined to create a fully functional, interactive prototype that mimics the experience of using the full product.

There is a wide variety of add-ons available for Adobe XD that simplify the workflow. Adobe XD can be customized to the individual's needs with the use of plugins that add new features to the program, such as icon collections, stock images, populating data, or user-friendly colour schemes. Icons 4 Design, LottieFiles, Tool Kit, UI faces, VizzyCharts, and unDraw were the plugins used.

Functionalities were added to each version of the DSR model based on their importance, as outlined in Section 4.1.2, and the implementations that concluded from the user research. The purpose of Table 10 is to prominently display all the procedures involved in the creation of this artefact. In the last iteration, we were able to reach a saturation point and authenticate the developed product by evaluating and certifying all implemented concepts aligned with the perspective of professionals.

Table 10. Iteratively added features

DSR Iteration	Features	ID
First Iteration	*Contacts integration*; *Smart lists; Lead aggregation.*	F1, F2, F3
Second Iteration	*Client qualification; Client's documentation management; Agenda integration*; *Individual performance management and statistical information.*	F4, F5, F6, F7
Third Iteration	First and Second iteration feature improvement.	-
Fourth Iteration	Third iteration feature improvement; *Individual performance management and statistical information; Customizable template messages*.	F7, F8
Fifth Iteration	Fourth iteration feature improvement; *Client's pipeline; Automated action plan; Campaigns; Notifications and reminders.*	F9, F10, F11, F12

4.1.5. Demonstration

As a means of showcasing the initial artefact, 30 screens were designed to showcase the new features added in this version. The 1st Iteration's folder depicts the most influential screens of each module (contacts and client's profile) and its respective adobe XD prototype.

When the interviewee accessed the prototype, the contact list was displayed. The prototype was pre-built with the available user flows, and the interviewee was guided through each step using a detailed set of questions. In lieu of having to wander around the artefact blindly, the agent was relieved to have a clear path to follow. However, the prototype's initial iteration did not utilize the Auto-Animate tool in Adobe XD, nor did it utilize components or states; hence, its level of interactivity was limited. This version functioned as a static high-fidelity prototype because only anchor links were utilized to transfer from one board to another from specified critical spots.

Due to the lack of interactivity, the expert was prompted to verbalize their predictions for the outcomes of various factors and procedures. Understanding this allowed the agent's desired behaviour for each flow to be implemented with more accuracy in subsequent iterations.

The interviewee had been expected to judge four main features in the list of contacts. They were, the filtering system, the favourites features, the understandability of each column state information, and how to get more information within the nested rows of each contact. Each line had information on a contact's name, quick actions, their previous and following date of contact, priority, and location.

After completing this section of the assignment, the user could switch to a specific customer's profile page by clicking on their icon from the list of contacts. Likewise, the expert was asked to rate key features of the client's profile. These are the client's personal data, a column chart about the customer's availability and another about their motivations, the customer's social connections, how to create a new event for that customer, and finally information about their upcoming events. The feedback from this agent is recorded in Table 11.

4.1.6. Evaluation

After the initial build of the prototype was finished, a usability expert in the field of RE was brought in for the first usability interview. A desktop computer equipped with Adobe XD was brought to the interview so that the candidate could watch the prototype flow in action via the desktop preview application. Thus, the agent could interact with the layout by clicking and dragging elements in the preview window.

As shown in Table 11, the feedback gathered after the initial validation of the artefact included five negative and four positive aspects, as well as thirteen proposals for enhancement, pertaining to the Contacts and Client's Profile Page.

Positives include the ease of completing typical operations (such as calling or emailing a client) directly from the contact list, the revelation of previously hidden client data in nested rows and social network information for each client. In regard to negative aspects, the expert had difficulty locating the contact list's filtering system and the entry point to each row's nested data. Due to the priority system and the development of groups, it was thought superfluous to have favourites. Since motivations are context-specific, the agent also noted that the input of a value for three static motivations was of limited use. Finally, the agent was confused about the distinction between tasks and events when it came time to create an event, causing it to conclude that the application's reasoning for this differentiation was not clearly stated. Concerning the aesthetics and layout of the app, the colour scheme was judged unflattering, and it was concluded that the usage of transparent elements and lighter colours would not effectively bring the user's attention to crucial content.

Concerning the proposed improvements, in addition to fixing the previously mentioned negative aspects, it was deemed crucial to update and optimize the visual hierarchy of information, for both the left-hand vertical sidebar and the client's availability. The agent wasn't only concerned with content alignment; she also felt the client's profile included too much information and suggested cutting some of it, more precisely her social media information. As they predicted a high learning curve for new semantics owing to their distinct vocabularies, it was also recommended that professionals be consulted at every step of the procedure to ensure semantic accuracy. Finally, a drop-down menu of origin possibilities was proposed. Using this technology, businesses may gather data and do statistical analysis to determine the effectiveness of their marketing strategy.

Table 11. Evaluation of the first iteration of the artefact

		ID	Stakeholder Synthesis	Stakeholder Opinions
Contacts	**Pros**	CP1.1	"Quick Actions are easy and convenient."	The agent found it advantageous and convenient to be able to contact someone directly from the list of contacts, rather than having to go into their profile.
		CP1.2	"Columns include relevant data."	Access to the user's most recent and upcoming appointments, as well as their client type and priority, was deemed sufficient for a quick client evaluation.
		CP1.3	"Information hidden in nested rows."	The nested list's socials and appointment summary were helpful. These speeds up processes by eliminating the need to manually enter customer profiles.
	Cons	CP1.1	"Difficulty to locate the filtering system."	The agent was told to utilize filters for a more thorough search, but the address list at the centre distracted her. Before finding the right location, the search bar and column headings were clicked.
		CP1.2	"Favourites will become obsolete."	Consulting firms need quick access to their top 5-6 clients. The "favourites" feature was created but, priority scale, powerful filtering, and groups will make this functionality obsolete.
		CP1.3	"Buttons at the end of each row are not clear."	It wasn't clear how to get to the nested data in each row of the address list. When asked about the end-of-row buttons, she didn't know what to expect.
	Proposed Improvements	CPI1.1	"Deleting the left-hand vertical sidebar."	To address the lack of emphasis on the left-hand vertical sidebar, the page layout should be redone without data partitions, with all content moved to the page's centre.
		CPI1.2	"Social media information is not required."	Even if the client's social networks, such as WhatsApp and Facebook, are required on occasion, they can be accessed via the client's phone contact. Therefore, socials should be eliminated due to lack of space.
		CPI1.3	"Nested list should be user-friendly."	The agent proposed replacing the end-of-row arrow icons with a button labelled "additional information" to clarify its function.
		CPI1.4	"Abbreviations should be avoided."	It was thought that the labels in the filtering system should be written in full rather than their abbreviated forms. Ideally, both options should be available.

		ID	Stakeholder Synthesis	Stakeholder Opinions
Contacts	**Proposed Improvements**	CPI1.5	"Use familiar field-specific semantics."	The customer's priority was indicated by "cold", "moderate", and "hot" tags. She feared a significant learning curve for this new priority semantic due to their differing lexicon ("low", "medium" and "high). Agents must be consulted in each iteration to ensure correct semantics throughout the entire desktop interface.
		CPI1.6	"Add mass emailing capabilities."	The expert didn't understand the utility of groups, but she thinks this area should be set up for mass emailing, since her RE company sends monthly or weekly updates to clients. Email marketing could be easier.
(Client) Profile Page	**Pros**	PP1.1	"Information regarding social relationships."	A section of each client's profile details the people with whom they are acquainted and/or work with. This function facilitates a deeper comprehension of the client's background and connections.
	Cons	PC1.1	"Client's motivations cannot be generalized."	The client's profile lists pricing, comfort, and convenience on a one-to-ten scale, as the three main motivations for a client. However, such motivations don't hold the same value for buyers and sellers. Additionally, all types of clients have diverse aims, making it impossible to get a global perspective of their motivations.
		PC1.2	"The distinction between a task and event is not explained."	Face-to-face meetings are different from texting, emailing, and calling a client since they involve a physical location. Thus, Face-to-face encounters were named "events", whereas the other three "tasks". However, this rationale isn't mentioned on the webpage, causing confusion and misunderstanding.
	Proposed Improvements	PPI1.1	"Replace client's motivations."	Motivations cannot be generalized, and having the employee manually fill three different motivations for each client is also of little assistance. Thus, it was suggested to replace this component with another one.
		PPI1.2	"Don't distinguish activities into tasks and events."	All activities should be viewed as an event. In the case of a face-to-face activity, the location should be unlocked when selected, and remain locked for the other three. It decreases complexity and the number of clicks required to create an event.
		PP1.3	"Comments must be added to an event."	The agent appreciates being able to comment on just-ended events since it serves as a client logbook, however, after-event comments are not obvious. To better serve users, the current language and UI needs to be updated.
		PPI1.4	"Client's sources should be predefined."	Knowing a contact's source is helpful. Instead of an open field, a dropdown menu with alternatives should be used. In this approach, data can be statistically analysed to determine the performance of their marketing campaign.
		PPI1.5	"Restructure the visualization order for the user's availability."	The weekly calendar view progresses upwards throughout the day, beginning at the bottom and ending towards the top. It was suggested that we should always start with the most important information first, as readers' eyes naturally travel to the top of a page before skimming down.
		PPI1.6	"Set up mobile alerts for important occasions."	All the events that display on the website should also surface as notifications in the mobile app, serving as an additional benefit.
Artefact	**P.I.**	API1.1	"The existing colour palette is not flattering."	The colour scheme of lilac and purple was regarded unpleasant by the agent, and it was determined that the lighter colours and transparency would not be effective in drawing the user's attention to important information. As a result, a richer colour scheme is required.

4.2. Second DSR Iteration

The first two iterations had a high amount of data that needed to be checked thoroughly because of the size of the artefact. To prevent interview fatigue and overrunning the given time, it was decided to focus the second round of testing only on the updated features introduced in this release, such as, the Client's Profile and the Calendar and Dashboard sections. Thus, 29 screens were designed to showcase the new features added in this version. The 2nd Iteration's folder depicts the most crucial screens of each module and its respective prototype.

Newer iterations, however, will review the entire artefact, ensuring that any problematic parts are fixed until a final consensus is established.

Proposal

Table 12 provides a summary of the areas that required improvement. Five of the suggested improvements addressed the interface's content, whether its structure, accessibility, authenticity of information, or absence. In the first stages, functionality was given precedence above visual appeal by adhering to Occam's Razor Law [35], which states that one should examine each piece and eliminate as many as feasible without affecting the whole. This would allow for a greater emphasis on style in subsequent iterations without sacrificing usability, accessibility, or stability.

Due to the enormous amount of content in the original artefact, its lack of white space impaired readability and harmonization. As a result, three alterations were made to improve space allocation. Three improvements focused on visual features, such as the hierarchy of visual information and colour schemes. Two final enhancements concerned the object's semantics. There were only three proposals to be disregarded. Given that PPI1.6 alludes to the mobile version of this app, which will be built later, it was decided to disregard it as it was beyond the purview of this study. CPI1.6 refers to the inclusion of mass emailing and messaging capabilities to the groups area. Since this research pertains to the construction of a CRM for RE, this function was deemed a website add-on rather than a core component and was therefore discarded. To further corroborate that the colour scheme does not fit the industry's standards and needs to be modified, development on API1.1 was halted until the third iteration.

Table 12. Applied enhancements based on the first iteration's results.

ID	Proposed Improvement	Type of Improvement	Was it Implemented?	By whose Suggestion?
CPI1.1	"Delete the left-hand vertical sidebar."	Space Allocation	Yes	Interviewee
CPI1.2	"Social media information is not required."	Space Allocation	Yes	Interviewee
CPI1.3	"Nested list should be user-friendly."	Content Accessibility	Yes	Interviewee
CPI1.4	"Abbreviations should be avoided."	Semantic	Yes	Interviewee
CPI1.5	"Use familiar field-specific semantics."	Semantic	Yes	Interviewee
CPI1.6	"Add mass emailing capabilities."	Content	No	Interviewee
PPI1.1	"Replace client's motivations."	Space Allocation	Yes	Interviewee
PPI1.2	"Don't distinguish activities into tasks and events."	Content Structuring	Yes	Interviewee
PP1.3	"Comments must be added to an event."	Visual Hierarchy	Yes	Interviewee
PPI1.4	"Client's sources should be predefined."	Content	Yes	Interviewee
PPI1.5	"Restructure the visualization order for the user's availability."	Visual	Yes	Interviewee
PPI1.6	"Set up mobile alerts for important occasions."	Content	No	Interviewee
API1.1	"The existing colour palette is not flattering."	Visual	No	Interviewee

Demonstration

The interviewee was presented the prior modules to provide background and illustrate how the system functioned before the interview. The prototype already had user flows, so the interviewee was guided through each stage. This prototype also lacked components and states and relied on the expert to forecast each procedure.

The prototype showed the interviewee a randomized client's profile. The interviewee reviewed three important client page components. Customer qualification, client papers, and timeline were covered. The website's navigation bar allows the interviewee to navigate to the calendar after completing all subtasks. The expert also had to review the calendar. Included were the monthly calendar, event data, task-based calendar filtering, event creation, and access to the subsequent events. The agent was then instructed to enter the dashboard and rate eight distinct components. These consisted of the client's birthday cards, recently uploaded documents, the user's timeline, the user's performance in canvassing, leads, sales, and scriptures, the user's RE properties, the user's locations of interest, and a condensed calendar. Table 13 contains all the agent's responses and observations.

Evaluation

The findings of the second interview sought the same level of precision regarding the material on the new pages, leaving the corroboration of the information acquired from the first iteration for the subsequent session. Negative feedback on the artefact continues to outnumber positive responses by six to five, indicating that further work is required to ensure it meets the demands of RE agents. Additionally, the interviewee provided eleven helpful feedbacks to help develop a fully personalized platform for the agent.

Throughout the interview, agents' ability to create and retrieve stored events transparently, as well as the significance of the data included in these modules to the system's functionality, were highlighted as positives. The agent also believed that by assigning a colour to each activity on the entire website, it was easier to visually determine which task the card was associated with. However, the application attempts to provide an excessive amount of information, much of which is unnecessary; this is one of the primary contributors to the unfavourable aspects. Figure 11 shows the Dashboard's interface, which was thought to be content-heavy. Consequently, the agents were able to make more educated decisions regarding which data should be kept and which data should be eliminated, for more visually appealing and structured displays. Results to the interview questions are summarized in Table 13.
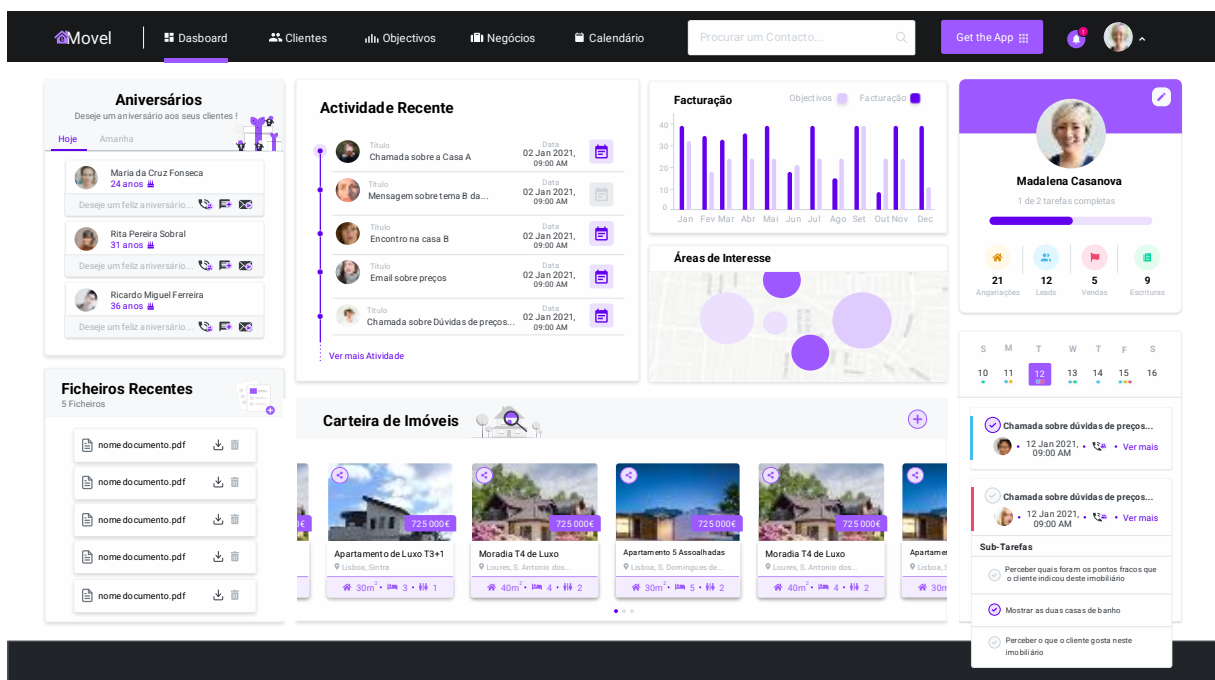
Figure 11. Artefact's second iteration - Dashboard

Table 13. Evaluation of the second iteration of the artefact

		ID	Stakeholder synthesis	Stakeholder Opinions
(Client) Profile Page	**Pros**	PP2.1	"Client exclusivity."	A client who is interested in signing a contract with the agent must first decide whether they want to be exclusive. The ability to filter the contact list for exclusivity is helpful because exclusive clients require a higher level of attention.
		PP2.2	"Events store the necessary information."	The agent can add notes and subtasks when generating the event and later comment additional information in the same event. This was deemed as sufficient to store all the desired information.
		PP2.3	"Simple record-keeping can track every client's interaction."	RE agents need a detailed history of each client's interaction to handle their relationships properly. This information is easily accessible in multiple places like the client's profile page and the nested rows in the Address Book.
	Cons	PC2.1	"There is no need for a client's bank details."	Since only commercial directors deal with payments directly, clients don't reveal their banking information to the agency until after a deal has been signed. Assuming the platform serves agents solely as a CRM and client database, this data is currently unnecessary.
	Proposed Improvements	PPI2.1	"All information must be displayed by default."	The "see more" part inside each event on the user's profile was suggested to be opened by default so that all the information could be accessible with fewer clicks.
		PPI2.2	"Iconography needs to be updated."	The consultant didn't realize the three vertical dots were the only way to edit or delete each event. It was recommended to use icons to symbolize the two activities directly on the event card, seeing that all information should be readily available. Additionally, the calendar-like icon for accessing an event's timeline creates the idea that it is for establishing new events.
		PPI2.3	"Client's qualifications must be more flexible."	Customers may be interested in buying and selling RE, and they may also have multiple properties to advertise. So, a selling customer must be able to have a wide range of properties linked to their profile.
		PPI2.4	"Documents must be easier to navigate."	Folder creation, improved filtering, or a search bar were proposed as essential features for the documents due to the large quantity of files associated with each client.
Calendar	**Pros**	CaP2.1	"Each event has a unique colour."	According to professionals, the four most frequent ways to do business are via phone, text, email, and in-person meetings. The website offers each activity its own set of colours.
	Cons	CaC2.1	"Information-packed Calendar."	At first glance, an overwhelming amount of data is displayed, making it progressively difficult to identify only the required information.

Dashboard	**P.I.**	CaC2.2	"The calendar's hues are dull and lifeless."	The calendar has soft, pastel hues. These hues make it tough to contrast UI elements with their surroundings to show their importance. This is crucial, seeing that it's necessary to highlight the most critical parts, so consumers can quickly scan the site.
		CaPI2.1	"Have a slider for the daily calendar view."	The calendar contains a lot of data; by default, the daily view should be hidden and only the monthly view shown. The daily view should be made available through a horizontal slider.
		CaPI2.2	"Reconsider visual hierarchy."	A paper notepad is a typical tool for salesmen, so the daily view mimics its behaviour. However, the current visual hierarchy neither emphasizes nor prioritizes information. Due to the small font, it's hard to keep the user's attention on the event dates, which are vital. The visual hierarchy needs to be rethought.
		CaPI2.3	"Bold colours instead of pastel colours."	Light and pastel colours may deter male users from using our program, since they don't reflect the strength and vigour that agents want to display for their clients. As a result, a richer colour scheme is required.
	Pros	DP2.1	"Direct access to a client's birthday."	Agents benefit greatly from having direct access to the names, birthdays, and contact information of clients whose birthdays coincide with their visit.
	Cons	DC2.1	"Areas of interest are incomprehensible."	This component's complexity requires the creation of an entire page devoted to it, which falls out of the dashboard's scope.
		DC2.2	"A list of recently added documents is of no use."	The agent didn't place a high value on the recently added documents section. Therefore, it ought to be discarded or replaced for something else.
		DC2.3	"Information-packed Dashboard."	There is a significant amount of data that needs to be eliminated from the dashboard to create room for the sections that are of relevance.
	Proposed Improvements	DPI2.1	"Rethink recent activity's structure."	The recent activity section doesn't have a lot of room to show what is important. A new structure must be developed because of the preference for quick access over going through two processes.
		DPI2.2	"Swap areas of interest with an additional goal card."	Replace the areas of interest with a similar card to the invoices, to displays the user's canvassing details and monthly goals. Adding these two cards together will provide a more comprehensive perspective of their monthly performance.
		DPI2.3	"Content must follow natural eye movement patterns."	The most significant information should be on the left column, seeing that users read the screen from left to right (as seen on Gmail, Outlook, etc). Therefore, the dashboard's material must be arranged in accordance with natural eye movement patterns.
		DPI2.4	"Use field-specific language."	RE agents are guaranteed to make money on deeds, but not on sales. Measuring this metrics could be difficult because some agents don't get paid at all, while others split the commission 50/50. Thus, this section should be replaced with proper field-specific language.

4.3. Third DSR Iteration

The third prototype was a consolidation of work based on information gathered in earlier iterations, as no new features were included. Thus, the Contacts, Client's Profile Page, Calendar, and Dashboard modules were finally completely functional in this prototype. With the introduction of components and states into the design system, the number of art boards was reduced from 59 to 29. This prototype was able to consolidate various art boards needed for different behaviours onto single boards, allowing the logic required to produce the intended behaviours to be integrated directly into the main components, as opposed to the art boards. The screens of each module are shown in the 3rd Iteration's folder.

Proposal

The Aesthetic-Usability Effect [35] states that people's brains respond more favourably to and infer higher utility from visually appealing designs, so the consensus distaste for pastel colours and transparencies in API1.1 was addressed, and a more daring UI design was implemented, as can be seen in Figure 12. In addition, all ideas for improvement offered in the first two iterations were applied prior to the review of this iteration. The modifications made are reported in Tables 12 and 14. Sections 4.1 and 4.2 provide the analysis, respectively, and to better comprehend the improvements made from the previous two iterations to this last iteration.

Since the primary focus of the first two interviews was identical, the sorts of solutions provided during those iterations were equivalent. Thus, on the second iteration, the ideas resulted in five visual enhancements, three changes to the content's structure, two modifications to the space allocation, and one change to the semantics of the component.
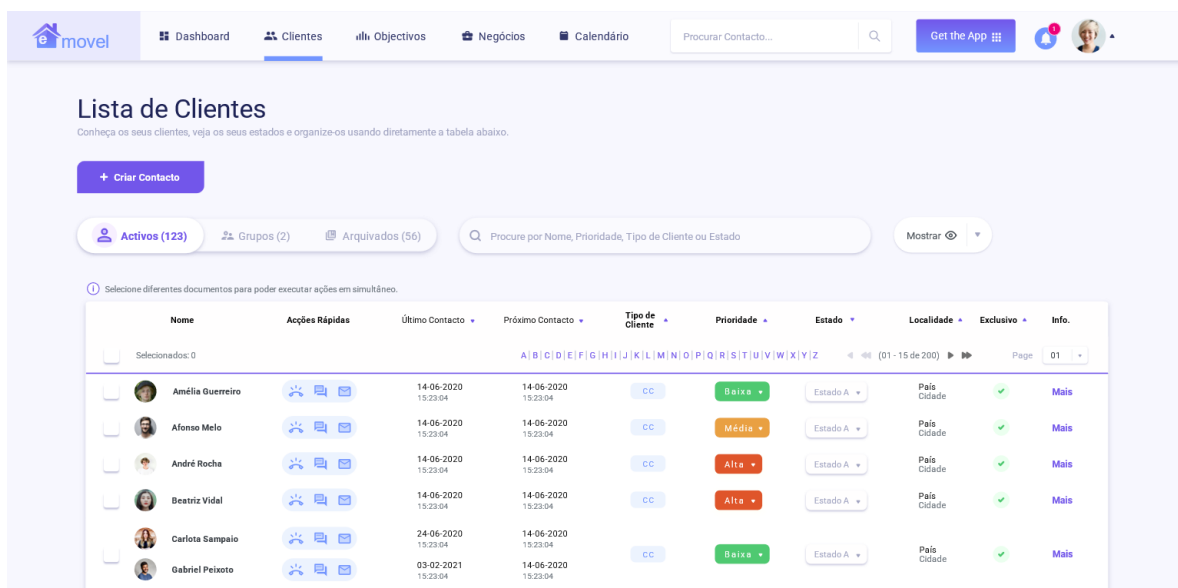
Figure 12. Artefact's third iteration - Contacts

Table 14. Applied enhancements based on the second iteration's results.

ID	Proposed Improvements	Type of Improvement	Was it Implemented?	By whose Suggestion?
PPI2.1	"All information must be displayed by default."	Content Structuring	Yes	Interviewee
PPI2.2	"Iconography needs to be updated."	Visual	Yes	Interviewee
PPI2.3	"Client's qualifications must be flexible."	Content Structuring	Yes	Interviewee
PPI2.4	"Documents must be easier to navigate."	Content Structuring	Yes	Interviewee
CaPI2.1	"Have a slider for the daily calendar view."	Space Allocation	Yes	Interviewee
CaPI2.2	"Reconsider visual hierarchy."	Visual Hierarchy	Yes	Interviewee
CaPI2.3	"Bold colours instead of pastel colours."	Visual	Yes	Interviewee
DPI2.1	"Rethink recent activity's structure."	Visual Hierarchy	Yes	Interviewee
DPI2.2	"Swap areas of interest with an additional goal card."	Space Allocation	Yes	Interviewee
DPI2.3	"Content must follow natural eye movement patterns."	Visual Hierarchy	Yes	Interviewee
DPI2.4	"Use field-specific language."	Semantic	Yes	Interviewee

Demonstration

As this iteration attempted to test all currently developed modules individually, the prototype was not presented and explained beforehand. However, the interviewee was still contextualized by a research introduction (see appendix B). The activities script was based on the features and tasks that caused the most difficulty in the first and second scripts. By focusing on the previous issues, it was easy to tell if their corrections worked. While the third prototype kept the same user flows as the previous two, the inclusion of components and states enabled it to completely function as a website. This gave the user more freedom to explore the prototype on their own and improved the website's usability because it showed how often, what kind, and how easily users made mistakes. The interviewee viewed a list of contacts, a client's profile, the calendar, and their personal dashboard in this prototype.

CPI1.1 determined that consumers of websites with a lot of material in the primary viewing area may not benefit from vertical navigation. This was crucial since contacts store a large data table with compressed data. As a result, the filters were embedded in the names of the individual columns. These filters were hidden until the user clicked on the triangle to the right of the column headings, as can be seen in Figure 13.
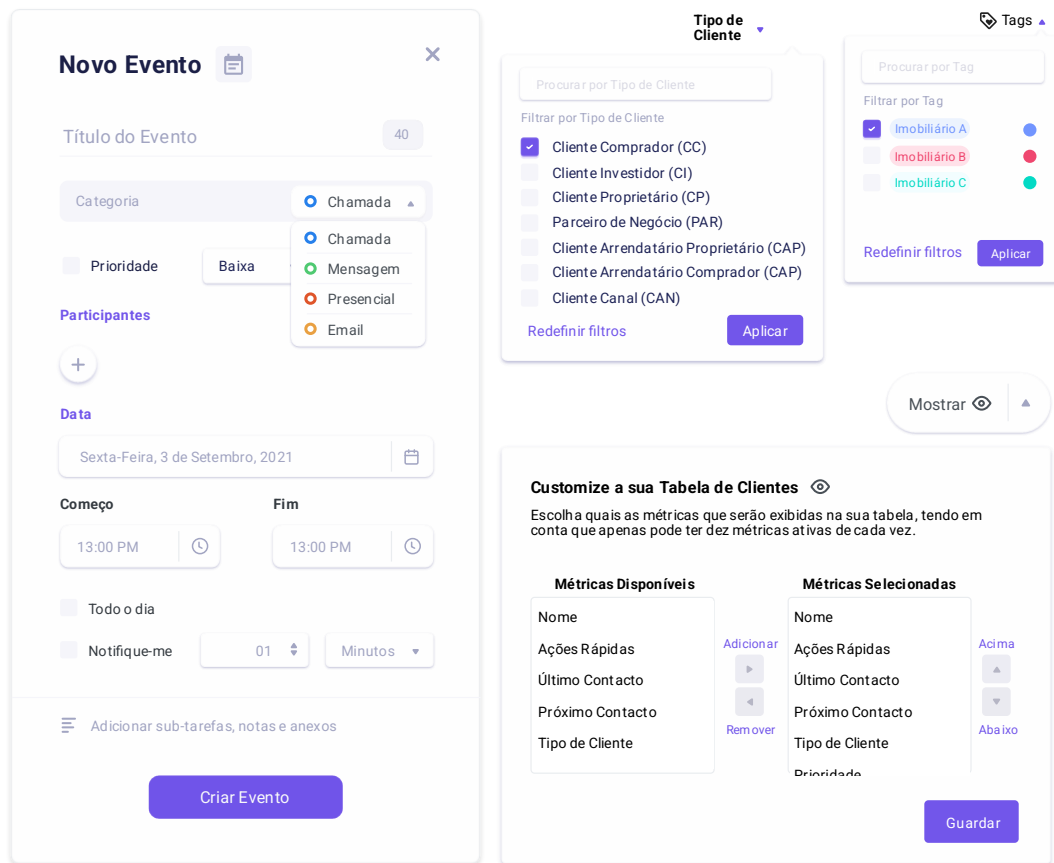
Figure 13. Enhancements made to the artefact by the third iteration (CPI1.4, CPI1.5, PPI1.2 and PPI2.4)

Additionally, the icon for more details in the timeline has been accompanied by text, and the arrows at the end of each row have been replaced with a written term after studying CPI1.3 and PPI2.2. This is to make both the table and timeline's true purpose more evident to the user.

Several adjustments were made to the client's profile page in accordance with PPI2.1, PPI2.2, and PPI2.3. Customer qualification, schedule, and supporting documentation have all been updated to include the most recent validated data and to present that data in a more aesthetically pleasing format, and the visual hierarchy of the events has been redesigned so that the most important details, such as the event's category, date, and content, are presented upfront.

Following an examination of PPI1.5, the appearance of the client's availability card was preserved, but tooltips for the user's schedule were added. Though, it's worth noting that this data doesn't show up until the mouse hovers over this section. After evaluating PPI1.1, the section that outlined each customer's goals was replaced with a notepad; this was something that agents in both iterations deemed essential. Additionally, Figure 13 shows that the analysis of PPI2.4 also yielded a tagging system that can be used to categorize documents.
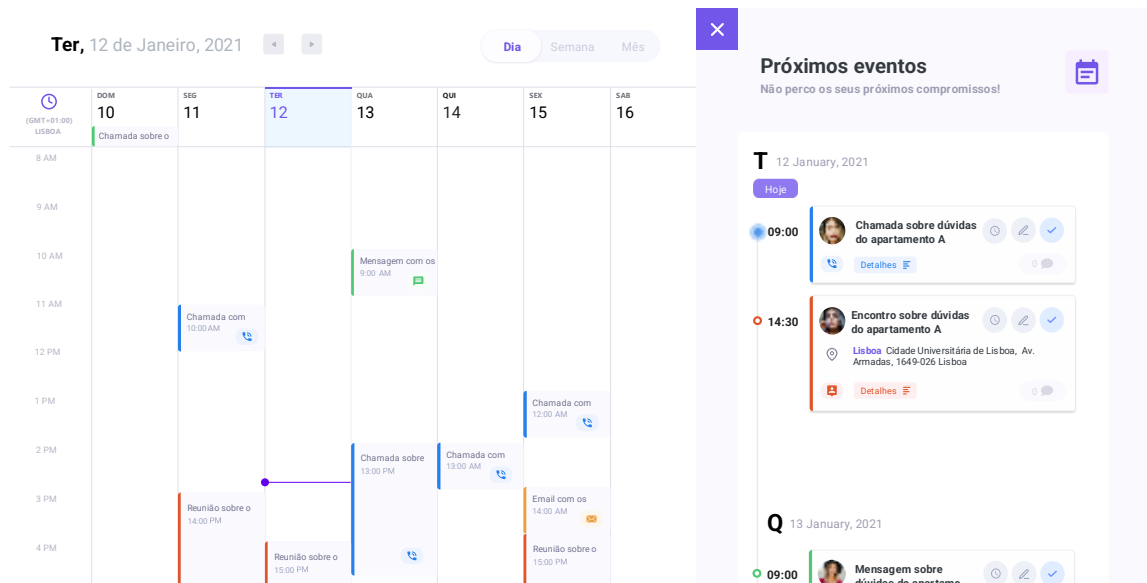
Figure 14. Enhancements made to the artefact by the third iteration (CaPI2.1 and CaPI2.2)

Problems with space and an overflow of unnecessary information that affected the second iteration's modules have been resolved. CaPI2.1 and CaPI2.2 were applied to the calendar to make it easier to read and follow, making use of the daily agenda slider depicted in Figure 14. To illustrate how DPI 2.1, DPI 2.2, and DPI 2.3 were used to restructure the dashboard's data to get the same result, see Figure 26 in the 3rd Iteration's folder.

Evaluation

Due to COVID-19, the third interview had to be carried out through a Zoom meeting, during which the interviewee was given unrestricted access to the screen of the computer containing the prototype. According to Table 15, the interview generated a total of ten proposals, five compliments and five complaints. This steadiness between positive and negative elements suggests that the prototype is progressively moving in the appropriate direction to suit the needs of the expert more effectively.

In this version, white space was considered an asset, and the website's straightforward arrangement was complimented. Consequently, objections and ideas for improvement began to centre on the data's visual presentation. For example, despite its best intentions, the graphical depiction of the client's availability still slows down the reader's journey through the client's schedule; and it must be rethought in accordance with best practices.

While the new colour scheme was generally well-received, the agent was worried that the navigation bar's light theme could discourage male agents from registering. So, the agent proposed making it darker to better suit all genders. This decision was put off until the fifth iteration, so we could learn more about how this effect would resonate with male users.

Table 15. Evaluation of the third iteration of the artefact

		ID	Stakeholder synthesis	Stakeholder Opinions
Contacts	**Pros**	CP3.1	"Customizable contact list."	The contact manager's "view" button customizes the list columns' contents and order. Each consumer can see which elements are in their list and personalize their display.
	Cons	CC3.1	"The placement of the filters is still ambiguous."	The triangular icon next to each column's name causes confusion. Such iconography implies that each column's order can be ascending or descending, rather than a hidden filtering method.
		CC3.2	"Difficult to visibly distinguish partnerships from individuals."	Given the contact list's simple design (no visual division between rows and columns on a white background), it's hard to tell which contacts are grouped together. Since this is an uncommon feature in contact managers, individuals may assume it doesn't exist. This must be more obvious.
	Proposed Improvements	CPI3.1	"More intuitive filtering system."	The agent said that it was highly unusual for consumers to navigate through contact lists by clicking the column headers in search of individual filters. New UX/UI research is necessary for contact management filters to be developed into an easy-to-use solution.
		CPI3.2	"Change the info column to an automatic hidden feature."	The view that opens when clicking "more" in the column "Info" was judged beneficial, however its access was still not well received. This column should be removed, and the view reorganized. It could be done by clicking the row or a dropdown arrow appended to the contact's name, differentiating between accessing the view via the name and the profile via the photo.
		CPI3.3	"Discern groups of contacts visually."	A clearer division between contacts was suggested to better understand individual vs. aggregated profiles.
		CPI3.4	"Differentiate archived contacts from closed deals."	It is important to distinguish between archived contacts and concluded deals. Archived contacts in RE are never used again, however agents sometimes wish to contact former clients. The system must offer a feature to recognize a client who has reached the final step of the contract while keeping their information in the active contacts.
		CPI3.5	"New presentation for the view button."	Given the importance of this button, this information should be presented in a clearer way, to immediately let the user, know of the list's customizable options.
(Client) Profile Page	**Pros**	PP3.1	"The client's qualification holds the necessary information."	The client's qualification determines how the user will do business with each client by stating that they are either a seller or a buyer, and their preferences in each deal. Each case is adequately and efficiently covered.
		PP3.2	"The documentation is well organized."	Due to the enormous number of documents per client, the previous iteration opted to improve the documentation section's organization. To meet these needs, a new tag was added to each document to group them by project. Thus, a higher level of complexity was achieved without the complexity of folders.
	Cons	PC3.1	"Customer's availability is still complicated to read."	Even though the availability feature was deemed crucial, its display was considered extremely time-consuming and complex to read, especially if the user is not hovering over the graph to see the tooltips regarding the hour intervals. The user must scroll through all the rows to figure out the client's availability for each day.

		PC3.2	"The comments in the events need a call to action."	In the client's "Following Events" area, comments can be added later. It's not clear that the option allows users to add new comments or view past ones. This button needs a call-to-action to be more transparent.
	P.I.	PPI3.1	"An editable table for the client's availability."	Given the difficulties of understanding the client's availability bar graph, a simpler solution is needed. The agent suggested that a simple editable table with the weekdays on the left and their availability in text is a better answer than the current static graph bar.
Calendar	**Pros**	CaP3.1	"The possibility to hide the daily calendar view makes the site lighter."	When the daily calendar view is only activated when selected, the user reported feeling less overwhelmed by the interface. Aside from that, the monthly view makes the page seem less cluttered and complicated to the user.
	P.I.	CaPI3.1	"Make it clear that there are different calendars to choose from."	It was not easy to get the user's attention on the fact that the calendar could be filtered by events. Therefore, it is important to choose brighter colours for the checkboxes so that they can be easily seen.
Dashboard	**Pros**	DP3.1	"Calendar data directly accessible from the Dashboard."	The agent was able to identify the condensed form of the calendar and recognize that this is a summary of what the Calendar section provides. It was appreciated that this data is readily accessible via the dashboard.
	Cons	DC3.1	"The number of tasks is hard to find."	Given that the dashboard is already content-heavy, highlighting non-centralized visual elements can be challenging. Since the number of tasks is on the left-hand sidebar, it must be more noticeable to the agent, or it may go undetected.
	P.I.	DPI3.1	"The goals' card must be structured differently."	A graph bar illustrates each monthly goals' current profit bar and goal bar. To grasp this graph's information, one must read the complete card (reach the right side of the card). This defeats the purpose of easy-to-access information shown via graphs; thus, crucial information should be placed on the left to let the user know the graph's purpose immediately.
		DPI3.2	"Aligning content according to natural eye movement."	It has become common practice for users to anticipate certain elements in a predetermined location. Additionally, associating things by putting them close together emphasizes their relationship. Thus, aligning pieces along the same path makes it easier to scan for related content by creating a sense of association between them. This methodology must be applied in the dashboard's content.
		DPI3.3	"Fix section's names that are not intuitive."	In the dashboard, the current name given to the section that holds the previous tasks done is not intuitive and does not translate well to its purpose. Thus, it should be renamed.

4.4.   Fourth DSR Iteration

The participant from the third interview gave some suggestions for this version. As with previous updates, the key aspects were analysed to develop aesthetically acceptable synergies with existing pieces. This iteration includes a goals and analytics module that connects to the dashboard's data, and 34 art boards were evaluated for usability. The 4rth Iteration's folder shows these modules' screens, and this section describes the collected research outcomes.

Proposal

As in prior rounds, the subject's input influenced this iteration's artefact alterations. Two of 10 recommendations were ignored. CPI3.2 deemed the informative view that appears when clicking "more" in the "Info" column beneficial, but its accessibility was not. The expert suggested eliminating this column and reorganizing the display using a secret method, such as the window opening when the line is clicked. This went against the initial requests (CP1.3 and CPI1.3) and Tesler's Law [35], which asserts that a system's complexity cannot be lowered below a particular level. In addition, CPI3.4 was not deployed because it required functionality that was not available until the next iteration (Business Funnels). As demonstrated in Table 16, this iteration's ideas emphasize content structuring above space allocation. Thus, the website's content was moving in the correct direction. In addition to improving the aesthetics, there were still field-specific semantic improvements that needed to be addressed.

Table 16. Applied enhancements based on the third iteration's results.

ID	Proposed Improvements	Type of Improvement	Was it Implemented?	By whose suggestion?
CPI3.1	"More intuitive filtering system."	Content Structuring	Yes	Interviewee
CPI3.2	"Change the info column to an automatic hidden feature."	Content Structuring	No	Interviewee
CPI3.3	"Discern groups of contacts visually."	Visual	Yes	Interviewee
CPI3.4	"Differentiate archived contacts from closed deals."	Content Structuring	No	Interviewee
CPI3.5	"New presentation for the view button."	Visual Hierarchy	Yes	Interviewee
PPI3.1	"An editable table for the client's availability."	Content Structuring	Yes	Interviewee
CaPI3.1	"Make it clear that there are different calendars to choose from.	Visual Hierarchy	Yes	Author
DPI3.1	"The goals' card must be structured differently."	Content Structuring	Yes	Interviewee
DPI3.2	"Aligning content according to natural eye movement."	Content Structuring	Yes	Interviewee
DPI3.3	"Fix section's names that are not intuitive."	Semantic	Yes	Interviewee

Demonstration

The dashboard's financial goals' card was revised considering DPI3.1's suggested improvements. The aim of the graph, which was to make difficult data accessible, was compromised because the user had to scroll through the entire piece to fully comprehend it. As shown on the left side of Figure 15 (top is the older version, below is the newer one), Gestalt laws of grouping [35] and the aid of colours, made it possible to create a card with the same information in a more pleasant and immediate way. Additionally, it's also possible to see how these standards can be applied to better specify content position, per DPI3.2.

Figure 15. Enhancements made to the artefact by the fourth iteration (Gestalt laws on DPI3.1 and Law of Common Region on PPI3.1)

As evidenced by PPI1.5 and PPI3.1, the client's availability bar graph has been difficult to read since the start; therefore, it was completely restructured into an editable table, using the Law of Common Region [35], as can be seen in Figure 15. This eliminates the need to navigate to the client's profile edit page to modify the client's availability, hence saving time and clicks. Reading it is easier since each square represents a separate period and is visually isolated.

Figure 16. Enhancements made to the artefact by the fourth iteration (Gestalt laws of grouping on DPI3.2).

As can be seen on Figure 16, the birthday feature, in which users could check that they had wished their client a happy birthday, was inadequately designed (left is the older version, right is the newer one). As the last action, the checkmark, was the first element displayed, its action route did not permit the discovery of contextually relevant content with a single swipe (left-to-right). The checkbox for this feature should only appear at the conclusion of this sequence.

Figure 17 shows a temporary approach to CPI3.2, by keeping the same logic but rewriting its label to clarify its function and wait for the next iteration to collect more data. The same figure shows CPI3.3's proposal for visually separating aggregated contacts. The new technique stacks icons horizontally instead of vertically and displays only the first contact. This eliminates the confusion of alphabetically sorting aggregated contacts and makes it clear when contacts are gathered. Opening the nested row displays all profile info. CPI3.5 required a new presentation for the table's editable elements, which was integrated into the headlines.
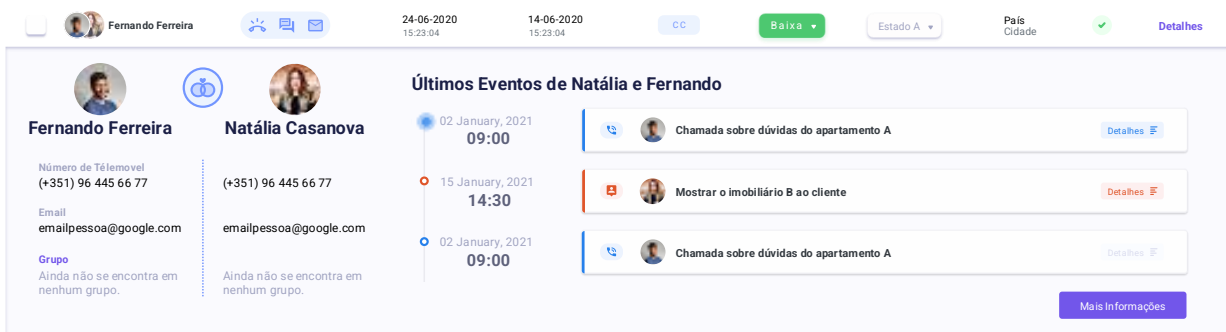
Figure 17. Enhancements made to the artefact by the fourth iteration (Tesler's and Gestalt laws, on CPI3.2 and CPI3.3)

CPI3.1 advocates for a more user-friendly filtering mechanism because consumers rarely click column headings to find individual filters. Figure 18 depicts the solution that emerged from UX and UI research [36] into the design of filters within tables with a heavy concentration of data in the page's primary content area.
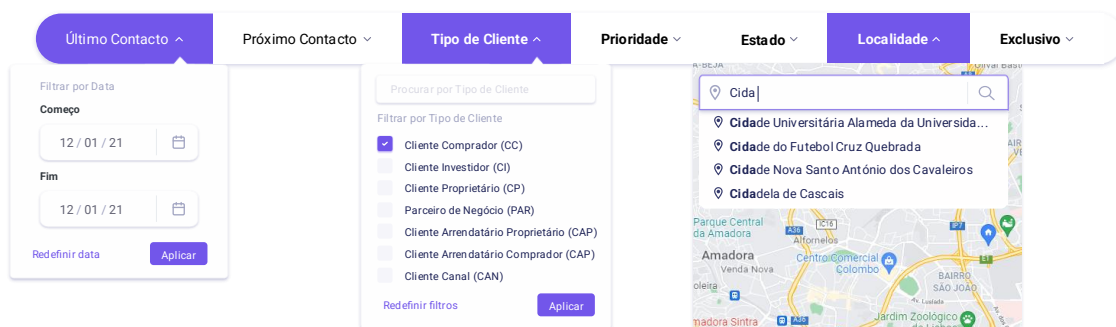

Figure 18. Enhancements made to the artefact by the fourth iteration (research into the design of filters, on CPI3.1)

Evaluation

Due to the epidemic, the fourth iteration was also conducted online, with unrestricted access to the prototype's computer screen. Table 17 shows that the interview produced nine recommendations, with roughly twice as many good (7) as negative comments (4). In this iteration, a shift in the expected direction was finally obvious, as the prototype started approaching its ideal development. The negatives centred on missing or insufficient information. The agent never considered beginning features from scratch, opting instead to make minor modifications to the current content. The positives, on the other hand, are mostly attributable to the fact that this version finally correctly addresses all the concerns that have been expressed previously. Section 4.5 presents interview analysis and suggestions.

Table 17. Evaluation of the fourth iteration of the artefact

		ID	Stakeholder synthesis	Stakeholder Opinions
Contacts	**Pros**	CP4.1	"Filtering system is both appealing and concise."	The agent rapidly learnt that the filters button provided more detailed filtering than the table columns. Since their systems don't have broad filtering, it was well-received.
		CP4.2	"Shared profiles will save consultants time."	When two brothers wish to sell their home, one individual is normally called, said the expert. However, this doesn't mean only this individual will sign the final documents. A streamlined family profile would make it easier to find everyone's details and contacts.
	Proposed Improvements	CPI4.1	"Sort by latest contacted, not alphabetically."	The expert said the table shouldn't be alphabetized like contact lists. He prefers to see recently contacted clients at the top of the table. Our system offers "latest contact" filtering, but it's not the default view; thus, it must be changed.
		CPI4.2	"The partnership icon should be neutral."	In addition to marriage, the website should consider other sorts of ties, such as family, friends, roommates, etc. Thus, using a symbol that doesn't immediately depict romance, but rather a mutual connection, was recommended.
(Client) Profile Page	**Pros**	PP4.1	"The iconography was intuitive and well-placed."	The agent was easily able to deduce the significance of each symbol in the user's profile. It was also determined that rescheduling is the most frequent activity they perform, therefore it makes sense to provide this option directly on the card.
		PP4.2	"The customer's availability is easy to view and change."	This was the first iteration in which checking availability happened instantly. This iteration's graphical format was significantly easier to understand than the previous one.
	Proposed Improv.	PPI4.1	"Use consistent design on the client's profile page."	Profile tabs have varied UIs. Title, subtitle, margins, and spacing are inconsistent. This reduces the profile's usefulness. These components should be evaluated and modified to maintain design consistency.
Calendar	**Cons**	CaC4.1	"Events can only be added through the "Create Events" button."	Clicking the button in the left vertical sidebar adds events to the calendar. However, electronic calendar users click on the desired calendar area to schedule events (like in Google Calendar).

		ID	Stakeholder synthesis	Stakeholder Opinions
Calendar	**P.I.**	CaPI4.1	"Move the "Create Events" button."	It's still tough to grasp the concept of alternate calendars. The button at the top of the page's left-hand vertical sidebar was the sole focus of attention for all users. Thus, the button should be moved somewhere, such that the left side of the screen is dominated by this component alone.
Dashboard	**Pros**	DP4.1	"The entire website is summarized in the dashboard.	The expert was able to identify the many components that the dashboard is linked to. He praised the dashboard's ability to provide user-friendly access to components of the most significant features.
		DP4.2	"The financial goals' card is easy to read."	The right interpretation of the financial goals' card was straightforward, quickly revealing that the user had already exceeded their monthly invoicing goals.
	Cons	DC4.1	"No time range defined in the Dashboard data."	There was some discussion regarding the time intervals to which each area of the dashboard was dedicated, and it was determined that this information was neither accessible nor obvious.
		DC4.2	"Completed tasks reflect something else.	The interviewee found the tasks he had completed, but it was challenging. Due to the component's interface mimicking LinkedIn's section on profile steps, he misunderstood the component's function.
	Proposed Improvements	DPI4.1	"Offer time intervals."	Information must be added to comprehend the time for which each graph is dedicated. The user suggested a selection of different time intervals, such as Weekly, monthly, and yearly.
		DPI4.2	"Link pie charts and goals."	Make it clear that the pie charts at the top of the dashboard are displaying data from the goal's page. As a result, their name should be altered, and they should be grouped together.
		DPI4.3	"Modify the completed tasks' visuals."	Despite being originally misinterpreted, the consultant admitted to preferring this information over LinkedIn's because it serves only the individual. He suggested highlighting this part.
Goals & Analytics	**Pros**	GP4.1	"It is possible to change, define, and track goals."	The user can create weekly, monthly, and yearly targets, which are tracked by graphs and charts to show the consultant's performance. Other benefits include having this information on both this page and the dashboard.
	Cons	GC4.1	"The Sales Funnel data is hazy and ambiguous."	It is to be expected for a consultant to lose a significant amount of business; hence, it is essential that one does not give equal importance to every sale. The sales funnel has a much broader scope than is required.
	Proposed Improvements	GPI4.1	"Goals data must be collected automatically."	After integrating the business section in the next iteration, this manually supplied data should be acquired automatically using business funnels. If a user doesn't use funnels to create a business event, they can still manually update the goals page.
		GPI4.2	"Remodel the Sales Funnel."	Seeing that the sales funnel has a much broader scope than is required, its primary focus should be on their canvass data. Additionally, this information must be divided between the clients who are buying versus selling.

4.5.   Fifth DSR Iteration

This final iteration confirmed and evaluated the entire artefact. During this version's usability interview, 58 art boards were examined, and the Business Funnels module was added as the last module. By the fifth iteration, most of the previously developed screens had been realized, and a consistent and identical response had been intercepted on each of them. Since no new functionality was added to the previous modules, feedback helped strengthen implementation and confirm consensus. With that said, the Business Funnels were evaluated with extra scrutiny because they were a new feature in this version. The <u>5th Iteration</u>'s folder demonstrates examples of some art boards, and Table 19 contains all the statements raised by the interviewee, along with their reasoning.

Proposal

This version of the artefact was constructed using all the expert's suggestions from the fourth iteration. Following the same line of reasoning as the previous interview, as seen in the Table 18, the expert's recommendations began to focus more on the aesthetically pleasing aspects of the artefact than on the information itself; hence, just nine recommendations were made, all of which involved content organization and visual enhancements. It is also important to note that no feedback was received regarding the website's content, space allocation or how the semantics could be improved to make the website more user-friendly for industry professionals. This means that a consensus has been reached on these topics, and they do not require further evaluation.

Table 18. Applied enhancements based on the fourth iteration's results.

ID	Proposed Improvements	Type of Improvement	Was it Implemented?	By whose suggestion?
CPI4.1	"Sort by latest contacted, not alphabetically."	Content Structuring	Yes	Interviewee
CPI4.2	"The partnership icon should be neutral."	Visual	Yes	Interviewee
PPI4.1	"Use consistent design on the client's profile page."	Visual Hierarchy	Yes	Interviewee
CaPI4.1	"Move the "Create Events" button."	Visual Hierarchy	Yes	Author
DPI4.1	"Offer time intervals."	Content Structuring	Yes	Interviewee
PI4.2	"Link pie charts and goals."	Content Structuring	Yes	Interviewee
DPI4.3	"Modify the completed tasks' visuals."	Visual Hierarchy	Yes	Interviewee
GPI4.1	"Goals data must be collected automatically."	Content Structuring	Yes	Interviewee
GPI4.2	"Remodel the Sales Funnel."	Content Structuring	Yes	Interviewee

Demonstration

Since the adjustments that needed to be made to CPI4.1, CPI4.2, PPI4.1 and GPI4.2 were rather minor, such as switching icons or choosing for various perspectives of already existing features, only simple changes were applied. CaPI4.1 mandates a change to the calendar button's visual hierarchy to address a usability issue. Figure 20 compares the two versions of the left sidebar, first from the old design to the new design. Since the "new event" button no longer occupies this column, readers can focus more intently on the alternative checkboxes shown. Accordingly, reading from top to bottom, it's possible to observe the prior version's core section and how its emphasis switched to the create event button. This lets the page's most crucial parts shine brightest, as the page is divided into distinct sections. Figure 19 shows how the previously mentioned usability laws were applied to DPI4.1, PI4.2 and DPI4.3 to address the concerns.
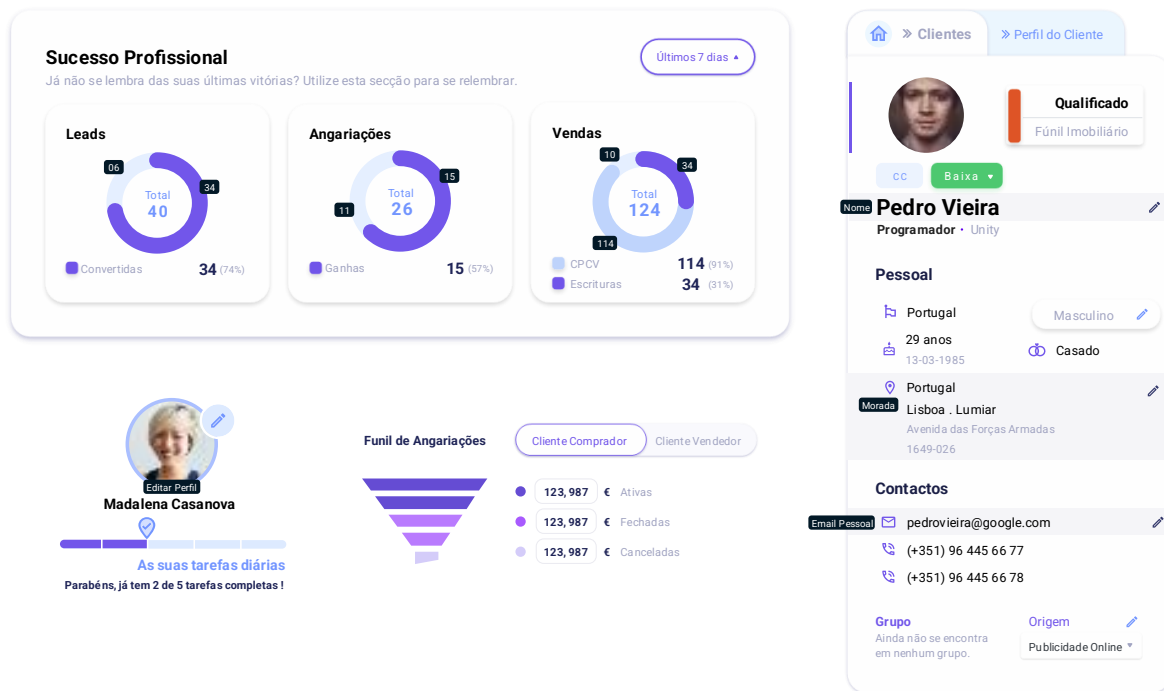
Figure 19. Enhancements made to the artefact by the fifth iteration (DPI4.1, PI4.2, DPI4.3 and GPI4.2)
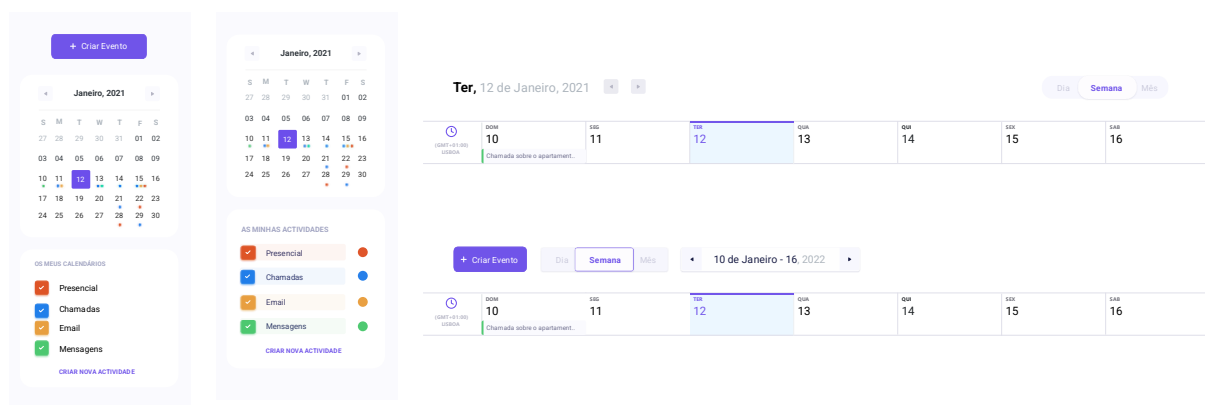
Figure 20. Enhancements made to the artefact by the fifth iteration (CaPI4.1)

The black navigation bar proposed in the third and fourth iterations has also been implemented in this final version. The navigation bar saw several changes, including a new colour scheme, the addition of tooltips to explain the use of each element, and the introduction of "fast actions". This button is available on every page's navigation bar and allows the user to initiate four of the most common tasks with a single click. When applied to mobile devices, the value will increase even further.
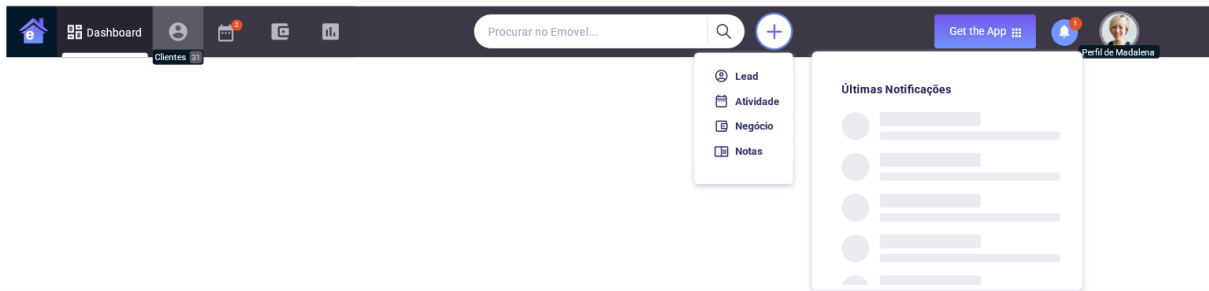
Figure 21. Enhancements made to the artefact by the fifth iteration (navigation bar)

Evaluation

After the fifth face-to-face interview, 9 improvements, 4 positive feedback, and 1 negative feedback were collected. It's clear that, except for the Business Funnels, all the recommended changes are merely proposals for extra data to supplement the existing platform. Examples include wider RE sector study, higher customization, capacity to track more devices, and better alert coordination via the app's mobile interface. The fact that these modules have been agreed upon shows that the artefact has come to a good estimate of the correct solution. The suggested modifications to business funnels are not concerned with improving the module's usability or aesthetics; rather, they are focused on improving the module's semantics. Positive remarks centre on past issues that were addressed and resolved, while the lone criticism is focused on the underlying mentality of monitoring ongoing tasks. This confirmed that the offered artefact influenced real estate agents and produced sentiments of impact, enthusiasm and satisfaction not generally connected with other well-known RE CRMs.

4.6. DSR Synthesis

At the end of the five iterations, it was possible to obtain a set of important improvement proposals that are included in Table 29. From a total of 52 suggestions for improvement, 50 were proposed by professionals and two by the author. Of the total of the suggestions, the majority was successfully accomplished, and only 13 proposals remained to be implemented.

Table 19. Evaluation of the fifth iteration of the artefact

		ID	Stakeholder synthesis	Stakeholder Opinions
Contacts Manager	**Proposed Improvements**	CPI5.1	"User should be able to set the table's viewing options."	The agent admitted that predefining the list by last contact works as a double-edged-sword, since it narrows the attention to already-engaged clients rather than attracting new ones. The list's display should consider the client's desired output, which may alter throughout their career. Thus, it would be ideal if the customer could set their own viewing choices for the table and keep them until it was time to make new viewing definitions (once more, rely on fully customizable user interfaces).
		CPI5.2	"User should be able to set tags".	The capacity to create and store one's own filters within the CRM system would be an excellent addition to the filtering system. With this, a user can keep a custom tag set and apply it to queries that would otherwise be dull.
		CPI5.3	"Understand real estate agent's preferences."	This system takes four clicks to select a filter, although a single click would suffice if all filters were displayed. However, straight access to all information would necessitate the reintroduction of the filtering options to the previous version's left vertical sidebar. This agent would rather have the first iteration's view. Thus, conducting a study to determining whether agents in filtering systems prioritize white space and breathability (at the expense of additional clicks) or speedy information (at the expense of screen complexity) is critical to close this issue.
Client Profile Page	**Pros**	PP5.1	"Information is readily accessible with no extra clicks."	She found the module's user interface to be intuitive and straightforward. One further perk is that reading up on each event doesn't require opening a new tab. This is because the information is always readily available on the main page by merely extending previously concealed parts. This contrasts with their CRM, that opens new tabs for extra information.
	P.I.	PPI5.1	"Incorporate WhatsApp monitoring."	Since WhatsApp is highly used in this business, it was suggested that the app include a mechanism to archive earlier chats, preserving their content and data history. This would be better than their current CRM, which only tracks WhatsApp date usage.
Dashboard	**Cons**	DC5.1	"The function to track subsequent tasks was not well considered."	Because they dislike using their CRM, this agency's agents only update their tasks days later. This is largely because their job requires them to spend a lot of time "on the go," making it hard to mix an active outdoor lifestyle with a continuous updating. They don't update their CRM's mobile version either, showing that this is not the best way to motivate them. Therefore, our task tracking feature may be misused or not used at all.
	P.I.	DPI5.1	"Log completed tasks through notifications."	Since most agents only log their activities at the end of the day, encouraging them to do so by sending them reminders or notifications in the late afternoon to provide an update on their accomplished tasks could prove more successful (rather than checking them individually throughout the day).
Goals & Analytics	**Pros**	GP5.1	"Goals presented are sufficient."	This set of goals makes sense since it allows them to zero in on the level of performance required to achieve their desired outcomes. As it stands, the application's current focus areas are sufficient, and the agent saw no gaps in functionality given the app's intended use case (a single user).

Business Funnels	**Proposed Improv.**	GPI5.1	"Improve statistics by relying on previous studies."	The agent mentioned that previous studies have been conducted in the business sector that offer statistical solutions to, for example, the minimum number of clients a consultant must contact to create a particular number of leads. Managing the system's goals considering the findings of these studies would be great because it would result in more precise feedback to questions such as "How many calls do I need to make to create 3 leads?".
	Pros	BP5.1	"Funnels can be changed to fit user's needs."	Because every real estate agent may have their own unique evaluation processes, the idea that the funnels are fully customizable and can be developed from scratch was quite appealing. It is crucial to recognize that people's preferred methods of operation vary.
	Proposed Improv.	BPI5.1	"There is a lack of clarity on existing funnel states."	The current sales and sales promotion pipelines are insufficient to meet the needs of the real estate industry and the goals of this section. The second funnel (Sale Funnel) should be aimed for the sales clients, and the established steps should be first contact, qualification, visit, proposal, CPCV and deed. The third sales funnel is unnecessary and can be replaced by a new one called "canvassing." Consisting of the following steps: canvassing visit, market research, canvassing, and property images, this service should be tailored specifically to the needs of buyer clients.
		BPI5.2	"To complete the first RE funnel, additional states are required."	While the first funnel is working well and should be kept in place, two further steps are needed to ensure a consistent follow-up. After the "Planned Presentation", the next step should be "Visits", and after "negotiations in process", the last step should be "Business Deal".
Artefact	**Pros**	AP5.1	"Agent found the colour palette to be pleasant and fitting."	The CRM Manager stated that the adoption of appropriate colour schemes was of the utmost importance to the performance of a CRM. Their old CRM employed a monochromatic colour scheme with an abundance of light greys, which made the content difficult to read. As a direct result of this, they stopped using it. She believed that our CRM's colour scheme was appropriate and that it was easy to read.
	P.I.	API5.1	"Include in-app training seminars as an option for users."	Several agents, although receiving a free copy of the CRM in this agency, they did not appear to be interested in making use of it. Because of this, they started providing free CRM training seminars, which is a perk that contributed to a higher adoption rate. The application should, therefore, aim to include a training area to facilitate the same goals.

4.7.   Usability testing Results

One simple way to gauge user satisfaction is to simply ask for feedback. It is important to inquire as to the respondent's general satisfaction, ease of use, navigational efficacy, knowledge of specific features, terminology clarity, aesthetic appeal, belief in the company, enjoyment, and so forth.

Usability studies have independent and dependent variables. Success/failure rates, user satisfaction, and completion times are dependent variables, whereas participant age and design testing results are independent [37]. To determine if a redesign increased a task's success rate, a user experience research study must know which factors to change (independent variables) and which to measure (dependent variables). Nominal, ordinal, interval, and ratio data quantify independent and dependent variables [37]. Thus, it was necessary to determine the data type early on since different types of information have distinct features and, most importantly, can only be analysed using certain statistical methods.

The task's success was determined using nominal data and simple descriptive statistics, such as counts and frequencies. This method makes it simple to determine the success or failure of a certain number of tasks. Considering the action scripts provided in Appendices D through H, Table 20 indicates which task's ID either failed entirely or were just partially successful. In addition, it also provides statistics regarding their counting inside each script.

Table 20. Identification and counting of each task completion status, by Iteration.

Iteration	Total Count	#Failure	Count	#Partial Success	Count
First	21	1, 6, 8, 10, 15	5	2, 5, 9, 17, 18, 19, 20	7
Second	26	9,12,19	3	1, 3, 4, 7, 14, 17, 22, 23, 24, 25	10
Third	27	1, 6, 12, 14, 20, 23	6	3, 4, 8, 9, 15, 24, 25, 27	8
Fourth	17	-	0	1, 2, 3, 10, 12, 16, 17	7
Fifth	19	-	0	4, 7, 13, 15, 18	5

If a user completed a task in less than 20 seconds, it was regarded successful; if it took longer than 20 seconds and/or users had additional usability comments, it was considered partially successful; and if the user was unable to complete the task, it was declared a failure. Stacked bar graphs were used to depict these data, with each bar representing a distinct iteration. In Figure 19, the results can be seen, where green represents success, yellow represents partial success, and orange represents failure.

Due to this, it is possible to observe that the failure rate persisted in the first three iterations but disappeared in the last two, indicating that the most significant usability concerns have been resolved by the fourth iteration. Even though the failure rate increased during the third iteration, this was because the prototype had grown from static displays to a dynamic prototype, making it possible to spot usability concerns more accurately.
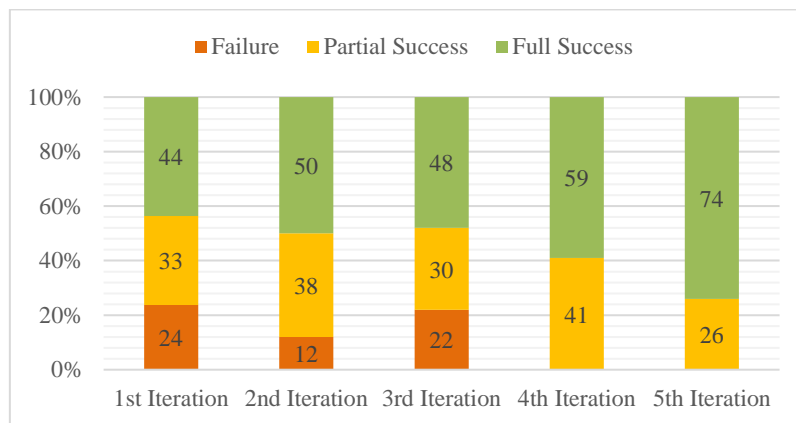
Figure 22. Percentage of each task completion status, by iteration.

By the fourth iteration, the failure rate had reached zero, but the partially successful rate had grown, and nearly as many tasks had been partially successful as entirely successful. This demonstrates that the focus of the first three iterations was on the correctness and completeness of the existing content (such as space allocation and semantics) rather than its usability (such as visual hierarchy and colour schemes), which had a substantial impact on the last two iterations. The most recent iteration had the highest success rate of any iteration in the study, with 74% of efforts being successful. Thus, as the number of iterations grows, the success rate is observed to increase continuously over time, illustrating its proper and successful evolution.

Figure 23 shows the same data as Figure 22, but this time broken down by module success rate. The Client Profile Page was rated at 100% on the fourth iteration, explaining why it was skipped over for the fifth round of testing. On the fifth iteration, both the Calendar and the User Goals were completely successful. The Contacts and Dashboard module had a perfect score of using pre-existing features and had only recommended enhancements for additional development. There were a few tweaks needed to be made to the Business Funnels module, but those modifications have all been documented and closed in section 4.5. Therefore, by the fifth iteration, we have achieved the consensus that was sought.
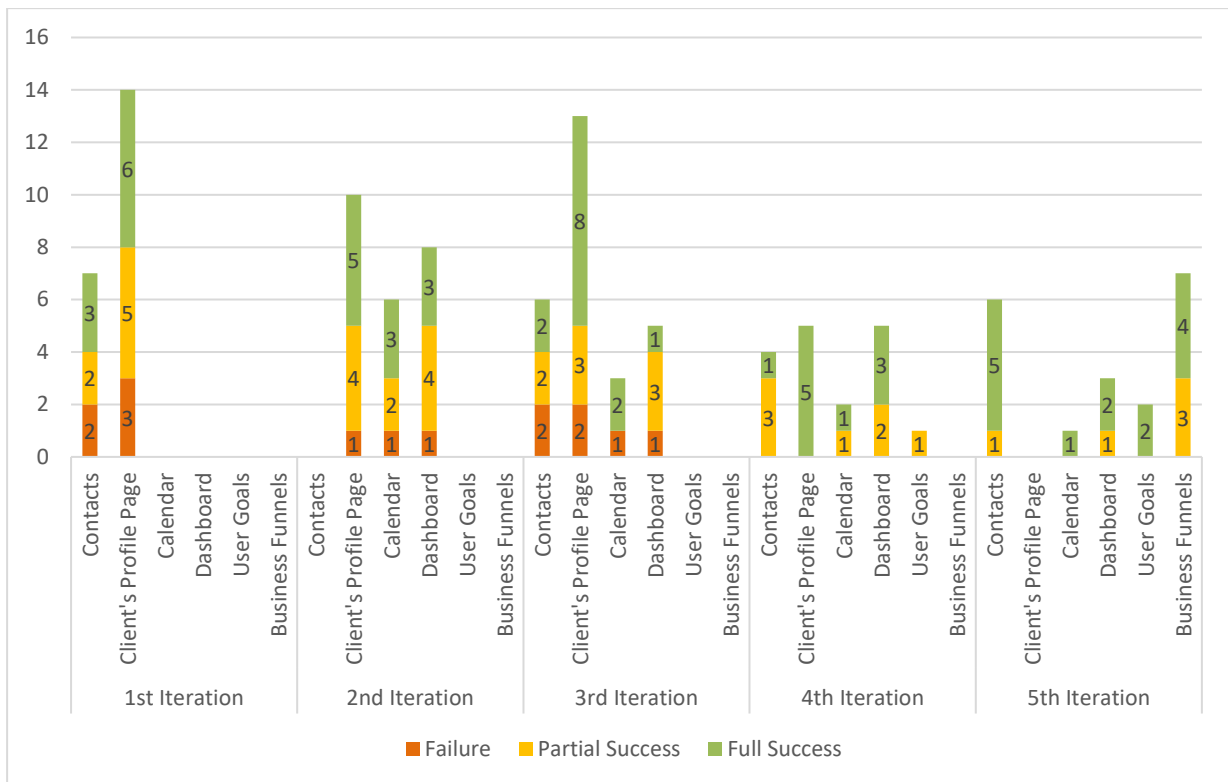
Figure 23. Count of each task completion status, by each module

The level of customer satisfaction was determined using Interval data. There is no natural zero point in interval data, so several descriptive statistics can be generated depending on the range of values in the data (including averages and standard deviation) [37]. As one of the most prevalent methods for collecting self-reported data in UX research, a Likert scale rating was employed for users to indicate their level of satisfaction. The satisfaction survey questions were largely inspired by Jim Lewis' 1995 Computer System Usability Questionnaire (CSUQ) [38], in which every statement was presented from a positive perspective, as opposed to the System Usability Scale (SUS) [39]; the main change being the use of a five-point scale of agreement rather than a seven-point scale. The scale went from a Strong disagreement (1) to disagreement (2), to neither agreement nor disagreement (3), to agreement (4), and finally a strong agreement (5). The CSUQ is designed to gauge user reactions to the following four aspects of a product or service: usefulness of the system, quality of the information provided, usability of the interface, and satisfaction with the product or service overall.

Indispensable for describing the meaning of interval data are descriptive statistics, that are used to select a single value representative of the entire set of values. Therefore, after considering the mean, median, and mode, it was settled on these central tendency metrics, which are frequently used in usability reports. [37].

Table 32 of appendix J displays the previously mentioned statistical data resulting from the results of the Satisfaction Survey, evaluating the general reaction to the programme, the system's information, its Learnability, and its Connectivity to Life. Figure 24 displays these results; it's possible to observe the mean steadily improving over time and taking a significant leap after the third iteration, when the static components became dynamic, and an improved colour scheme was chosen. Despite the apparent insignificance of the difference between the fourth and fifth iterations' means, it is important to note that the fifth iteration produced the highest possible ratings (5) for the median and mode. This data illustrates that incorporating o'Riley's well-known UX Laws and an iterative approach in which professionals analyse each stage of this interface's development results in greater user satisfaction.
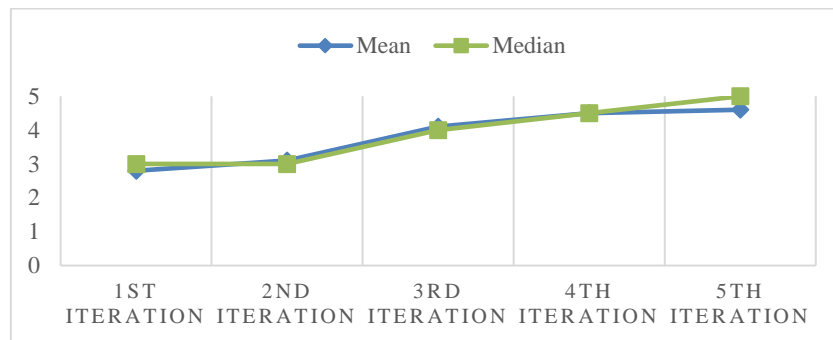
Figure 24. Descriptive statistics compiled from the responses to the Satisfaction Survey, relevant to the whole application

Table 33 in Appendix J displays the results of the Satisfaction Survey for each module's features, while Tables 34, 35, and 36 display the mean, mode, and median, respectively. This survey also used a five-point Likert scale, but rather than being influenced by CSUQ, the questions were tailored to the specific functionality of each module. Table 34's findings are seen in Figure 25.
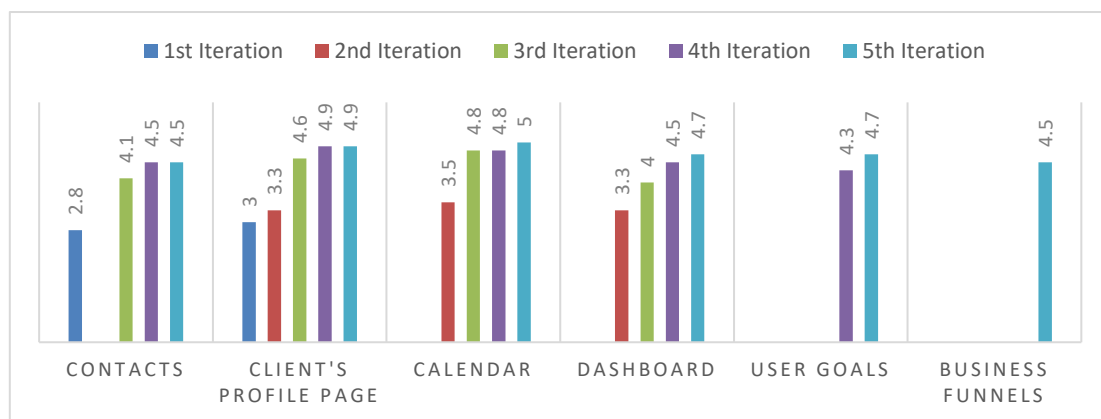
Figure 25. Calculated satisfaction levels for each module based on the Satisfaction Survey's responses.

CHAPTER 5
Conclusion

This investigation seeks to discover how to convert a mobile application for real estate that employs a CRM business approach into a successful internet interface. It emphasizes the customer to promote loyalty, contentment, and performance through an intuitive, efficient, and user-friendly interface that builds long-term relationships. DSR and interviews were used to establish needs and validate the artefact.

Finally, a user-friendly desktop interface was developed. This solution may require an initial investment of time, but it is still considerably easier to use than conventional RE CRM solutions. This interface was designed to be simple enough for specialists in this sector to prefer it over notebooks and use technological advances to improve their productivity. The interviews used to gather requirements helped pinpoint the most crucial elements of an effective and efficient e-CRM. Integration with calendars and contact lists with granular filtering, real-time agent performance monitoring via dashboards and statistics, client qualifying tools and business funnels are just a few of the essential features.

Professionals have voiced their approval of the e-CRM, with many expressing interests in putting it to use in their careers as real estate agents. The adaptability of this tool is indicative of the usefulness and efficiency of the interface designed for it. The respondents also felt that the developed artefact, with the addition of the mobile application, would save them time, allowing them to put more effort into nurturing the personal, caring connection they have with each customer.

The simplicity and appealing colour scheme of the interface were singled out as particularly noteworthy by the reviewers, who saw these features as direct results of the design's increased usability (as the Aesthetic-Usability Effect states). The task's colour palette was also praised for its effectiveness in conveying information quickly and simply through visual cues. Additionally, it's crucial to emphasize that the app's high level of personalization could enhance the number of prospective users, since nearly every component can be tailored to the user's preferences.

In the end, a desktop interface was developed with the aid of usability laws, that was well-received by the agents, who found it to be visually pleasing, simple to operate, and beneficial to their daily tasks.

This desktop interface helped fill a gap that had been noticed in the existing literature. Interview-based UI and UX design that was rigorously monitored using the DSR model allowed for the creation of a desktop application with a solid scientific foundation.

Publishing the findings in a peer-reviewed scientific journal marked the official completion of the DSR model's last phase. Article intended for publication in "Creativity and Innovation Management" journal.

By producing this artefact, we've made a significant contribution to the business world by making available a web interface focused only on user satisfaction and ease of use for real estate agents. By making the most important aspects of the app more accessible, this product has the potential to enhance users' day-to-day lives and foster a stronger bond with returning consumers.

5.1. Limitations

The current epidemic has led to a rise in online interactions, accounting for almost half of all this research's interactions, which may influence the development of empathy and comfort for interviewees. Another drawback was that the candidates couldn't use the app until the day of the interview, preventing them from verifying its legitimacy in their everyday lives, and having a very limited time to evaluate such a comprehensive app. Additionally, some usability concerns might have gone unnoticed because only select user processes were integrated into the interface.

Finally, research [37] shows that when asked for self-reported data face-to-face, people are more likely to provide positive comments than they are in an anonymous online survey, which could have implications for the outcomes of the usability testing. People tend to give answers that they hope would make them look good to others, a phenomenon known as the social desirability bias. Due to the small sample size per iterations, the survey could not be declared anonymous, even if the data collection technique insured that the moderator would not see the user's responses until after the participant had left. Thus, this may have led to less candid responses.

5.2. Future Work

The extent to which a person will be expected to use this CRM on their own is contingent on whether their agency already makes use of a similar system. If the organization already has a CRM system, this employee will have to use both the agency's system and their own, resulting in wasteful effort duplication. As it stands, this CRM is useful for organizations without CRM systems, independent salespeople, and smaller enterprises. Thus, for larger enterprises, the need for customer relationship management systems to link their several company locations necessitates an additional layer of management and hierarchy. Additionally, larger businesses may also benefit from a hierarchical approach for supervising the CRM Manager's monitoring of the agents' CRM activity.

For the sake of future research, it is instructive to note that numerous agents didn't seem interested in utilizing a CRM, even though they were given a free copy of the software by their agencies. As a result, various organizations began offering free CRM training courses, a perk that inevitably led to a greater rate of adoption. Therefore, a dedicated training area should be a future primary focus of the application.

Agents also pointed out that there have been prior studies in the business sector that offer statistical solutions to how many clients a consultant requires to call to generate a fixed quantity of leads. Despite these studies' existence, the evaluated CRMs do not provide this data, forcing agents to compile it manually in addition to stating their objectives. Incorporating these quantitative details into this CRM may therefore show to be an excellent advantage over competitors.

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Appendices

Appendix A

INFORMED CONSENT LETTER

As part of a Master of Science in Computer Engineering thesis, research is being undertaken on the usability and design of a real estate-specific customer relationship management (CRM) desktop interface.

To better interpret the data and analyse the results, an interview will be conducted in which handwritten notes, digital audio, and video recordings will be used to collect information. Your interview details will not be made public.

Participation in this study is entirely voluntary, therefore you are free to decline or end the interview at any time.

All collected information is **anonymous** and **confidential**.

- Gender: ■ Years of experience:

- Age: ■ Level of education:

- Professional position:

Signature of Participant _____

Date: ____/____/2021   □ I agree to participate   □ I do not agree to participate

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Appendix B

Introduction to Study

We appreciate your assistance in testing eMovel, an application being developed as part of a computer engineering master's thesis on the usability and design of a desktop CRM application suited exclusively to the real estate business. This solution will help agents better manage their client interactions by centralizing all pertinent client data in a single location, coordinating client goals, and enhancing business outcomes.

This study aims to give evidence in favour of the master's thesis question " Enhancing customer satisfaction towards UI&UX in a Real Estate CRM" suggested for the ISCTE-IUL Computer Engineering master's program.

Today, we will be evaluating n major application components and their respective features:

- **Component n1**
    - Feature n1
    - Feature n2
    - Feature n3
- **Component n2**
    - Feature n1
    - Feature n2
    - Feature n3

Participants can anticipate spending a total of **1 hour and 15 minutes** on the study (one hour on the interview, and the other fifteen minutes on the satisfaction survey).

A completely functional and interactive version of our website has just been loaded into your screen, and you are now free to explore it. To automatically populate text fields, you simply need to click on them once.

On this interview, you will be required to accomplish several tasks. I will not be able to answer specific questions during each task; however, I can clarify any instructions. Before we begin each task, I will ask you if you have any questions about the instructions. Please narrate your thought process by thinking aloud. For instance, if you were going to appropriate action, you would say out loud, "I'm going to appropriate action." This will help me understand what you're trying to do and improve the effectiveness of this study.

Please keep in mind that you are not being tested in this study. We are merely evaluating the application's capacity to assist you in accomplishing your goals. All notes, documentation, and comments will be kept **strictly confidential.**

Appendix C

Introduction

We appreciate your participation in this experiment.
Your participation in this research is crucial to us.
This study's primary purpose is to evaluate the usability and user experience of eMovel, a CRM for the real estate industry.
You will be asked to do multiple actions on the prototype during the interview. If you choose to withdraw at any point, you may do so without explanation.
Participants should be aware that the computer screen will be captured so that quantitative usability data can be analysed afterwards.
All information will be stored and handled anonymously and in confidence.
There will be no personal information stored. Following analysis, recordings will be removed.
The findings of this study will form the basis of a master's thesis titled "Can a UI & UX-centred design boost client satisfaction in a CRM application for Real Estate?"

| | I declare that I am familiar with the aims of this study and the goals of this research. |
| | I have been assured that my data will be kept secure and that no information exposing my identify will be published. |

(Place an "X" in the box if you agree)

Table 22. Satisfaction Survey - Entire Artefact as a whole

Part II: Satisfaction Survey - eMovel

Instructions:
Using a "X", please respond to the following questions regarding your user experience with the prototype.
Please answer every question in its entirety.

Take your time, and above all, respond honestly.

#	Description	Strongly Disagree 1	2	3	4	Strongly Agree 5	NA
	OVERALL REACTION TO THE SOFTWARE						
1	The interface's UI makes a positive impression.						
2	The interface's layout is user-friendly and working with this software is satisfying.						
3	The colour scheme is appropriate and appealing for the real estate industry.						
	SYSTEM INFORMATION						
4	I had no trouble carrying out the suggested tasks and locating the necessary information.						
5	I was able to complete the required tasks quickly because I did not have to click many times to collect the required						
6	This interface's design lays a significant focus on providing an intuitive navigation mechanism.						
7	I made many mistakes while interacting with the interface.						
8	Due to the interface's adaptability, I can undo my previous mistakes and start over.						
	LEARNING						
9	The interface is memorable, and I won't feel the need to relearn it every time I use it.						
	CONNECTIVITY WITH LIFE						
10	The application will offer greater accuracy in my data and better performance in my career.						
11	I would use this application over other competitors.						
12	I would recommend this application to friends or colleagues.						

Table 23. Satisfaction Survey - Features and Components part 1

Part II: Satisfaction Survey - eMovel

Instructions:

Using a "X", please respond to the following questions regarding your user experience with the prototype.

Please answer every question in its entirety.

Take your time, and above all, respond honestly.

#	Description	Strongly Disagree 1	2	3	4	Strongly Agree 5	NA
	OVERALL REACTION TO THE SOFTWARE						
1	The interface's UI makes a positive impression upon first glance.						
2	The interface's layout is user-friendly and working with this software is satisfying.						
3	The color scheme is appropriate and appealing for the real estate industry.						
	SYSTEM INFORMATION						
4	I had no trouble carrying out the suggested tasks and locating the necessary information.						
5	I was able to complete the required tasks quickly because I did not have to click many times to collect the required						
6	This interface's design lays a significant focus on providing an intuitive navigation mechanism.						
7	I didn't make many mistakes while interacting with the interface.						
8	Due to the interface's adaptability, I can undo my previous mistakes and start over.						
	LEARNING						
9	The interface is memorable, and I won't feel the need to relearn it every time I use it.						
	CONNECTIVITY WITH LIFE						
10	The application will offer greater accuracy in my data and better performance in my career.						
11	I would use this application over other competitors.						
12	I would recommend this application to friends or colleagues.						

Table 24. Satisfaction Survey - Features and Components part 2

Part II: Satisfaction Survey - Components & Features

Instructions:

Using a "X", please respond to the following questions regarding your user experience with the prototype.
Please answer every question in its entirety.

Take your time, and above all, respond honestly.

#	Description	Strongly Disagree 1	2	3	4	Strongly Agree 5	NA
	DASHBOARD						
17	The information displayed on the dashboard tab is sufficient.						
18	I can easily access all my daily and weekly events.						
19	I can easily access my clients' birthdays.						
20	I can easily deduce my performance from the graphs presented.						
21	The birthday card is easy to use and understand.						
22	I can easily access the last events I have completed.						
	USER'S GOALS						
23	The information displayed on the dashboard tab is sufficient.						
24	It is easy to update my weekly, monthly, and yearly goals.						
25	It is easy to analyse my weekly, monthly, and yearly goals.						
	BUSINESS FUNNELS						
26	The information presented in business tab is sufficient.						
27	It is easy to create new business funnels.						
28	It is easy to edit existing funnels.						
29	It is easy to access all the transactions made within my funnels, even after they have been finalised.						

Appendix D

Table 25. Actions required for the first DSR Iteration's interview

Required Actions			
#	**Tasks descriptions**	**Answers**	**Additional annotations**
	Contact List		
1	Filter your contacts so that the contact list only shows Buyer Clients and Investor Clients.		
2	Add Fernando Ferreira to your favourites, then archive the contact.		
3	State your most recent contact with Fernando Ferreira and your next contact with Natalia Casanova.		
4	On the front page, list the names of all clients who are buyers.		
5	On the front page, list the names of your highest priority clients.		
6	Explore additional details about Pedro Vieira without entering his profile page and specify the last time you sent him a message.		
7	Access the profile page for Pedro Vieira.		
	Client's Profile Page		
8	State which group Pedro Vieira belongs to and his origins.		
9	State whether Pedro Vieira is available from 12 noon to 2pm on Thursdays.		
10	State Pedro Vieira's main motivation as a client.		
11	State how many acquaintances Pedro has in common with your contact list.		
12	Add a new social connection for Pedro and add "Catarina Maria Rodrigues" as a friend.		
13	Add a new tag called "Others".		
14	Add a new known person outside of your contact list.		
15	Add a new event to Peter's profile, specify that it will be a call.		
16	Indicate what kind of tasks you have to do with this customer soon.		
17	Edit the call that will take place on the 2nd of January.		
18	Pedro just told you that he is not available on that date, reschedule the event for a new date.		
19	You are about to follow up on this call with Pedro, see the notes to remind yourself what to talk about.		
20	You have just finished the call that took place on 2 January, add a comment with new information.		
21	Mark this event as "Completed".		

Appendix E

Table 26. Actions required for the second DSR Iteration's interview

	Required Actions		
#	**Tasks descriptions**	**Answers**	**Additional annotations**
	Client's Profile Page		
1	View a history of all previous events you have had with this customer.		
2	Indicate the last time you met with this customer in person and what it was about.		
3	Get more information about this event.		
4	Find out how qualified this customer is.		
5	State the minimum amount the client wants to sell their property for and how many bedrooms it has.		
6	Specify that this customer is exclusive. After that, delete the card.		
7	Check the files you attached to this customer and specify how many files he has.		
8	Delete the first Word file.		
9	Change the list view format to a card view format, and delete the first PDF file.		
10	Add a new file to this customer's profile. On completion, go to the calendar.		
	Calendar		
11	State how many events you have between January 10 and January 16.		
12	Filter the calendar in order to only view your calls.		
13	Connect the eMovel Calendar to your Google Calendar.		
14	Indicate how many and what types of tasks you have on January 28.		
15	Find out more about the event occurring on Friday at 3 p.m. and review its subtasks and comments.		
16	Create a new event.		
17	Change the weekly calendar view to the monthly view.		
18	You have just completed the day's first task; please mark it as complete.		
	Dashboard		
19	State how many tasks you have completed today.		
20	State how many sales you have completed so far.		
21	State the first task you should do today.		
22	State how your invoicing performance has been and whether you have been able to meet your monthly targets.		
23	State what the last event you completed was, when it happened and what it was about.		
24	State how you can obtain the customer's information to send a birthday message.		
25	State the name of the last document added.		
26	State how many properties you own, have two bathrooms.		

Appendix F

#	Tasks descriptions	Answers	Additional annotations
	Required Actions		
	Contact List		
1	Filter your contacts so that the contact list only shows Buyer and Investor Clients.		
2	On the front page, list the names of your highest priority clients.		
3	Explore additional details about Amelia Guerreiro without entering her profile page and specify the last time you sent her a message.		
4	Explore additional details about Natália Casanova and Fernando Ferreira without entering their profile page.		
5	You no longer need the contact "Beatriz Vidal", archive it.		
6	Detail the steps required to make the "Nationality" of each contact a readily accessible column in the contact list.		
	Client's profile page		
7	State which group Pedro Vieira belongs to and his origins.		
8	State whether Pedro Vieira is available from 12 noon to 2pm on Thursdays.		
9	Add a new social connections for Pedro and add "Joana Bastos" as a friend.		
10	Add a new event to Peter's profile, specify that it will be in person, and state how to add notes to it.		
11	Edit the call that will take place on the 2nd of January.		
12	Pedro just told you that he is not available on that date, reschedule the event for a new date.		
13	You are about to follow up on this call with Pedro, see the notes to remind yourself what to talk about.		
14	You have just finished the call that took place on 2 January, add a comment with new information.		
15	View a history of all previous events you have had with this customer.		
16	Get more information about this event.		
17	Find out how qualified this customer is.		
18	Check the files you attached to this customer and specify how many files he has.		
19	Change the list view format to a card view format, and delete the first PDF file.		
	Calendar		
20	Filter the calendar in order to only view your calls.		
21	State how many and what types of tasks you have on January 28.		
22	Change the calendar view from weekly to daily.		
	Dashboard		
23	State how many tasks you have completed today.		
24	State how your invoicing performance has been and whether you have been able to meet your monthly targets.		
25	State what the last event you completed was, when it happened and what it was about.		
26	State how you can obtain the customer's information to send a birthday message.		
27	You have just wished Maria Fonseca a birthday, mark it as completed.		

Appendix G

Table 28. Actions required for the fourth DSR Iteration's interview

	Required Actions		
#	**Tasks descriptions**	**Answers**	**Additional annotations**
	Contact List		
1	Filter your contacts so that the contact list only shows Buyer Clients and Investor Clients.		
2	Explore additional details about Amelia Guerreiro without entering her profile page and specify the last time you sent her a message.		
3	Explore additional details about Natália Casanova and Fernando Ferreira without entering their profile page.		
4	Detail the steps required to make the "Nationality" of each contact a readily accessible column in the contact list.		
	Client's profile page		
5	State whether Pedro Vieira is available from 12 noon to 2pm on Thursdays.		
6	Add a new social connections for Pedro and add "Joana Bastos" as a friend.		
7	Pedro just told you that he is not available on that date, reschedule the event for a new date.		
8	You have just finished the call that took place on 2 January, add a comment with new information.		
9	View a history of all previous events you have had with this customer.		
	Calendar		
10	Filter the calendar in order to only view your calls.		
11	Change the calendar view from weekly to daily.		
	Dashboard		
12	State how many tasks you have completed today.		
13	State how your invoicing performance has been and whether you have been able to meet your monthly targets.		
14	State what the last event you completed was, when it happened and what it was about.		
15	You have just wished Maria Fonseca a birthday, mark it as completed.		
16	Of the sales the user has completed to date, how many of these have been converted into deeds?		
	User's Goals		
17	Set your weekly goals and save the data.		

Appendix H

Table 29. Actions required for the fifth DSR Iteration's interview

#	Tasks descriptions	Answers	Additional annotations
	Required Actions		
	Contact List		
1	Filter your contacts so that the contact list only shows Buyer Clients and Investor Clients.		
2	Explore additional details about Amelia Guerreiro without entering her profile page and specify the last time you sent her a message.		
3	Explore additional details about Natália Casanova and Fernando Ferreira without entering their profile page.		
4	Your latest customers are at the top of your customer list. How would you sort the list alphabetically? Additionally, what would you prefer the default view to be?		
5	Detail the steps required to make the "Nationality" of each contact a readily accessible column in the contact list.		
6	Consider how joint accounts would benefit your brand. Would it speed up your business? (Show Amelia, Natália, and Fernando's accounts).		
	Dashboard		
7	State how many tasks you have completed today.		
8	Of the sales the user has completed to date, how many of these have been converted into deeds?		
9	How do you view 30 days of earned leads instead of only 7? Which dashboard measure would you make the default?		
	User's Goals		
10	Set your weekly goals and save the data.		
11	Specify whether the fundraising funnel contains the information you require and whether you find this information beneficial.		
	Business Funnels		
12	Add a new business to the primary funnel and provide feedback on the quality of the requested information.		
13	Examine the predefined funnels in emovel (the Real Estate Funnel, Sales Funnel, and Sales Promotion Funnel) and reflect on the quality of each funnel's stages.		
14	I would like to add a new funnel, how would I do it?		
15	I would like to change the titles of the second stage of the orimary funnel, how would you edit this information?		
16	Move the business card from the "Qualified" column to the "Contact Started" column.		
17	How would you view more information about the business listed in the "Booked Presentation" column? Comment on the quality and utility of the information.		
18	I would you like to view a record of all the transactions I have completed, where can I access that information?		
	Calendar		
19	Filter the calendar in order to only view your calls.		

Appendix I

Table 30. Iteratively proposed enhancements for the artefact

ID	Proposed Improvement	Type	Implemented?	Suggested By	Figures
First Iteration (1st Iteration folder)					
CPI1.1	"Delete the left-hand vertical sidebar."	Space Allocation	Yes	Interview	6
CPI1.2	"Social media information is not required."	Space Allocation	Yes	Interview	6
CPI1.3	"Nested list should be user-friendly."	Content Structuring	Yes	Interview	7
CPI1.4	"Abbreviations should be avoided."	Semantic	Yes	Interview	7
CPI1.5	"Use familiar field-specific semantics."	Semantic	Yes	Interview	6,7
CPI1.6	"Add mass emailing capabilities."	Content	No	Interview	6
PPI1.1	"Replace client's motivations."	Space Allocation	Yes	Interview	1
PPI1.2	"Don't distinguish activities into tasks and events."	Content Structuring	Yes	Interview	8, 9, 10, 11
PPI1.3	"Comments must be added to an event."	Visual Hierarchy	Yes	Interview	3
PPI1.4	"Client's sources should be predefined."	Content Structuring	Yes	Interview	1
PPI1.5	"Restructure the visualization order for the user's availability."	Visual	Yes	Interview	1
PPI1.6	"Set up mobile alerts for important occasions."	Content	No	Interview	1
API1.1	"The existing colour palette is not flattering."	Visual	No	Interview	1
Second Iteration (2nd Iteration folder)					
PPI2.1	"All information must be displayed by default."	Content Structuring	Yes	Interview	1
PPI2.2	"Iconography needs to be updated."	Visual	Yes	Interview	1
PPI2.3	"Client's qualifications must be flexible."	Content Structuring	Yes	Interview	3
PPI2.4	"Documents must be easier to navigate."	Content Structuring	Yes	Interview	5
CaPI2.1	"Have a slider for the daily calendar view."	Space Allocation	Yes	Interview	9
CaPI2.2	"Reconsider visual hierarchy."	Visual Hierarchy	Yes	Interview	9
CaPI2.3	"Bold colours instead of pastel colours."	Visual	Yes	Interview	9
DPI2.1	"Rethink recent activity's structure."	Visual Hierarchy	Yes	Interview	12
DPI2.2	"Swap areas of interest with an additional goal card."	Space Allocation	Yes	Interview	12
DPI2.3	"Content must follow natural eye movement patterns."	Visual Hierarchy	Yes	Interview	12
DPI2.4	"Use field-specific language."	Semantic	Yes	Interview	12

Third Iteration (3rd Iteration folder)					
CPI3.1	"More intuitive filtering system."	Content Structuring	Yes	Interview	18
CPI3.2	"Change the info column to an automatic hidden feature."	Content Structuring	No	Interview	16
CPI3.3	"Discern groups of contacts visually."	Visual	Yes	Interview	17
CPI3.4	"Differentiate archived contacts from closed deals."	Content Structuring	No	Interview	15
CPI3.5	"New presentation for the view button."	Visual Hierarchy	Yes	Interview	18
PPI3.1	"An editable table for the client's availability."	Content Structuring	Yes	Interview	1
CaPI3.1	"Make it clear that there are different calendars to choose from."	Visual Hierarchy	Yes	Author	20, 21
DPI3.1	"The goals' card must be structured differently."	Content Structuring	Yes	Interview	26
DPI3.2	"Aligning content according to natural eye movement."	Content Structuring	Yes	Interview	26
DPI3.3	"Fix section's names that are not intuitive."	Semantic	Yes	Interview	26
Fourth Iteration (4rth Iteration folder)					
CPI4.1	"Sort by latest contacted, not alphabetically."	Content Structuring	Yes	Interview	8
CPI4.2	"The partnership icon should be neutral."	Visual	Yes	Interview	13
PPI4.1	"Use consistent design on the client's profile page."	Visual Hierarchy	Yes	Interview	1, 3, 4, 5
CaPI4.1	"Move the "Create Events" button."	Visual Hierarchy	Yes	Author	14
DPI4.1	"Offer time intervals."	Content Structuring	Yes	Interview	15
DPI4.2	"Link pie charts and goals."	Content Structuring	Yes	Interview	15
DPI4.3	"Modify the completed tasks' visuals."	Visual Hierarchy	Yes	Interview	15
GPI4.1	"Goals data must be collected automatically."	Content Structuring	Yes	Interview	16
GPI4.2	"Remodel the Sales Funnel."	Content Structuring	Yes	Interview	16
Fifth Iteration (5th Iteration folder)					
CPI5.1	"User should be able to set the table's viewing options."	Content	Future Work	Interview	9, 10
CPI5.2	"User should be able to set tags."	Content	Future Work	Interview	-
CPI5.3	"Understand real estate agent's preferences."	Content	Future Work	Interview	-
PPI5.1	"Incorporate WhatsApp monitoring."	Content	Future Work	Interview	-
DPI5.1	"Log completed tasks through notifications."	Content	Future Work	Interview	-
GPI5.1	"Improve statistics by relying on previous studies."	Content	Future Work	Interview	-
BPI5.1	"There is a lack of clarity on existing funnel states."	Semantic	Future Work	Interview	18, 19, 20
BPI5.2	"To complete the first RE funnel, additional states are required."	Semantic	Future Work	Interview	18
API5.1	"Include in-app training seminars as an option for users."	Content	Future Work	Interview	-

Appendix J

Table 31. Satisfaction Survey's results regarding the interface as a whole

ID	Description	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
1	The interface's UI makes a positive impression.	3	3	4	5	5
2	The interface's layout is user-friendly and working with this software is satisfying.	3	3	5	5	5
3	The colour scheme is appropriate and appealing for the real estate industry.	2	2	4	4	5
4	I had no trouble carrying out the suggested tasks and locating the necessary information.	3	3	4	5	5
5	I was able to complete the required tasks quickly because I did not have to click many times to collect the required	3	3	4	4	4
6	This interface's design lays a significant focus on providing an intuitive navigation mechanism.	3	4	5	5	5
7	I did not make many mistakes while interacting with the interface.	3	3	3	4	4
8	Due to the interface's adaptability, I can undo my previous mistakes and start over.	3	3	4	4	4
9	The interface is memorable, and I won't feel the need to relearn it every time I use it.	3	4	4	5	4
10	The application will offer greater accuracy in my data and better performance in my career.	3	3	4	5	5
11	I would use this application over other competitors.	2	3	4	4	4
12	I would recommend this application to friends or colleagues.	2	3	4	4	5

Table 32. Statistical data derived from the Satisfaction Survey's results

Statistic's Method	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
Mean	2.750	3.083	4.083	4.500	4.583
Mode	Mo= {3}	Mo= {3}	Mo= {4}	Mo= {4,5}	Mo= {5}
Median	3	3	4	4.5	5

Table 33. Satisfaction Survey's results regarding the features & components of the interface

ID	Description	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
CONTACTS						
1	The information presented in the contact list is sufficient.	3	-	4	5	5
2	The existing filtering procedure in the contact list is sufficient for comprehensive filtering.	3	-	4	4	4
3	The quick actions will benefit my productivity and I will use them.	4	-	5	5	5
CLIENT'S PROFILE PAGE						
4	The information presented in the client's profile is sufficient.	3	-	4	5	5
5	The client's motivations are useful and easy to understand.	2	-	-	-	-
6	The client's availability is easy to understand.	3	-	4	5	5
7	The client's notepad is easy to understand.	-	-	5	5	5
8	The client's social connections are easy to understand.	4	-	5	4	4
9	I can easily access forthcoming events and their associated information.	3	3	5	5	5
10	I can easily access former events and their associated information.	-	3	4	5	5
11	I can easily access the qualifications of the client.	-	3	5	5	5
12	I can easily access to the client's documents.	-	4	5	5	5
CALENDAR						
13	The information shown in the calendar tab is sufficient.	-	3	5	5	5
14	I can easily access all my daily, weekly, and monthly events.	-	4	5	5	5
15	I can successfully create an event.	-	3	4	4	5
16	I can easily access the information stored in each event.	-	4	5	5	5
DASHBOARD						
17	The information displayed on the dashboard tab is sufficient.	-	3	4	4	5
18	I can easily access all my daily and weekly events.	-	3	5	5	5
19	I can easily access my clients' birthdays.	-	4	3	4	5
20	I can easily deduce my performance from the graphs presented.	-	3	3	5	5
21	The birthday card is easy to use and understand.	-	4	5	4	4
22	I can easily access the last events I have completed.	-	3	4	5	4
USER'S GOALS AND ANALYTICS						
23	The information displayed on the user's goals tab is sufficient.	-	-	-	3	4
24	It is easy to update my weekly, monthly, and yearly goals.	-	-	-	5	5

25	It is easy to analyse my weekly, monthly, and yearly goals.	-	-	-	5	5
BUSINESS FUNNELS						
26	The information presented in business tab is sufficient.	-	-	-	-	5
27	It is easy to create new business funnels.	-	-	-	-	5
28	It is easy to edit existing funnels.	-	-	-	-	4
29	It is easy to access all the transactions made within my funnels, even after they have been finalised.	-	-	-	-	4

Table 34. Mean derived from the Satisfaction Survey's results regarding features & components

Module	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
Contacts	2.750	-	4.083	4.500	4.500
Client's Profile Page	3	3.25	4.625	4.875	4.875
Calendar	-	3.5	4.75	4.75	5.00
Dashboard	-	3.33	4	4.50	4.67
User Goals	-	-	-	4.333	4.67
Business Funnels	-	-	-	-	4.50

Table 35. Mode derived from the Satisfaction Survey's results regarding features & components

Module	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
Contacts	Mo= {3}	-	Mo= {4}	Mo= {5}	Mo= {5}
Client's Profile Page	Mo= {3}	Mo= {3}	Mo= {5}	Mo= {5}	Mo= {5}
Calendar	-	Mo= {3,4}	Mo= {5}	Mo= {5}	Mo= {5}
Dashboard	-	Mo= {3}	Mo= {3,4,5}	Mo= {4,5}	Mo= {5}
User Goals	-	-	-	Mo= {5}	Mo= {5}
Business Funnels	-	-	-	-	Mo= {4,5}

Table 36. Median derived from the Satisfaction Survey's results regarding features & components

Module	1st Iteration	2nd Iteration	3rd Iteration	4th Iteration	5th Iteration
Contacts	3	-	4	5	5
Client's Profile Page	3	3	5	5	5
Calendar	-	3.5	5	5	5
Dashboard	-	3	4	4.5	5
User Goals	-	-	-	5	5
Business Funnels	-	-	-	-	4.5