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New continuous improvement system in real-time for a SaaS product

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Master Thesis

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Abstract

Users are one the of the main assets of a SaaS company. The acquisition value of a new customer is often high and, for that reason, churn rate and CLV (customer lifetime value) are always a permanent concern. Allied to this fact also arises the enormous amount of information offered by the users, internal or external to the organizations, that is, the feedback that most of the times, due to many different reasons, is ignored or used incorrectly.

Thus, the starting point of this project is exactly the need to develop an effective and efficient system for continuous improvement of a SaaS product in real time, based on all the information provided by the users. It's crucial to find an optimal way to analyze thousands of feedback data inputs, in different data architectures and points of access, and with limited resources to allocate to this task of analyzing and managing all this information.

In order to correctly define the problem and develop the best feasible solution, the project started by using and perceiving the various means of collecting used feedback, understanding their relevance through statistical analysis, and, finally, conducting various interviews with people who speak directly to the customer (customer support) and product managers.

In the end, this project describes the system developed, the various steps required, the structure and logic implicit in the information system built and the results obtained in the proof of concept put into practice. The proposed objectives were achieved, making it possible to increasingly reinforce empirical software development and continuously improve a SaaS product in real time.

In fact, with the development of the proposed system, it became possible, efficient and effective to analyze a large amount of feedback data inputs, resulting in a greater real knowledge of what users actually think of the service. In numbers, the project allowed to reduce, in an analogous comparison, 87.13% of the workload required to handle all the feedback that the company receives on average in one month. It also allowed to apply a continuous improvement cycle, adding feedback as a plausible and crucial source in empirical development and continuous product improvement.

More than this, the proof of concept applied in real context resulted in an automatic filtering of 90% of the feedback inputs received through the ETL system, a ratio between created improvements and feedback received of 13.44%, all of this improvements being empirically based (with one or more associated feedback inputs).

Keywords: Digital marketing automation, continuous improvement, SaaS, feedback management system, continuous improvement methologies.

Resumo

Um dos principais ativos de uma empresa SaaS são os seus utilizadores. O valor de aquisição de um novo cliente é, muitas vezes, elevado e, por essa razão, a taxa de desistência e a CLV (*customer lifetime value*) são sempre uma preocupação permanente. Aliado, a este facto surge também a enorme quantidade de informação oferecida pelos utilizadores, internos ou externos às organizações, isto é, o feedback que frequentemente, em diversos casos, é ignorado ou usado de forma incorreta.

Assim, o ponto de partida deste projeto é exatamente a necessidade que desenvolver um sistema eficaz e eficiente para melhoria contínua de um produto SaaS em tempo real, usando como base toda a informação indicada pelos próprios utilizadores. É crucial encontrar uma maneira ideal de analisar milhares de entradas de dados de feedback, em diferentes arquiteturas de dados e pontos de acesso, e com recursos limitados para alocar à tarefa de analisar e gerir toda esta informação.

Por forma a definir corretamente o problema e desenvolver a melhor solução viável, o projeto iniciou-se por usar e perceber os vários meios de recolha de feedback usados, entender a sua relevância através de análise estatística e, por fim, a realização de diversas entrevistas com pessoas que falam diretamente com o cliente (suporte ao cliente) e responsáveis de produto.

No final, este projeto descreve o sistema desenvolvido, as várias etapas necessárias, a estrutura e a lógica implicita no sistema de informação construído e os resultados obtidos na prova de conceito colocada em prática. Os objetivos propostos foram conseguidos, tornando possível cada vez mais reforçar o desenvolvimento empírico de software e melhorar continuamente um produto SaaS em tempo real.

De facto, com o desenvolvimento do sistema proposto, tornou-se possível, eficiente e eficaz analisar uma grande quantidade de dados de feedback, resultando num maior conhecimento real do que os utilizadores pensam realmente do serviço. Em números, o projeto permitiu reduzir, em comparação análoga, 87,13% da carga de trabalho necessária para analisar todo o feedback que a empresa recebe em média por mês. Este permitiu também aplicar um ciclo de melhoria contínua, acrescentando informação cedida pelos utilizadores como uma fonte plausível e crucial no desenvolvimento empírico e na melhoria contínua do produto.

Mais do que isso, a prova de conceito aplicada em contexto real resultou numa filtragem automática de 90% das entradas de feedback recebidas pelo sistema de ETL e num rácio entre melhorias criadas e feedback recebido de 13,44%, sendo todas estas melhorias baseadas empiricamente (com uma ou mais mais entradas de feedback associadas).

Palavras-chave: Automação de marketing digital, melhoria contínua, SaaS, sistema de gestão de feedback e metodologias de melhoria contínua.

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List of abbreviations

BD – Database

CI – Continuous improvement

DMAIC – Define, measure, analyze, improve, control

ETL – Extract, transform and load

KB – Knowledge base (an online space with blog posts that aim to help users navigate and use certain functionalities of the platform)

MUR – Master User Research

NPS – Net promoted score

PDCA – Plan, Do, Check and Act

PDI – *Pentaho Data Integration* (ETL software)

PoC – Proof of concept

ROI – Return on investment

SaaS – Software as a service

SEA – Search engine advertising

SEO – Search engine optimization

UX – User experience

1 Introduction

In the scope of this dissertation development, included as a mandatory component in the master's in services engineering and management of the Faculty of Engineering at the University of Porto, this project was carried out at E-Goi, focused on the specification of a new continuous improvement system in real-time for a SaaS product.

1.1 Project Background

Cloud computing is here to stay, each day more and more companies realize that using cloud and a service-oriented architecture (SOA) provides many new and innovative opportunities. These two paradigms highly contributed to several new service architectures and business models that started to be widely adopted, such as SaaS (Software-as-a-Service). It represents a transition from the traditional purchases of software packages licenses to remotely "rent" specific software services which are available on demand through the internet and the business model is paid per use (Cancian, Rabelo, & von Wangenheim, 2013).

In numbers, according to Lambert (2018), in 2017, 33% of companies were using more SaaS applications than they did in the year before, 73% of companies said that nearly all their apps would be in a SaaS model by 2020 and that, for the period 2013-2018, 59% of all cloud workflows would be delivered as software-as-a-service (SaaS) by the end of that year.

This trend is mainly because we are currently in the era of digital revolution. In fact, digitization is currently one of the processes that most dynamizes companies in the business world (Kostin, 2018). However, many SMEs do not use yet the full potential of the new digital tools. Internet and all available tools are transforming the way consumers search and buy products or services. The way to embrace these digital opportunities and to reach customers more efficiently it's necessary to invest in digital marketing. Main benefits of using digital marketing strategies are to reach new target audiences, improve growth and facilitate internal and external communication (Taiminen & Karjaluoto, 2015).

Along with this, it comes the possibility to automate all marketing processes. This includes the use of software that enables to transform segmentation, customer data integration and campaign management in a much efficient and effective process. Customization and nurturing are also keywords when referring to such a topic in digital marketing (Todor, 2016).

Of course, using a SaaS strategy and adding all the necessary aspects to apply digital marketing and marketing automation at its best, may imply changes to management, including the use of continuous improvement methodologies. Having a good and well adapted management is crucial to improve profit, reduce waste (everything thing that the client is not willing to pay for) and optimize all processes. Also, from past to present, there are many continuous improvement methodologies that can be used, it's important to know the basics of the most important ones and that can be useful in modern businesses (Bhuiyan & Baghel, 2005).

1.2 Problem Description

Creating digital marketing campaigns, automating the various processes involved and doing all its management, as well as achieving the expected results is challenging for any

professional and company. Also, the feedback generated from user, internal or external of the SaaS company, is a crucial source of information for product improvement.

Therefore, for SaaS platforms, it is crucial to realize the needs of current and potential customers in order to improve the product, adding new functionalities, communication channels and processes that allow continuous improvement through a new system and management model. That's how the opportunity for development of this project arose and, having these details into account, efforts were made to find a new system of continuous improvement in real time for a product in the SaaS model.

A key point about the problem is also the huge amount of information generated by a SAAS system. This causes enormous difficulty in organizing all the information, which usually has different structures and only a small part is truly useful for the purposes of product improvement. Being so, the keywords of defining processes (due to limited resources available in a company), filtering data inputs, categorizing and merging all valuable feedback together, describe in a rather brief way the problem to be solved.

1.3 Research Questions

The following research questions aim to guide and focus this project.

- Research question 1 (RQ 1) – How can a SaaS company build a product continuous improvement system based on internal and external feedback?

- Research question 2 (RQ 2) – How can a company that provides a SaaS know what their customers really think of their service?

- Research question 3 (RQ 3) – Does user research help a SaaS company to apply empirical software development and continuous improvement techniques?

1.4 Study and Project Development at E-Goi

This project was developed at E-Goi, a Portuguese company, headquartered in Matosinhos, which has a platform with the same name, that enables its customers to manage digital marketing. The E-goi platform is defined as multi-channel marketing automation platform, integrating several communication channels such as E-mail, SMS, SmartSMS, Voice, Push, WebPush. Currently, this company has over 100 employees and serves more than 400.000 clients across the world.

The business model of E-Goi is based on a SaaS, providing a cloud marketing automation software in exchange for a monthly fee or in pay per use model. There are many strong competitors in this market, therefore it's crucial for E-Goi to keep always innovating and paying attention to what it's users really think of the platform. The company is growing each day with over 250 new account sign-ups each day, which leads to many new challenges and opportunities to improve.

With this project, the goal is to implement an innovative continuous improvement system that aims to support product development at this company, using all the data generated to provide effective and efficient information.

1.5 Report Outline

This dissertation is divided into six chapters, each of which deals with topics such as context, methodology, literature of interest related to the study topic, presentation of results and conclusions.

In the first chapter, named introduction, there is an introductory framework, giving a brief presentation of the context and motivations for the realization of this project, as well as the research questions I set for it.

Following this chapter, there is a background review about digital marketing, new contact channels, continuous improvement methodologies, SaaS, tasks prioritization and business process modelling to support the practical development of the project.

The third chapter is based on the presentation of the problem having into consideration the objectives of the research and E-Goi. Therefore, it consists in a topic in which practical and research objectives become clearer and well defined. Also, the company where the project took place, E-Goi, is better presented and described.

In the following chapter, designated methodology, it's included the description of the method of research and the used work along with the proper justification of selection and the applicability in the context of the problem.

The last two chapters are focused on results, comparison with literature review and research questions, and future research. In particular, all the results of the practical research are presented in the topic of results and, in the topic of conclusion, there is the summary of the results obtained in the developed project and how they contributed to respond to the initial research objectives.

2 Background

2.1 Digital Marketing and Marketing Automation

We are currently in the era of digital revolution. In fact, digitization is currently one of the processes that most dynamizes companies in the business world (Kostin, 2018). Moving closer to the concept of digital marketing, according to Paul, Bhuimali, Aithal, and Bhowmick (2018) this is a kind of marketing in which IT and digital technologies help to offer products and services. In addition, it is related to the following keywords: search engine optimization; search engine marketing; content; marketing; e-mail marketing; social media marketing. These authors also affirm that this concept was first popularized in 90s, but only in the recent past such type of businesses and demand have been increasing.

In contrast, Buchanan (2018) considers a digital marketing action all activities that are initiated through apps, websites, social media networks, emails, online games and mobile phone texts. In this context, digital marketing can now be anything from an online banner on a website to an article sponsored on a social network. More than that, the only common point in the various possible strategies is the ability to measure results and segment with high specificity. In fact, currently the keyword in digital strategies is conversion. The focus is on the real impact of the campaign on the business through conversions (Martin, 2017). Thus, the challenge for digital marketers become increasingly related to analyzing consumer behavior data, to improve ROI (Ryan, 2016).

This way, companies that want to follow this digital trend must not only digitalize it's business processes, but also their products and services and the way they're offered and promoted (Kostin, 2018). However, one aspect that ends up being overlooked is that this type of marketing is not just about technology, it is rather directly related to people. Technology is just interesting in the sense that it connects people efficiently (Ryan, 2016). Another aspect that is worth to mention is that the trends related to digital technologies are artificial intelligence, big data and blockchain (Kostin, 2018).

Moving on to a more specific topic, the technological revolution and multiplication of communication channels, associated with the last decades, considerably affect the general activity of marketing. As a consequence, it becomes difficult to predict which channels consumers prefer to be contacted, in part because there is no longer only traditional media tradition, but rather a whole new large set of tools with different characteristics and capabilities (Schaeffer & Luce, 2018).

So, this information raises the question of what the new and most effective communication channels are. The answer is explained in several articles, being one of them a study of Taiminen and Karjaluoto (2015) that shows the main current digital channels and also classifies them in one-way and two-way communications (see table 1).

Table 1 - Digital communication channels classification

	High company control	Low company control
One-way	Website Email newsletters Online directories Banner advertising	SEO (search engine optimization) SEA (search engine advertising)
Two-way	Company blogs Company's communities	Social media

As it is easy to observe, much of the global information, from all topics, is shared online. Also, consumers can now share their opinions in open virtual spaces that then can be seen by other consumers. These leads to the fact that people now trust more peers than organizations. That's why marketing communications are changing, focusing in creating online communities, generating leads and collaborating with consumers to better understand their needs. Digitalization is a source of business growth, performance and competitiveness. Being so, the use of digital channels is important for brands, especially to attract new customers and reach existing customers more efficiently (Taiminen & Karjaluoto, 2015).

So, as table 1 shows the classification of digital channels, website and email are one-way communications that are mainly responsibility of the company. Although, email is in its nature a two-way communication, it is frequently used as a one-way channel to deliver newsletters and other kind of advertisements. This two are the most widely used digital marketing channels. Besides these channels, search engine optimization (SEO), the process of improving the website's search engine rank in organic search results, and search engine advertising (SEA), paid advertisements on a search engine's results page related to some keywords, are also one-way communication channels. Their purpose is to inform people of the products or services available, and they are crucial to a company's online visibility (Taiminen & Karjaluoto, 2015).

Moving on to the two-way communication channel. This kind of channels was mostly originated by the "post-internet", that includes the appearance and huge growth of social networks. In this kind of platforms, companies can't use just monologues and create sales pitches or marketing messages, they do need provide real information, co-create value and focus on manage customer relationships. Therefore, Taiminen and Karjaluoto (2015) consider two main communication channels in this category: social media (engaging consumers and increasing brand awareness) and blogging (company has more control and gives some advantages to the brand in terms of SEO).

More recently, the challenge of engaging better mobile digital consumers a new trend appeared. In agreement with Liu (2017), push targeted marketing messages are the best way to target mobile users and to provide customized content. In fact, consumers might receive targeted push messages based on either their individual historical behavior or their current location. This same author also highlights the combination of "push notification - pull a coupon - visit online or brick and mortar store to shop" as a good way to increase to sales. In contrast, Taylor (2014) affirms that this kind of channel can be associated with high technology like beacons (small Bluetooth hardware transmitters) to provide real time and

locally segmented targeted messages, also the results of campaigns using push messages are highly measurable.

In addition, mobile also introduced the online chat channel and reinforced the power of the traditional SMS. Being the example of a hotel enables travelers to communicate directly with service personal via messaging or a travel agency sending customized messages and support through WhatsApp, the opportunities can heavily leverage businesses. Messaging is one of the big winners in technology in that last few years. Applications like WhatsApp and WeChat have reached a huge number of consumers. In this case, the challenge and innovation are the adoption of this channels by businesses. The main advantages of this channel are that it's a personal one-on-one communication and it is instant (Thygesen, 2016).

This way, with so many possibilities of communication channels and the growth of the concept of multichannel communication, it's crucial for companies to use technology that allows to engage with current and potential customers in an automatic, cross channel, cross devices and personalized way. That's the goal of marketing automation (Todor, 2016).

In line with Lamont (2015), this kind of technology is one of the most rapidly growing software in its industry. It is used in 76% of the world's largest SaaS companies and businesses that use marketing automation have 9,3% higher sales quota achievement rate (Wesson, 2013).

By definition, marketing automation is the use of software to automate marketing processes such as segmentation, customer data integration, and campaign management. With the application of this type of software, it is possible to automate processes that would otherwise have to be done manually and would be less efficient. The goal is simple, nurturing leads through useful and personalized content in order to convert these contacts into customers (Todor, 2016).

In contrast, Durga (2015) indicates that this type of software is meant to manage the processes of leads (acquisition, scoring, prioritizing and nurturing), campaigns (design, creation, management, execution, tracking and analysis) and landing page (creation, testing, optimization and integration). Therefore, it is a very complete technology that, when well used, enables companied to increase its efficiency, create a closer relationship with the customer and improve the customer experience (Lamont, 2015).

The most important when choosing a software of marketing automation is to realize that the common ground of all of them is that they serve to help build, enrich, and promote leads in a marketing database. To this end, these platforms help to segment databases into specific subsegments that can be prioritized and involved in a particular campaign based on their attributes and behavior (Durga, 2015). Nevertheless, according to Aquino (2013) there are some key points to take into account in the implementation of marketing automation tools: have enough content; define goals; quality of data; try all functionalities gradually.

2.2 Continuous Improvement

Continuous improvement is an organization culture that aims to provide sustainable improvement and eliminate waste in all processes and systems. The improvements can be performed through radical changes or incrementally through an evolutionary process, and it must involve everyone of a company by having the same purpose and it doesn't have to necessarily mean high capital investments (Bhuiyan & Baghel, 2005).

In other point of view, Juergensen (2000) indicates that this concept happens when work groups use their time to continuously improve daily processes in a faster rate than the competition. Also, it is not one event or one-time action, it's a way of being, working and behaving that comes only from people. However, like Bhuiyan and Baghel (2005) mentions, it's important to be aware that several tools, techniques and technologies may be used in this constant search to find problems, waste (anything for which the customer is not willing to pay), and variation, and also to find solutions to minimize them.

No matter how standardized or similar companies may be, there are no magical solutions. The key, as mentioned above, is people, which can be challenging to join all the necessary resources, environment and support that can really provide a good improvement (Juergensen, 2000).

The first applications of continuous improvement emerged on 1800s, with mainly improvements in incentives to employees, like reward schemes and strategies to improve labor-management relationships. Also, due to the beginning of industrial revolution some methods, like training, quality control and education of supervisors, were applied to increase production rates and labor standards. Currently, according to Bhuiyan and Baghel (2005) continuous improvement is no longer associated only with work improvement, but with organized and comprehensive methodologies, generally involving the overall organization in the performed changes.

Over the years, there have been developed many continuous improvement methodologies that have the goal to improve quality, reduce waste and simplify the production line/processes. The three most known methodologies are: lean manufacturing, six sigma and balanced scorecard (Bhuiyan & Baghel, 2005). It is also important to consider PDCA cycle (Sokovic, Pavletic, & Pipan, 2010).

- Lean manufacturing

Systematic approach that was first introduced by Henry Ford in its factories. The objective of this approach is mainly to identify and eliminate waste in every area of production (customer relations, product design, factory management and networks of suppliers) through continuous improvement. There are applied techniques that are exactly designed to minimize or eliminate inventory, eliminate waste, improve productivity and, in this way, reduce operational costs (Bhuiyan & Baghel, 2005).

This methodology is a management philosophy with main the main goal of reducing waste in a production process. The most known tools to apply lean manufacturing are Kaizen (continuous process analysis), kanban systems and poka-yoke (errors prevention). Also, the basic principle of this methodology are do good at first (search for zero defects), continuous improvement, waste elimination, pull processes (products are requested by the downstream process), long relationships with suppliers and flexibility without sacrificing company efficiency (Carvalho, 2006).

- Six Sigma

Method applied in process improvement and new product development that is based on statistical and scientific methods and aims to minimize defects to the level of accepting close to zero and reducing variation in all the processes of the organization (Bhuiyan & Baghel, 2005). In other point of view, Kwak and Anbari (2006) describes six sigma as project-driven management approach, which goal is to improve organization's products, services and processes by continually reducing defects in the company. This organized and systematic

approach has two major perspectives: statistical (six sigma methodology is defined as having less than 3.4 defects per million opportunities or, in other terms, a success rate of 99.9997%) and business (business strategy applied to improve effectiveness and efficiency of all company operations in order to improve business profitability and meet customer's needs and expectations).

Being so, it was developed the DMAIC model, an acronym for define, measure, analyze, improve and control. In an overview, it is a closed-loop process used to eliminate steps that are unproductive using technology for continuous improvement (Kwak & Anbari, 2006). In other words, according to Bhuiyan and Baghel (2005) using DMAIC enables organizations define opportunities and improve performance in a continuous and iterative process of define, measure, analyze, improve and control.

Six sigma steps	Key processes
Define	Define the requirements and expectations of the customer
	Define the project boundaries
	Define the process by mapping the business flow
Measure	Measure the process to satisfy customer's needs
	Develop a data collection plan
	Collect and compare data to determine issues and shortfalls
Analyze	Analyze the causes of defects and sources of variation
	Determine the variations in the process
	Prioritize opportunities for future improvement
Improve	Improve the process to eliminate variations
	Develop creative alternatives and implement enhanced plan
Control	Control process variations to meet customer requirements
	Develop a strategy to monitor and control the improved process
	Implement the improvements of systems and structures

Figure 1 - Key steps using DMAIC process (Kwak & Anbari, 2006)

One important aspect to note is that six sigma can be used in further more operations than only in manufacturing. In fact, this methodology, used to provide quality measurement, can be used in all the organization, including manufacturing, design, administrative and service areas (Bhuiyan & Baghel, 2005).

- Balanced Scoreboard

Strategic planning tool of management and decision support that has been used for many years to measure strategic, operational and financial performance. The goal of using balanced scoreboard is to assess the performance of an organization through objectives and KPIs organized in four perspectives: financial, clients, internal processes and learning & growth (Bhuiyan & Baghel, 2005).

Therefore, the main goal of describing information from the four perspectives is to achieve balance between strategic planning and operational activities of the organization, translating its mission and strategy into objectives and indicators (Kaplan & Norton, 2007).

This way, balance scoreboards is still relevant today as a good organizing framework that elucidates to all stakeholders what the company intends to achieve (Bhuiyan & Baghel, 2005).

- Hybrid Methodologies

Times change, new innovations appear along with different market conditions that require new strategies. Also, individual programs of continuous improvement may be not be able to solve effectively all issue. That's the reason many companies started to merge different

continuous improvement approaches. Lean manufacturing, resulting from the merge of the approaches of lean manufacturing and six sigma, is one of the most well-known hybrid methodologies that can be used in many business contexts. More than that, it does overcome the weaknesses of both lean manufacturing (can't add a process to a statistical control) six sigma (isn't able to dramatically improve process speed or reduce invested capital) methods (Bhuiyan & Baghel, 2005).

In this way, by merging this both methodologies of continuous improvement, it's possible to provide greater value to the customer in the figure of more quality, higher delivery speed, better pricing, etc. This happens because, on one side, lean manufacturing aspects act on the elimination of waste and, on the other side, six sigma will aim to also reduce variation preventing defects (Bhuiyan & Baghel, 2005).

Related to SaaS services, lean six sigma method can be useful to apply a holistic improvement strategy that enables to improve customers retention. The focus in to join SaaS functions and develop comprehensive and adapted solution to improve outcomes. In a concrete example, a lean six sigma was applied in a SaaS company to holistically address customer attrition in a coordinated way. So, the method of DMAIC was applied in an app that had a higher monthly customer churn number than expected. It was defined the problem along with goals (what was causing high customer churn rate and to reduce it), then all data available according to the problem and goal was measured (in the practical example, the team noticed that they needed more data to analyze). After gathering all data, it was time to analyze and find concrete, using formal methods, causes and crucial aspects (one client segment, estimators, needed a more efficient customer support) to be able to develop solutions, which is the phase of improve (development of an API that would automate and simplify the necessary process). Finally, in the control phase, the team must understand if solutions worked, maintain and extend the gains. Being so, this methodology helps to standardize a process that aims to implement continuous improvement to one or all areas of a SaaS product (Powers, 2014).

- PDCA Cycle

This concept, also known as the Deming cycle, is a continuous improvement methodology based on the planning, executing, checking and acting cycle. This was created so that, at the end of each completing all the four steps, it starts again at the beginning of the next cycle, and so on (Sokovic et al., 2010).

The first step, planning, is defined as the definition of the objectives and planning that indicates data and information for the remaining method steps. Some questions answered at this stage are the specific objective, which people to be involved, the action plan and others related to a specific and rigorous planning (Andrade, 2003).

Next, it's the stage of execution, in which all the objectives and plans defined in the previous step are put into practice, following the philosophy of work aligned with the respective organization. After the planned actions are executed, the verification phase begins, in which the actions carried out in the previous step are verified, based essentially on the results obtained through monitoring the actions performed in relation to what was planned (Andrade, 2003).

Finally, the last step, called "act", is characterized by the standardization of the actions performed, considering the results planned, obtained and verified in the previous phase. This is a crucial process to sustain the continuous improvement evidenced in the application of this method (Sokovic et al., 2010). This is because, in this step, a standard is created or some

existing one is modified in order to define what, when, how, where, and why each action performed in the process is performed. In general, for projects that require reduced focus in the area of statistics and to avoid defects through complex probabilistic calculations, PDCA can be very useful (Andrade, 2003).

2.3 SaaS and Feedback

The SaaS model, or software as a service, has increasingly been adopted because of the advantages of having a low risk and a fast time-to-market (time that a product takes from the time it begins to be created until it is made available for sale). In this model, the companies that serve SaaS solutions are responsible for the security, performance, availability and stability of the service. The focus is primarily on economies of scale, which allow customers to offer their service through relatively small monthly or annual subscriptions when compared to other business models (Hai & Sakoda, 2009).

In this sense, companies with a SaaS business model always seek to increase the rate of retention of customers, being essential to offer the best possible user experience. In this topic, usability engineering has an important role using all service usage data (number of users, events, clicks, etc.) by combining them with user feedback to make the best decisions regarding product management and development (Hai & Sakoda, 2009). Thus, as Fotrousi, Izadyan, and Fricker (2013) state, incorporating and taking feedback to design, develop and implement improvements becomes essential from the beginning of these processes.

By definition, processes can be classified as defined or empirical. In the first case, they integrate processes like the production lines of automobile factories where the same output is always expected. On the other hand, the classification of empirical processes includes, for example, the development of software that, as there are frequent changes at various levels (technology, requirements, resource allocations, etc), require short cycles of inspection and adaptation, unlike the traditional waterfall method and cycles of collection and frequent feedback treatment (Williams & Cockburn, 2003).

In fact, increasingly, especially in the area of software and service development in SaaS models, the trend is to converge to empirically based software development, in order to overcome the challenge of various changes (be it usability, new technologies, behaviors the consumer, etc.) that occur during the development time itself (Selby, Porter, Schmidt, & Berney, 1991).

More than that, the use of agile work methods, very common in software development projects, has as keywords, among others, feedback and change (Williams & Cockburn, 2003). Still related to agile methodologies, according to Bowers (2002), in order to be successful in its use it is necessary that the project manager has extensive experience and is well prepared to lead and carry out the projects under his control, have access to real users to obtain useful information when necessary and there is physical proximity between the people allocated to the project, allowing them to exchange ideas with each other.

On the other hand, more focused again on the issue of empirical processes. These processes, by their very nature, take advantage of the feedback provided by various systems, and that analysis must subsequently be done based on metrics to focus development efforts on areas of greater value to the product or service. For this purpose, analysis systems based on metrics should be created to support the use of feedback to describe, analyze and control software development processes (Selby et al., 1991).

The problem today is that all this information relevant to product improvement, whether gathered internally or externally by an organization, is dispersed across a wide variety of channels and platforms. This difficulty coupled with limited working time and several other tasks to accomplish, often culminates in the fact that much of this information is not properly analyzed nor used (Trauner, 2018). Having this into account, Coleman (2015) considers that the solution to the problem described is to construct an internal repository that stores and organizes the feedback obtained from the various sources. In addition, this system should be aligned as closely as possible with the tools and work structures of the product and development teams, as well as allowing collaborative work among the various members.

In this sense, a crucial aspect that must also be taken into account is that users often do not really know what they really want, hence it is important and relevant to analyze feedback before taking actions (Williams & Cockburn, 2003).

2.4 Tasks Prioritization

Something that, according to Zamudio, Aguilar, Tripp, and Misra (2017), is still very common today, is the use of common sense and experience rather than proven formal methodologies in software project development. In fact, in the perspective of Rahim, Chowdhury, and Das (2017), this problem is even more worrying in the prioritization of tasks and requirements, since for this all the various techniques that exist and are used fail in several aspects.

This phase of prioritization, which occurs prior to each interaction in the developments following an agile philosophy, is crucial and one of the most challenging due to its high importance in the process and, as indicated above, there are no simple, highly customizable and fast techniques for its realization (Rahim, Chowdhury, & Das, 2017).

The same author, also indicates that practically all techniques fail to avoid the problem of issues starvation, defined by Rahim, Chowdhury, Nandi, and Rahman (2017) as tasks that, because of low priority, are never completed.

Some of the techniques that exist are Analytic Hierarchy Process (AHP), Cost-Value and RIZE, presented by Rahim, Chowdhury, and Das (2017). However, an agile framework requires a fast, scalable, customizable technique for various product types.

In this way, several techniques have emerged in recent times, often directly from organizations that apply them and publish successful case studies. According to McBride (2018), the technique he created and named RICE, acronym for reach, impact, confidence and effort, addresses all these identified problems. It is a framework in which the scale for each of the four factors analyzed can be customized for each particular project, and the value at the end is obtained through a simple calculation: for each issue to prioritize, reach value is summed with the impact value, and then with confidence value, finally divided by the effort value. Issues with higher RICE value have higher priority. As to the meaning of each factor, the explanation follows on the basis of what the author of the technique indicates:

- Reach – related to the number of people who will be impacted;
- Impact – measure that describes how big the impact will be on each person;
- Confidence – value that indicates how confident the company is with the change or resolution under review;
- Effort – related to the time of development and implementation.

Although the scale can be customized for each project, it should be, as is clear, uniform for all issues analyzed and prioritized in the same project or company (McBride, 2018).

2.5 Business Process Modelling

The interest in process aware management, supporting methods and new information technologies remains very high. In fact, according to Brocke and Rosemann (2014), business process management can be decomposed in six main elements, which are strategic alignment, that demands processes are designed, executed and managed according to the global strategy of the organization, governance, clearly defining who is responsible for each action, methods, people and culture. The last one, culture, is meant to note that the definition of processes should incorporate the collective values of the organization.

Similarly, the author Oca, Snoeck, Reijers, and Rodríguez-Morffi (2015) considers that business process modelling is a key factor in understanding, and also to redesign when needed, all the activities that an organization uses to achieve its business goals. It is used in research and practice to create business process models.

For software engineering, Becker, Rosemann, and Von Uthmann (2000) defends that process modelling is also becoming more and more important, especially for many aspects related to organizational purposes like process reorganization, certifications, costing issues related and planning human resources. Also, according to the same author, this activity of defining business process models can very challenging, in particular for enterprise-wide process management projects.

Business process models describe the activities of a company in an abstracted manner, or in and more clearly defined statement, they manage to show the tasks achieved by business workers to reach business goals (Hake, Zapp, Fettke, & Loos, 2017). These models, according to Oca et al. (2015), are required for transferring knowledge, promote quality purposes and regulations, to assure internal and external collaborative partners, and to serve as documentation in general.

In order to create these models, it’s generally used the concept of swimlanes, which is a way to organize activities. In this representation, each swimlane contains actions performed by the same actor or participant. An actor or participant can be a business worker or an organizational unit and, being so, it represents the role that interacts with the use cases to which it is related (Hake et al., 2017).

The design, more than a modeling exercise, has an economical and organizational scope. Therefore, it’s important to evaluate the quality of process models from different perspectives and iterate to get to the most efficient and effective ones (Becker et al., 2000).

3 Problem Definition

The definition of the problem presented by the company is based on the need to organize the feedback collection process and the introduction of a continuous improvement system that can be applied to a SaaS product.

However, moving towards structuring solutions without understanding more specifically the real source of the problem, as well as having a greater knowledge of the company and practical foundation for the project, can cause constraints and would not be feasible for its development.

In this way, the first step in this problem definition is the elaboration of E-Goi's business model, followed by the definition of its process map.

3.1 Business Model

Therefore, it was used the business model canvas tool to obtain, from a general perspective, a better knowledge about the company's operation. That said, the company's business model presented (see appendix A) indicates that the company seeks to provide a marketing automation platform for all its target customers that are SMBs, blogs and micro-businesses and large companies with specific needs. In addition, the focus is that the platform offered has a high level of usability and several possibilities of integration and customization, as well as allowing its customers to convert more visitors and leads into sales. This, through strong customer success actions (a strategy that involves several actions in the area of customer relations and aim to increase retention rates and obtain more revenue per customer), product development and provide the sending and monitoring of campaigns of customers. To do this, the company uses some necessary resources such as human resources, the physical space it owns and all the hardware, databases and, of course, the developed online platform. Some partners are essential to achieve all their achievements, including Altice, affiliate associates and some communication partnerships (eg the newspaper Público). Finally, revenues are earned through monthly and annual subscriptions to paid E-Goi plans and custom platform customizations. These revenues cover the main costs of human resources, implementation and maintenance of servers and some others, allowing the company to achieve positive financial results.

However, from the point of view of this project, this business model is not sufficiently useful, because it reflects the company from a general perspective leaving out some important details related specifically to the area of product development. For this reason, it was created, using the same tool, a second business model (see Annex B).

This second model is focused on the product area, associated with the task of product development and management. That said, the benefits offered to target customers (already mentioned above) is to provide a multi-channel marketing platform with a high level of usability, with frequent updates and presentation of all the metrics needed to evaluate the success of the sent campaigns. The main activities in the product department are performing usability studies of E-Goi functionalities and visual aspects, supervising improvements and upgrades in the platform, communicating new functionalities and upgrades in the platform, and developing and updating the knowledge base. In addition, it is also important to understand that, in this area, partners are the sources of product usability feedback (sales,

marketing, customer service and development) and that the key features are analysis tools (Google Analytics, Full Story and CRM), the team of product development and management, and places (online or offline) where users can leave feedback (forms, live chat, E-Goi community, external communities and others).

3.2 Process Map

So far it is possible to understand some of the main aspects in product management and development, but more detail is needed to assertively state the problem to solve and the definition of objectives for this work. So, the decision was to create the process map of the product management area of the E-Goi platform.

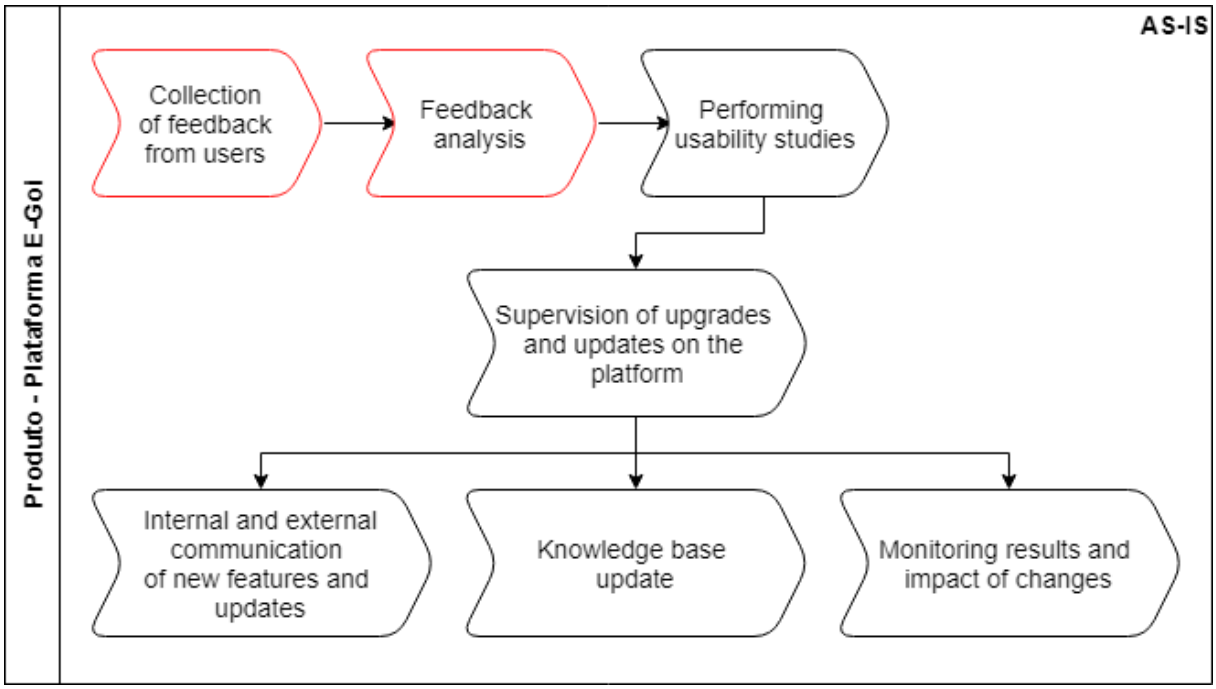

Figure 2 - Process map of product department at E-Goi

Following, there is a more detailed description of the seven critical processes identified in the analysis performed of the product department at E-Goi:

- Collection of feedback from users - Description of all steps beginning when a user, whether internal or external to the organization, provides some type of feedback and this feedback is received by the product management team.
- Feedback analysis - Identification of procedures that start after any feedback is identified by the product management team until its impact on the E-Goi platform is determined.
- Performing usability studies - Description of actions that allow the product team to evaluate the best solutions related to UX and usability. In other words, specification of all phases that allow the product management team to decide on the best features or visual aspects to implement in order to improve the E-Goi platform.
- Supervision of upgrades and updates on the platform - Specification of all steps related to the development of improvements and upgrades in the platform proposed by the product management team, as well as with the supervision and quality assurance performed in this process.

- Internal and external communication of new features and updates - Steps that combine the whole process of communicating internally, to the members of the E-Goi organization, and externally, to E-Goi users, when there are new functionalities and updates are performed in the platform.
- Knowledge base update - Definition of all the steps taken in the activity of managing and updating, whenever there are new updates in the platform, of the knowledge base, a virtual space where diverse content is made available that explains how to use all the functionalities of the platform.
- Monitoring results and impact of changes - Steps taken to monitor and evaluate the impact that changes and new developments have on the E-Goi platform.

From a general perspective, product and development management teams are already working in an empirical development perspective, seeking to base any development on the feedback gathered on the E-Goi platform. This feedback, which can be collected from several sources and available on various platforms, is subsequently reactively sought after by product managers. In addition to this method, the team also uses proactive methods through planning and performing usability tests or searches on tools like Google Analytics and Full Story.

After collecting feedback, some of the inputs are analyzed by the team, defining whether to move forward to delineate possible outputs or whether it is rejected. In the case of rejected, feedback is ignored and has no impact on the product management team or the platform. On the other hand, if the feedback is evaluated and is a source of possible improvement, possible outputs are defined, then usability tests are performed. In these tests, the final output is the development that, according to the tests, will have better results and that should be delivered to the development team.

The development phase is led by the SaaS product development team, overseen by the product team to ensure that the output meets the criteria and objectives.

Finally, there are three steps that take place simultaneously after the implementation of the solution that resulted from the feedback. These phases are internal and external communication of the new functionality or added / improved aspect, updating if necessary of knowledge base articles and monitoring the impact that the improvement causes on the metrics and KPIs that should also be defined at this stage.

3.3 Lack of Feedback Systematization and Organization

Of the seven identified processes, there is a lack of systematization and organization in the collection and processing of feedback, which causes some constraints in the area of product management.

The main causes of this problem are the existence of several possible sources available for internal and external users to communicate issues and possible improvements (listed below), as well as analytical tools (Google Analytics and Full Story) that allow to deduce possible obstacles and obstacles to the UX that can be improved. Moreover, feedback inputs are not recorded on a single platform or system, these are eventually spread across various tools and systems used in E-Goi (see appendix C), forcing the product management team to invest high resources (especially time) in seeking feedback from various sources.

#Feedback from 01/01/2018 until 28/02/2019	
F_Cancellation	7150
F_NPS	4060
Community	131
Helpdesk	145742
Chatgoi	50984
Total	**208067**
AVG/Month	**14862**

Figure 3 - Total feedback inputs received on E-Goi

Just considering the sources indicated in figure 3 (customer support software Helpdesk, community forum, live chat named Chatgoi and pop-up forms of NPS evaluation and cancellation reason specification) E-Goi currently collects, approximately, 14.862 feedback inputs per month. Of course, after an analysis was found that, as would be expected, only a small fraction of this number is in fact relevant to product improvement.

However, there is no system in the company to do this filtering automatically, leaving this process for manual analysis and very time consuming. Consequently, what happens is that much of the feedback provided is never analyzed.

In order to better understand the problem and procedures in the collection and management of feedback, these two processes are represented in more detail through swimlane diagrams (see appendix D and E).

These two processes are the basis for structuring a continuous improvement system for the development and management of E-Goi, a multi-channel marketing automation platform (email, sms, smart sms, voice and push) served in SaaS business model.

The problem begins with the lack of centralization of information, which in turn involves dispersing resources in reactive and proactive search for relevant user data. In addition, the feedback record structure is not a single system, which also makes the integration and automation task very difficult. Another aspect considered very relevant is that there may be redundancy in the sense that, as all feedback is not centralized, there is no effective way of grouping together all the information, requests, or questions that are similar.

On the other hand, there is a positive aspect that can be highlighted, the decision chain is short, and in most cases, there is autonomy in the product management team to make the necessary changes to the platform.

Taking all of this into account, there is in an opportunity here to define and build a feedback management system that will address the identified failures, effectively associating with the other product management processes, system of continuous improvement that allows a sustainable improvement and elimination of waste.

4 Methodology

Step of this dissertation project where the methodology used to collect and analyze data is explained, as well as all the processes performed to achieve the necessary results in order to solve, from the point of view of the dissertation, the problem described.

4.1 Possible Approaches

In order to accomplish this project several approaches were considered. The main challenge was to combine the research component with the practical application of a possible solution to the business context on which this dissertation is based.

The quantitative study is characterized by an empirical investigation in which all phenomena studied can be represented in indicators that represent the truth. So, the result of a quantitative study is objective and independent of perceptions or interpretations. This is made possible by the ability of the researcher to study a given object/topic without influencing or being studied (Sale, Lohfeld, & Brazil, 2002).

On the other hand, the qualitative paradigm is based on subjective questions and interpretation of phenomena. Thus, reality in relation to an aspect or situation under study is socially constructed and is constantly changing. In this type of study there is a relationship between the researcher and participants that allows the results to be mutually created (Sale et al., 2002).

In the perspective and scope of application, these two approaches are quite different. However, from the perspective of several authors it is possible and even advantageous to use them together. This is because the goal is similar: to obtain valid data to study a given phenomenon. More than that, the methods are compatible and very useful to use together when studying complex phenomena in areas such as health (Steckler, McLeroy, Goodman, Bird, & McCormick, 1992).

4.2 Selected Methodology

In this particular case, this is a type of research where, in order to obtain the data needed to build a continuous improvement system for SaaS products that uses the full potential of feedback, there is the need to obtain the maximum detailed knowledge about what professionals use, advise and also the challenges and improvements that they would apply in such a system. More than this, this project depends heavily on getting answers and perceive the experience of those who work in the area of product management in SaaS model and the interpretation of this experience and reality of the situation under study.

However, the purpose of this study is not only to contribute to the theoretical field (increase theoretical knowledge, to understand why certain situations occur in particular contexts), but also to the practical field (apply theory to solve practical problems).

Thus, the following were defined steps for this study. From the theoretical knowledge and state of art explicit in the literature review, to perceive and use the current means of collecting feedback from E-Goi and to document the experience. After that, the step is to understand the relevance, through available statistics, of each of source of feedback, with the aim of knowing what the most relevant sources are.

Still, considering the case analysis of the platform under study, several informal interviews with company personnel who speak directly with the customer (customer support) and product managers are conducted in order to determine and document what information is most important to collect, what are the main obstacles to the flow of feedback within the organization, as well as internal suggestions to improve the current system.

After this, the phase arrives at which, based on a careful and reasoned analysis, it is define a possible solution that aims to solve the given problem, as well as the respective representations of the new processes related to feedback management.

To finalize the dissertation project, the intention is to apply the PDCA continuous improvement methodology to the specified solution. The crucial thing to keep in mind is that it is a continuous process that must be applied with a view to total optimization in the management of the SaaS product, which in this specific case is directed to the area of digital marketing and automation of marketing processes.

In a theoretical context, case study is a method that is characterized by emphasizing the analysis and interpretation of the context that the case is inserted, trying to study it in a complete way (Yin, 2009). Thus, this is especially used to test theoretical models, through their application in real situations. In this sense, there is no such thing as a restricted set of rules as in other models, but rather the aim is to study and analyze the natural and significant context of a particular phenomenon, applying well to exploratory research types (Voss, 2010).

5 Case Study

As indicated in the problem definition, this dissertation project is based on the creation of a new system of continuous improvement for SaaS product, based on the collection, analysis and management of feedback and implementation in E-Goi's marketing automation platform. Thus, in this step it is performed an analysis of all the relevant context of this platform.

The essential focus is on how the feedback is obtained, the source of the feedback that can be internal (employees) or external (customers) of this SaaS product, and also to understand how this information is handled until it actually results in the implementation of new improvements in the product.

At the time of development of this thesis, the company is changing its product management structure, and the new feedback management system for product improvement must be adapted to this change. As such, the product team will be renamed to user experience and product marketing and there is a division and allocation of the product team to the development team. In practice, each of the development teams will have allocated a user experience and product marketing team to work together. This shift is seen as a growing focus on the importance of product feedback and, consequently, empirical software development and SaaS product improvements.

In this sense, feedback that is not currently organized or worked in the best way, gains a greater dimension of importance. In the next topic is indicated how the feedback is collected, managed and organized in the current feedback management process.

5.1 Assets Used to Collect Feedback

At E-Goi, feedback is collected from several sources, as indicated in the topic of problem definition, and there is no centralized space where all the information received is stored and processed. Next, the main sources of feedback are identified, as well as its main characteristics, databases where their data inputs are stored and how the data that is collected.

- Chatgoi

Chatgoi is shown in a bar placed at the bottom of the E-Goi platform, that is always visible to the users, and through the "Help" button in the menu. This allows the user to interact with a chat which, according to the information indicated by the user, presents useful articles of the knowledge base. At the end of the interaction, the user is asked if the information presented was useful or not. If it isn't helpful, there is the option to contact an E-Goi customer support agent.

All the information of each interaction is stored in a database and is accessible through E-Goi's management area. In this area, no statistics are displayed, just raw data in a table that can be exported to a CSV file. The current treatment method is to perform this extraction monthly and integrate the collected data (see table 2) into an excel document. This document is used solely to perceive basic information such as the total number of unique interactions (removing cases of data duplications) and comparisons of these numbers with past homologous periods.

Table 2 - Fields obtained in CSV file extraction from Chatgoi

Interaction ID	Client ID	User ID	Message content
Creation date	Useful? (boolean var.)	Type of cliente	User country
Used support? (boolean var.)	KB presented suggestions		

The type of customer can be non-paying, customer, non-paying customer with login, trial, loyal customer, prospect, corporate, old paying customer.

Another problem to note in this source of feedback is that there are several duplicated results in the saved data. This is due to the operation of the LiveAgent software (service used by E-Goi for customer support purposes), and in the analysis, it is therefore necessary to perform the elimination of duplicated data.

- Issues created in JIRA

All E-Goi employees can create tasks to be performed for the product, development or systems team. The submission takes place through E-Goi's management area and integrates directly with Jira, the software used to manage and organize the tasks of the product, development and system operations teams.

By integrating into the indicated software, based on the categories selected, the task is automatically delegated to a responsible person. The information is stored directly on the Jira platform.

The data collected is shown in the following table. Also, the evaluation of this feedback source occurs directly on the Jira platform. However, when an issue is created the purpose is, more than to provide feedback, to obtain a response, preferably the resolution of the indicated problem, from the responsible team. That said, this system works more in the perspective of response to feedback than properly constituting a source, being of course important to still consider the potential of the data it collects.

Table 3 - Data fields registed in issue created in Jira

Project	Summary	Description	Issue type
Category	Priority	Support message associated	Employee that reported the issue
Responsible	State	Creation date	Last update date
Tags	Issue ID		

In relation to the attribute "Project", it can have the values of product, development or systems, based on the nature of the reported issue. The "Issue type" field can be one of several options that appear depending on the selected project (see appendix F).

Responsible is the employee in charge of verifying and solving the issue created. This is defined based on the selected project, issue type, and category combination. This person is also the one responsible to change the "Status" attribute, which can be: Open; In progress; In review; Resolved; Closed; Failed in review; Reopened.

- Helpdesk - LiveAgent

E-Goi integrates, along with its entire customer support structure, the LiveAgent service, an integrated online customer service system. In this case, users create an interaction with this service whenever they request support in the "Help" tab in the menu, widget in the

presentation page of E-Goi and through Chatgoi when they indicate that they want to contact the support.

Support conversations are handled by the concept of tickets and the main source that generate tickets and requests for help on the platform is Chatgoi. This connection between the Chatgoi source and the Helpdesk is another point of redundancy in the current feedback management and processing system.

The categorization of tickets works by the attribution of tags, which is mostly done manually. So far there is no tag to evidence a ticket that has a purpose and high value as feedback for improvement of E-Goi.

On the other hand, it's possible to export all ticket data with one or more tags. In export via CSV, the file obtained includes many data (see table 4). Currently, the product team regularly analyzes the various tickets that are created and, whenever they find something to improve, determine possible solutions.

Table 4 - Data fields gathered on E-Goi Helpdesk

Ticket code	Conversation ID	Creation date	Update date
Change date	Resolution date	Reopening date	Tags code
Tags name	Subject	Content preview	Message groups
Ticket state	Agent name	Agent ID	Department
Department ID	Level ID	User ID	First name
Last name	System name	Contact ID	Email
Description	Groups	Groups name	Direct link

- E-Goi community

E-Goi users have, in the initial interface of the platform, a form where they can submit suggestions for improvement. These suggestions or ideas are recorded in the administration area of E-Goi, as in the data of the Chatgoi, within only a table with all the information, no statistics at all are presented. In this case, the following data is saved:

Table 5 - Data fields obtained in the CSV file extraction from E-Goi community

Coment ID	Title	Type	User language
User ID	E-Goi client ID	Creation date	Update date
Number of comments	Number of votes	State	Content

In the context in which it appears, this source of feedback offers several new suggestions from users. Currently, whenever a user suggests an idea or change, it is evaluated directly by the product team leader who promptly leaves a response and determines the status of the suggestion: implemented, planned, evaluated, or rejected. The status can be changed as needed based on the progression of the suggestion.

The processing of the information collected in this system is carried out directly on the E-Goi platform through its management area. However, the information can also be extracted to a CSV file.

- Google Analytics and Full Story

These two analytical tools are used proactively by the product team to find possible sources of improvement. In the case of the FullStory platform, it allows to follow the path and steps of

all users during their interaction with E-Goi, any difficulty or bug that is found is annotated and analyzed in more detail.

Google Analytics is also used in this sense, following several metrics and, whenever any relevant data is found, it is studied to determine the possible reasons.

Currently, the result of the analysis of these two tools, if any improvement actions are found, is the registration of a issue in Jira that can be categorized as product, development or systems. Since these two sources of feedback work on an analysis based on observation of data, there is no automatic way of extracting feedback, the current process is proactive and manual.

- Cancellation and NPS forms

These are questionnaires that appear to users in certain contexts of use on the E-Goi platform. The cancellation form is displayed to the user when, as the name implies, the user cancels the E-Goi account. On the other hand, the NPS questionnaire appears to the user ten days after trying the platform, new paying customers on the tenth day, forty-fifth day, seventy-fifth day, six months, twelve months and also when the client becomes paying and does not respond to NPS for sixty days.

As these are forms created and applied through E-Goi main account, the results of these forms are accessed by logging into this E-Goi account. In the area of management of the respective forms, there are some statistics (number of responses, percentage of options selected in the multiple-choice options, etc.), and for a more careful analysis the results can be extracted to CSV file. Some fields are recorded on both forms (see tables 6 and 7). It is important to note that the fields are related to the questions presented in the respective forms.

Table 6 – Data fields gathered in the extraction of the cancellation form

Date	Contact ID	Form ID	List ID
Email	Client ID	Would you recommend E-goi to a friend?	Why did you stop using E-goi?
Observations			

Table 7 - Data fields retrieved from NPS form extraction

Date	Contact ID	Form ID	List ID
Email	Client ID	NPS classification	Reason for classification

5.2 Statistics of Feedback Collection

In this step, all the presented sources of feedback in the previous topic are analyzed, in order to determine which ones have the most relevant results. In this study, it's not possible tell, from the absence of a centralized and organized feedback platform, how many inputs from each source are directly related to product improvements developed. However, it is indicated for each source the number of interactions made and, in cases where more numbers are available, which ones tend to be more efficient. The time period considered for this analysis is six months, between August 2018 and January 2019.

Considering all the values of the sources of feedback analyzed (see appendix G), the Helpdesk and Chatgoi are the ones that generate the most interactions. Chatgoi generates a lot of results (more than 2000 a month), requiring high processing since several duplications are recorded

and, with a quick analysis, it’s clear that the text content that users typically write in it is not the most effective for product improvement.

In fact, the only source that, in the moment of analysis, allowed to have a direct link between generated feedback and improvements required in the product development management system is Helpdesk. However, the ratio between tickets and issues for improvement created does not currently reach even 1% in any of the analyzed months.

The analysis of the data gathered in Helpdesk and Chatgoi, as well as the values of the number of interactions of the other sources, show that E-Goi receives a lot of feedback and that almost all of it is not properly analyzed. There is no system that shows the connection between the source, the feedback, and the respective improvements. As a result, it is practically impossible to monitor and optimize the empirical development for SaaS product improvement.

5.3 Results of informal interviews

Informal conversations with several members of the E-Goi team, including Vítor Tavares (CTO), Hugo Monteiro (Product Leader), several product managers and people dedicated to customer service, managed to clarify some of the biggest obstacles and aspects that the solution to be developed for this project should take into account.

Related to obstacles, the greatest difficulty in not taking a careful analysis of the received feedback is that, as already indicated, it is dispersed in dozens of platforms and the manual method of extraction and observing one by one is not efficient, nor suitable for the high growth rate that the company has. In addition, the inputs of information, whether in the Helpdesk, Chatgoi or others, are not standardized, there is no global classification system or a system that allows grouping similar inputs.

In this sense, the path must be to centralize the various entries in a single space that makes the process as much automated as possible and, consequently, scalable. The target audience for this system should be the product managers who will be divided and allocated by development teams. The categorization should be tailored to the tags that are currently used in Helpdesk and to the new structure of the user experience and product marketing team. In terms of development, the request is that, in a first phase, the system proves its operation by focusing on the sources that are most likely to produce results and does not need to include advanced natural language processing capabilities.

Also, some other information is that it's important to allow the addition of feedback manually, because the automatic integration of some sources may not compensate the efforts needed.

6 Project | *Master User Research*

Considering the theoretical content that mentioned in the background review, as well as the analysis made in the case study and evidences resulting from the informal interviews, in the following subtopics is defined a feasible solution to solve the problem described and that translates as the central object of this dissertation project. The system developed was named Master User Research (MUR).

To make it clear, in summary, the four main problems that system developed, MUR, aims to solve are:

- Currently, the company has no efficient and effective, neither based on continuous improvement, process of managing and processing information received by users that aims at product improvement and empirical development;
- E-Goi databases receive thousands of user feedback inputs that are not currently properly analyzed or even seen at all;
- E-Goi has many different sources of feedback, each one with different data architecture and spaces where inputs are saved and accessible;
- There is no system to centralize or to automatically filter only the valuable data inputs for product development.

6.1 Definition of the developed system

The real-time SaaS continuous improvement system proposed is the use of a repository for feedback centralization with a Kanban structure, where multiple feedback sources with high number of inputs are added automatically through integrations. All feedback management is performed in this repository, including the definition of new empirically based improvements, direct integration with Jira (platform used for software and product development management). Also, it's possible to manually add feedback inputs resulting from Google Analytics and FullStory proactive analysis, usability tests and other sources used, as well as a RICE scoring and prioritization system.

In addition, in between of the mass feedback sources and the repository that centralizes all the collected information, there is an ETL system. This system is responsible for receiving all user data inputs (extract), deleting unnecessary attributes for analysis, filtering feedback that is not relevant for analysis, and categorizing all inputs (transform) before uploading the information already transformed to the repository (upload). The set of defined processes and systems that constitute this presented solution, is designated as Master User Research or MUR.

Finally, a preponderant aspect of this system is that all the sources of feedback that have previously implicated, by their nature, human intervention and analysis, such as customer support tickets (Helpdesk), must have an initial filtering. In other words, from these sources should only be extracted and processed in ETL and repository information labelled as feedback for product improvement.

This conceptual definition of my proposed viable solution aims to solve the four main problems mentioned above. The repository is created to centralize all the feedback, already exported, transformed and filtered from all data sources through the ETL system, all of it

allied to a set of processes that define the various steps and responsible for each of the necessary actions.

Regarding the research questions, by collecting all feedback provided by users of E-Goi, filtering and centralizing it in a repository, as well as setting well defined processes in order to keep the system organized, efficient and effective, this a way to enable the company to manage all user feedback and, therefore, always know what the customer really thinks of this SaaS (RQ 2). The subject of continuous improvement and empirical software development are further described in detail in the topic of applying a continuous improvement methodology.

6.1.1 Processes of Master User Research

More than just a system, MUR involves a critical set of processes aimed at extracting the full potential of all feedback, always considering the efficiency and effectiveness factor from the point of view of a SaaS product. These processes aim to solve the problem indicated that E-Goi has no guide or persons responsible managing and processing the information received by its users.

That said, here are presented the processes that constitute the developed system within the scope of this project.

From a general point of view, the process of managing and organizing feedback when a user, internal or external, indicates some feedback. The ETL system automatically collects this feedback and performs all the various information processing and categorization actions. After the ETL process is completed, if there is content in the output step, it will be automatically added to the feedback repository. Here begins the interpretation and management of the feedback, manually, by the respective product managers that, when it is empirically justified, should create improvements associated with feedback received. These improvements are later integrated into the task management system used in the company which, in the particular case of E-Goi, is Jira.

Moving towards a more focused representation, it was created the process map of Master User Research (see figure 4).

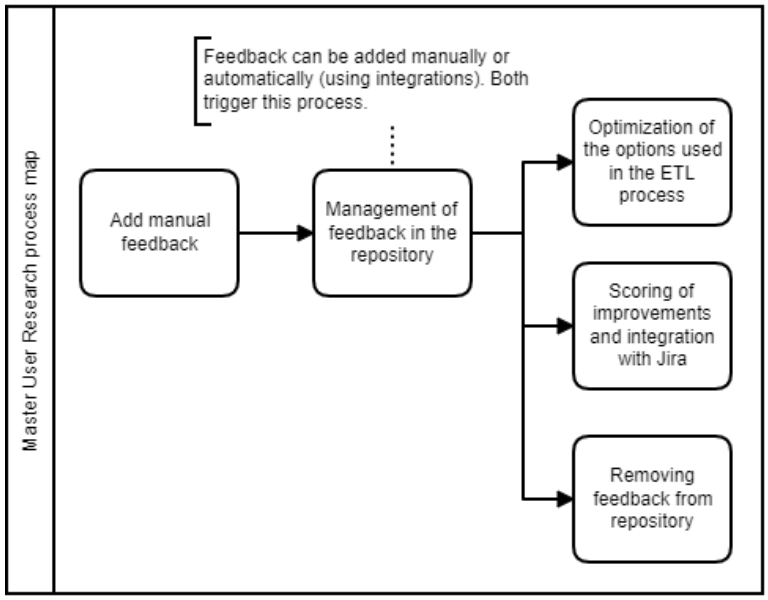

Figure 4 - Master Research system process map

In this way, it’s possible to highlight five processes that involve product managers and the user research manager (a position that should be added to the responsibilities of one of the current product managers). All these processes are represented in detail through swimlane diagrams (see appendix H, I, J, L and M).

The process of adding feedback manually, presented in figure 5, can be performed proactively by any member of the product management team. This is always when one of these team members finds some relevant data to the improvement of E-Goi platform in sources such as Google Analytics, FullStory or usability tests. The information must be manually included into the feedback repository in the right category, indicating a title, description and status.

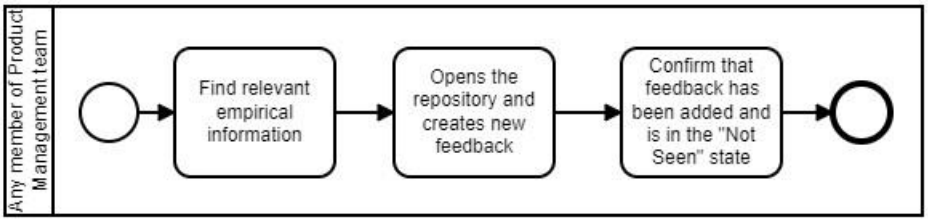

Figure 5 - Process of manually adding feedback

Following this sequence, both the addition of manual and automatic feedback through the ETL process is a trigger to start the process of "Management of feedback in the repository" (see figure 6). In this process, product managers receive an email notification whenever there is new feedback to analyze in the categories they are responsible for analyzing (there are sixteen categories divided by four user experience and product marketing teams). The analysis always starts in feedback in the "Not seen" state and, after opening and analyzing the status, it must be changed to "Seen". If the analyzed information contains an empirical basis for product improvement development, then an "Important" label is added, and an improvement is created associated with the respective feedback or the feedback is associated with some improvement already created. In case the feedback information is not relevant for analysis, the process is to advance to the next feedback with status “Not seen”.

There may also be instances where the product manager cannot determine, based on the present information, whether the feedback is relevant or not. In this situation, the responsible product manager must add the label "Inconclusive", which will notify the User Research manager to send an email to the user who left the indicated feedback, in order to obtain more information, and from that, determine conclusively whether or not feedback is important and if it is a basis for product improvement.

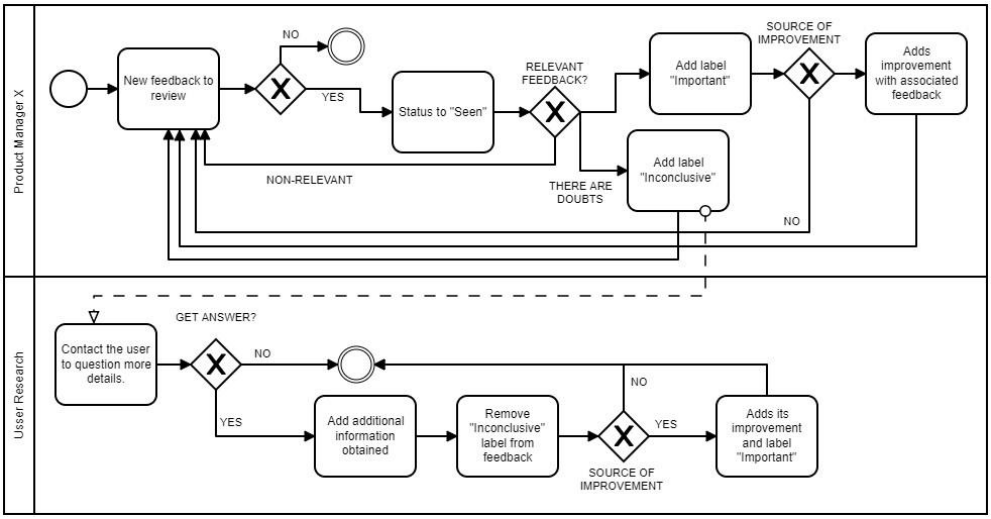

Figure 6 - Process of feedback management in the repository

Following this, still under the responsibility of the respective product managers, the process of "Scoring the improvements and integration with Jira" (see figure 7) begins.

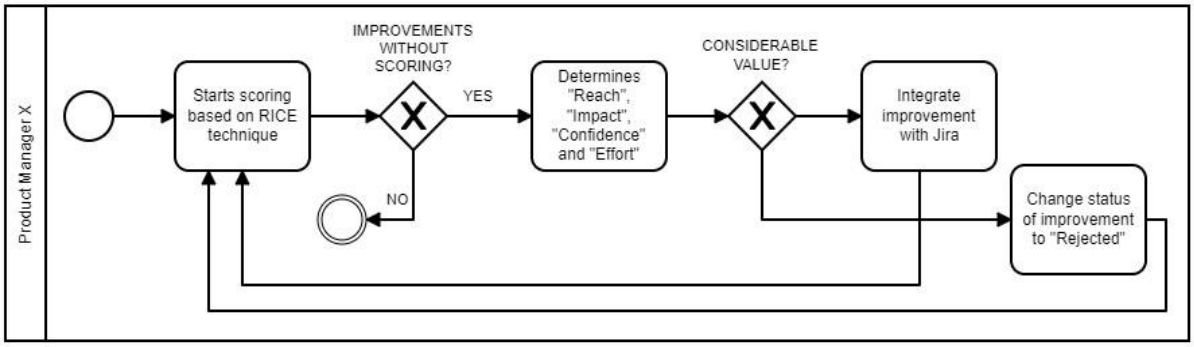

Figure 7 - Process of improvement scoring and integration with Jira

This set of actions is started when there is some improvement without a scoring value and all feedback inputs present in the repository, related to the categories of a certain improvement, are in the "Seen" state. To determine the scoring of the improvements, the technique to use is designated RICE. For any of the parameters (reach, impact, confidence and effort), the scale to be used is between zero and five, using the scale defined in table 8. Thus, the product manager must assign a value for each of the four parameters in order to calculate and analyze the final RICE value (Reach x Impact x Confidence / Effort). If the value is considerably high, the improvement must be integrated into the Jira and automatically moved to Backlog state. On the other hand, if the RICE value is low the state of the improvement is changed to Rejected.

Table 8 - Scale created for the RICE prioritization system

	Reach	**Impact**	**Confidence**	**Effort**
0	Don’t know	Don’t know	Don’t know	Don’t know
1	Single case or need	Design/copy issues | Hardly affects UX	Very low	Very complex | At least a month
2	Specific conditions	Feature doesn't work, has an easy workaround | Fixes/improvements that slightly improve UX	Low	High complexity | Days or weeks are required
3	Not a single case or a specific condition	Feature doesn't work, complex workaround; Fixes/improvements business-related; Design/copy issues that seriously affect UX	Medium	Not a done deal | At least a day
4	Multiple cases in multiple scenarios	Loss of data; Feature doesn't work, has no workaround; Fixes/improvements core feature	High	Not that hard | Couple of Hours
5	Every case and scenario	Security/privacy issues; Service is down; Delivery is blocked on major ISPs	Very high	Very simple | Few Minutes

To keep the system optimized (also for continuous improvement purposes), one of the most important processes of this system is to progressively improve the ETL system (see figure 8). This is the system that allows filtering only the relevant feedback for product improvement and to automatically categorize this feedback. Therefore, the more improved it is, the less resources and time it takes to be invested in feedback analysis, making the whole process and system more efficient. Thus, the main responsibility for this process is the User Research

manager, that every month or whenever 1000 feedback entries are added to the repository, should analyze with the product managers possible improvements to the system and new rules to implement in the filtering and categorization. If there are important and relevant changes, the responsible for User Research should develop them in the system and then notify the product managers of the improvements performed in the system.

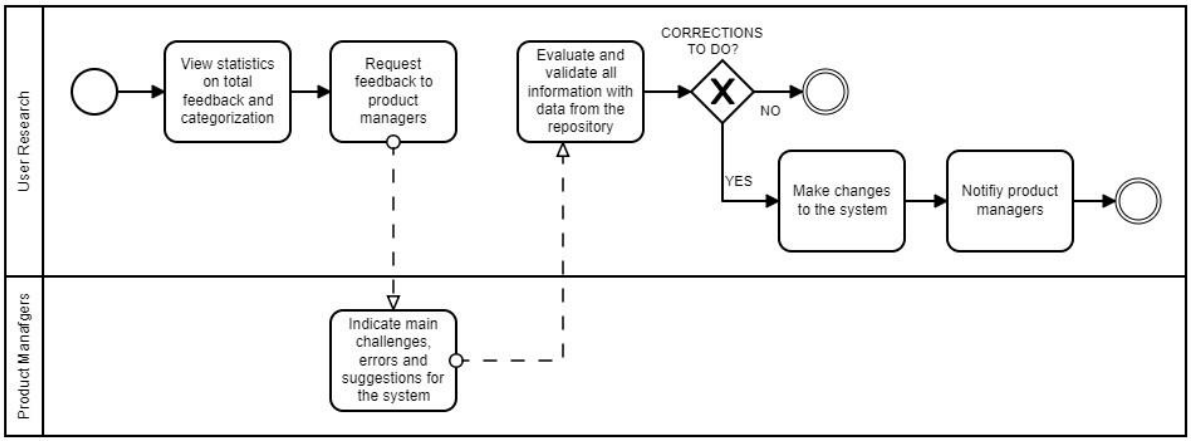

Figure 8 - Process of optimization of the options used in the ETL process

Finally, the last process inherent in the MUR system aims to avoid the accumulation of less relevant information in the feedback repository (see appendix M). Thus, when there is feedback with more than 60 days from the day it was originated, the person in charge of User Research is notified by email to initiate a removal analysis. Any feedback that is more than 60 days old and without relevance to future product improvement is removed with a simple "Remove Feedback" button, except for all information that has the "Inconclusive" label that must be kept in the repository until this label is removed.

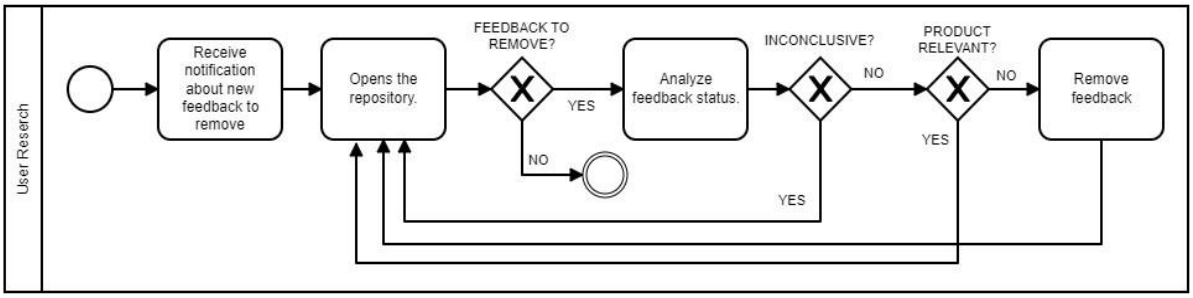

Figure 9 - Process of removing feedback from repository

6.1.2 ETL system rules and functions

This system is the central aspect of this project. It allows to analyze thousands of data inputs, filtering only the ones that are relevant for SaaS product improvement and also to categorize them into a set of topics. All this automatically and in just a few seconds. This way, it allows me to face the current issue that E-Goi has no way to automatically filter and centralize only the valuable data inputs and also to merge all data inputs into one central database with a single and relevant data architecture.

In this sense, the system is used to merge databases from different sources into only one database, to filter out the results that are not reliable for analysis, and to categorize feedback inputs into one of several predefined topics that correspond to areas of the platform and that, in turn, correspond to the division of the new teams of development and product management.

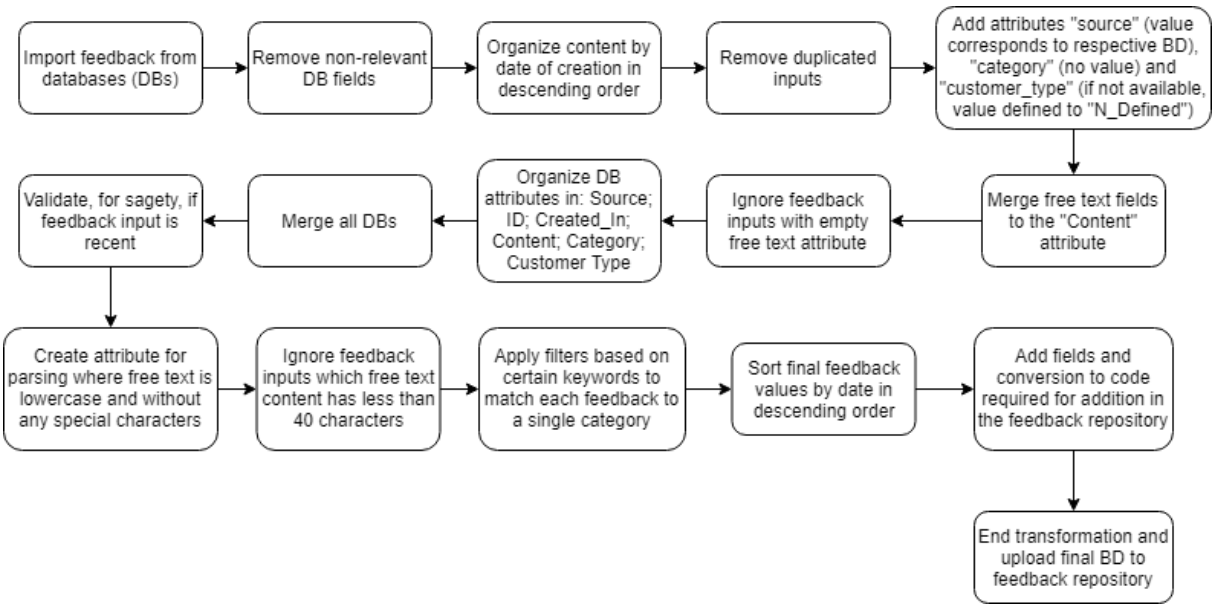

Figure 10 - Steps performed in ETL process

The output of executing the ETL system is a single database containing information from the various databases that were imported. This resulting database contains only the relevant feedback inputs for analysis (filtering process can ignore inputs without free text or less than 40 written characters). In addition, all relevant feedback inputs are categorized into pre-defined topics through keyword matching. Thus, the resulting database contains all the information centralized and contains only relevant inputs for analysis.

The categories, in case of E-Goi, were pre-defined based on the areas of the platform, being these: User Accounts; Senders and Cname; Payments; Lists; Email; Forms; Slowness; Campaigns; Integrations; Reports; SMS and Smart SMS; Autobots; Push; API; Affiliates; Transactional; Others.

6.1.3 Models for the development of Master User Research

In order to represent the proposed system, as well as to clearly allow its development from the practical point of view and adaptation to other SaaS services, the following representations were created: domain model (see figure 11), class diagram (see figure 12), state machine (see figure 13) and logic view diagram (see figure 14).

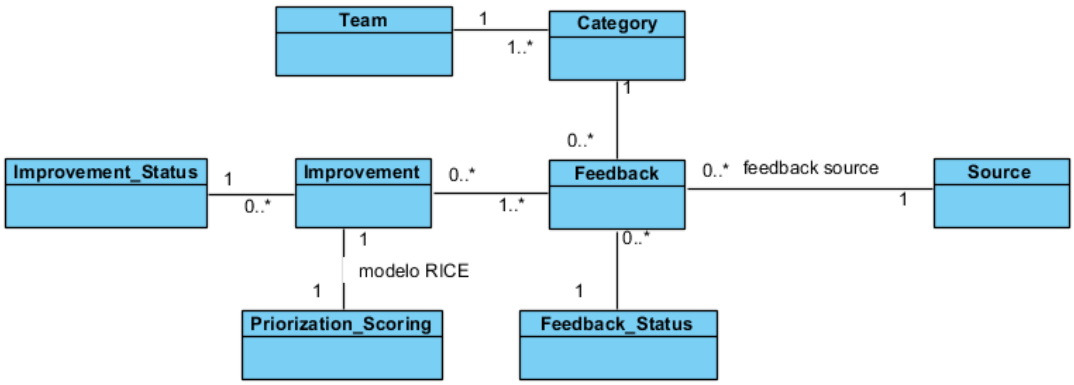

Figure 11 - Domain model of Master User Research

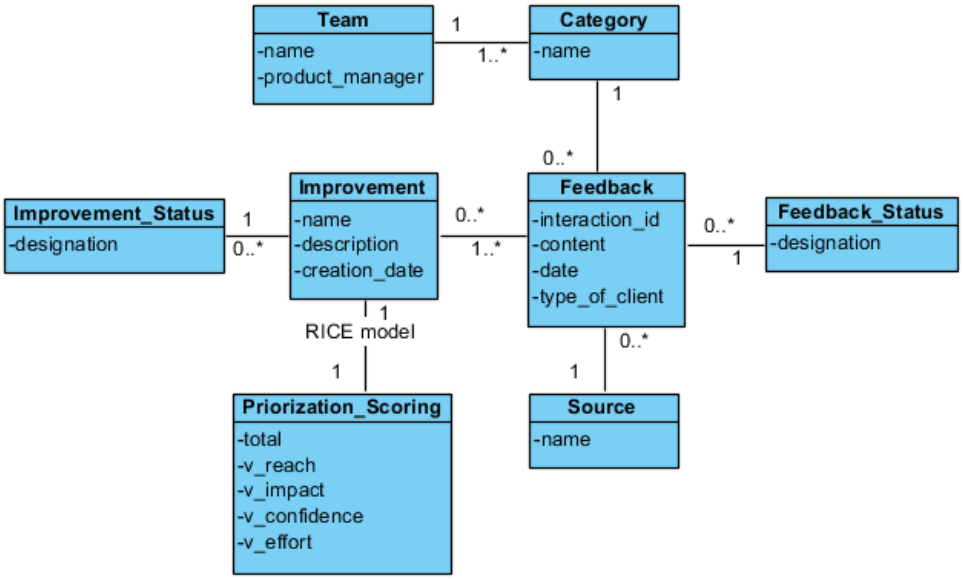

Figure 12 - Class diagram of Master User Research

The proposed feasible solution requires the use of eight classes. The main one with the highest number of associations is "Feedback". This entity represents any information, from internal or external users, that is relevant for analysis from the point of view of product improvement. Feedback is associated with a source that characterizes the source of the feedback and which in turn may have one or more associated feedback records, as well as a state (following the same source logic) and a category. Each category may, at any given time, be associated with none or many feedback inputs and must have a team responsible for handling the feedback associated with each category. The "Team" class consists of a product manager who in practice must be responsible for one or more categories and their associated feedback inputs.

In relation to “Improvement” class, each record must have at least one associated feedback, always bearing in mind that not all Feedback records have to be associated with an improvement. Each improvement has a title, description and creation date, being characterized by a single priority value and improvement state. The prioritization considers the RICE scoring system, hence it is constituted by a value of reach, impact, confidence, effort and the resulting final calculation.

Also, regarding entities, each feedback input, as evidenced in the class diagram (see figure 12), may be associated with one or more improvements.

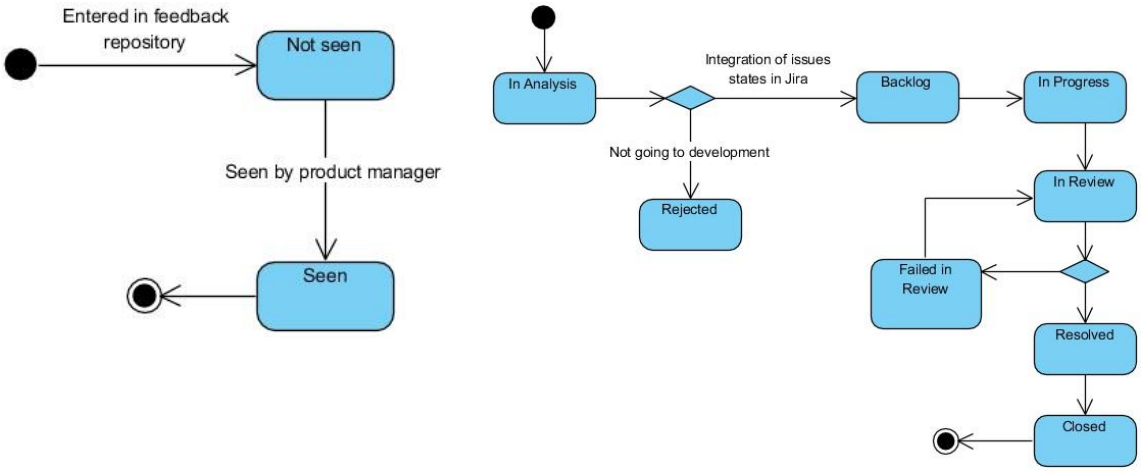

Figure 13 – Feedback and improvement state machine

Regarding feedback states, all inputs start in the "Not Seen" state, which is then changed to "Seen" as soon as the feedback is read and, more important, analyzed by the responsible product manager.

On the other hand, the state machine of improvements evidences more states. Following the sequence (see figure 13), each improvement starts its activity in the "In Analysis" state. This state indicates that the improvement has not yet been associated with a scoring and that the responsible product manager has not yet determined whether improvement is added into the development task management system, which in the case of E-Goi is Jira. After the decision is made, it can be negative, changing the status of the improvement to "Rejected", or positive integrating it into Jira and thus changing its the status to Backlog. From here, it follows the various states described in the state machine of improvements, depending on its state of development.

It is important to understand that, in the state machine of improvements, from the moment that there is an integration with Jira (or other development task management software) the state diagram must be equal to the one that is used by this software. Thus, what is represented from the "Backlog" state is exactly the set and state sequence currently used in the E-Goi Jira service.

To finalize MUR system models definition, a logical representation of the system was created (see figure 14). So, the services that save data, considering only the four sources of feedback used, are integrated through ETL system API. When there is a new input of feedback, it is automatically extracted and executed in ETL system, passing the output data, through the API of feedback repository, to the repository. In addition to this way of including feedback in the repository, there is also an interface, linked to the feedback repository API, which allows to manually add new inputs product analysis. Also, Jira is linked in “double-way” to feedback repository, in the sense that the task manager API allows the repository to add new improvements (named issues), just as the repository can fetch and display the status and updates of the improvements in its interface.

This integration with Jira, which is the software for development task management in E-Goi, but could be any of the software that exists, is exactly to make it more agile and easy to transform user feedback inputs into real product improvements, increasing and reinforcing empirical software development. Being so, it’s referring to the research question three (RQ 3).

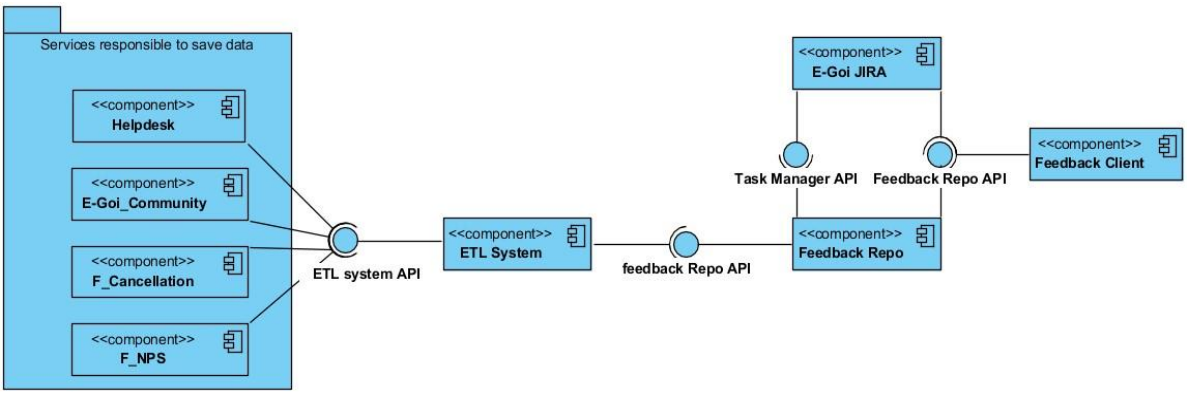

Figure 14 - Logical view diagram of Master User Research system

6.2 Proof of concept (PoC)

In order to obtain data and statistics to evaluate the effectiveness and efficiency of this system, without overburdening the company's development resources, a proof of concept was created with the same concepts and processes, but with a lower level of automation.

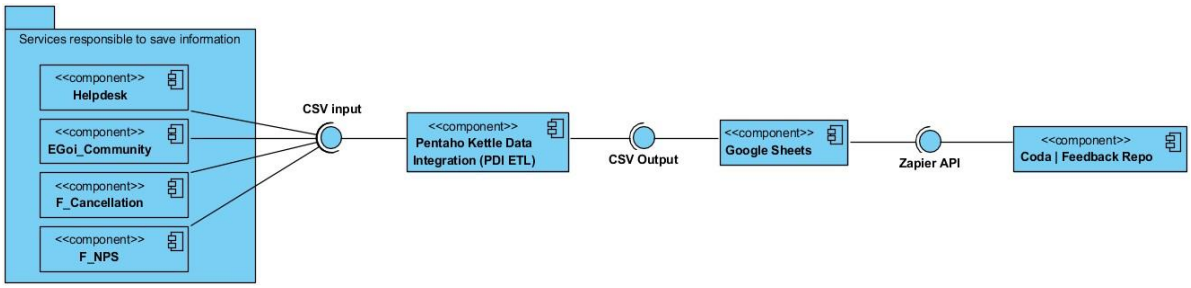

Figure 15 - Logical view diagram of MUR proof of concept

As indicated in the logical view representation of this proof of concept (see figure 15), Pentaho Data Integration software and Coda were used, respectively, as the ETL system and as an online and cloud platform for the feedback repository.

To integrate the ETL system results into the feedback repository, two middleware tools are used, a Google Sheets document, and an integration created in Zapier system, programmed and mapped to add each new line of the Google Sheets file to the repository created in Coda. The integration with Jira has not been performed on this proof of concept, because this is a relatively simple action and, by its nature, already belongs to the development team, so it is not so relevant for centralizing, processing and translating information provided by users in product improvements.

Furthermore, in this system the extraction of feedback inputs to the ETL system is not automatic (see appendix O). This requires manual extraction of the corresponding CSV files from each database and subsequent addition of these to the Pentaho Data Integration project created for ETL purposes.

In this way, the first step decided for this proof of concept was to define the databases to be used. Based on statistics and relevance for the company, it was decided to use Helpdesk (already implementing the filtering system explained above with the feedback tag), the E-Goi Community, the Cancellation Form and the NPS Form. After that, the process was to analyze each one of the databases and, based on its attributes and characteristics, build the ETL system in Pentaho Data Integration software. Once finished the development of the ETL system, it was necessary to create a process of loading the results into a Google Sheets file because it allows, through Zapier software, to automatically integrate all new inputs with Coda platform in which the feedback repository was developed.

This proof of concept is valuable for two reasons: it faces all the defined problems in this project, just with a few more manual steps; it allows to have outputs and statistics, which are shown in the topic “Results of PoC”, to evaluate the real impact of the system in the company. Also, it was possible to develop, apply and measure the results and impact of MUR in a few weeks and without exceeding the resources which had been made available (mostly time and technical assets constraints).

6.2.1 Restrictions applied to proof of concept

In this first phase of the project, there are certain restrictions applied that aim to ensure that the system can be developed and tested without exceeding a reasonable number of resources made available.

The fact that E-Goi works in markets with different languages is a challenge, and because the time devoted to the dissertation is limited, the solution for me is to focus on the main relevant languages for the business (number of users and total revenue). Therefore, the system presented only takes into account the feedback in Portuguese of Portugal and Portuguese of Brazil.

Furthermore, in the solution presented, Chatgoi is not considered because although it collects a great deal of user information monthly, it is mostly not relevant to product improvement and its analysis would involve the use of advanced natural language processing techniques, unplanned at this stage to the real-time SaaS continuous product improvement system idealized and developed.

6.2.2 ETL system in Pentaho Data Integration

The use of this software to create the ETL system was decided due to essentially three factors: it has a free community version with complete resources, it allows to create all the necessary functions graphically with little programming need and it is scalable, being able to support high amount of data processing, having options for use in cloud and integrations with many applications.

Its operation, for the transformation of the feedback databases, starts by including a CSV file input step. In this case, there are four input steps, since the system has to import data from four feedback sources (Helpdesk, cancellation form, NPS form, and E-Goi community.) Next, there are all the steps to follow the entire ETL sequence that the system which I propose needs (see figure 10). In total, the system consists of 121 steps (see appendix N), 44 of which are after the unification of the several databases already transformed and correspond to the process of filtering, categorization and ordering.

Its execution is a simple process, it is only necessary to open the software and the created project, applying it to the extracted databases. The total execution time of the software is less than 3 seconds for 1912 data inputs. It’s fast and automatically merges the different data structures into one single database, also categorizing the information and filtering only the valuable data.

At the end of executing the ETL system, the output is a CSV file with all data inputs that are viable and relevant to product analysis and improvement. This output is ready to be added to the repository, therefore it is added to a Google Sheets document, and through a Zapier integration it is added to the Coda repository developed, that is explained in detail in the next topic of this thesis.

6.2.3 Feedback repository in Coda

To build the repository, there were considered all the processes and needs of the MUR system and processes. First, the system to use needs to be compatible with all actions planned on the processes, it must be scalable because E-Goi is a never ending source of feedback growing

each month and, preferably, it should be in cloud to be easily accessible and allow collaborative work between product managers and the user research responsible.

Having into account all this, Coda was the chosen software to use in this proof of concept. It is a cloud-based collaborative document editor based on the structure of a spreadsheet, with the main advantages that allows to build several functionalities in a graphical way. The repository built in Coda is structured in folders and sections, following this structure:

- Add manually – Folder with only one section that allows to manually add feedback.
- Feedback management – Folder that contains three sections, all serve the purpose of feedback analysis, one being to show the whole information, one only for feedback with the important label and one for feedback only with the inconclusive label. As indicated in the specifications, a kanban style board is used to expedite the analysis.

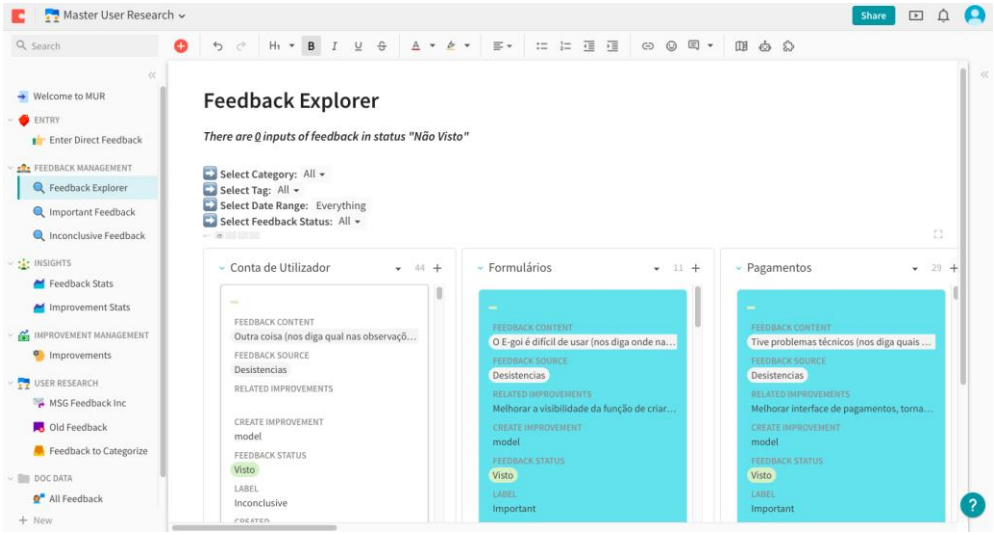

Figure 16 - Feedback management section of the repository created in Coda

- Statistics - Folder that has two sections with statistics, one related to feedback inputs and another related to created improvements.
- Improvements management - It only has one section where the various improvements created with empirical basis are presented and the process of scoring and integration with the Jira is applied.

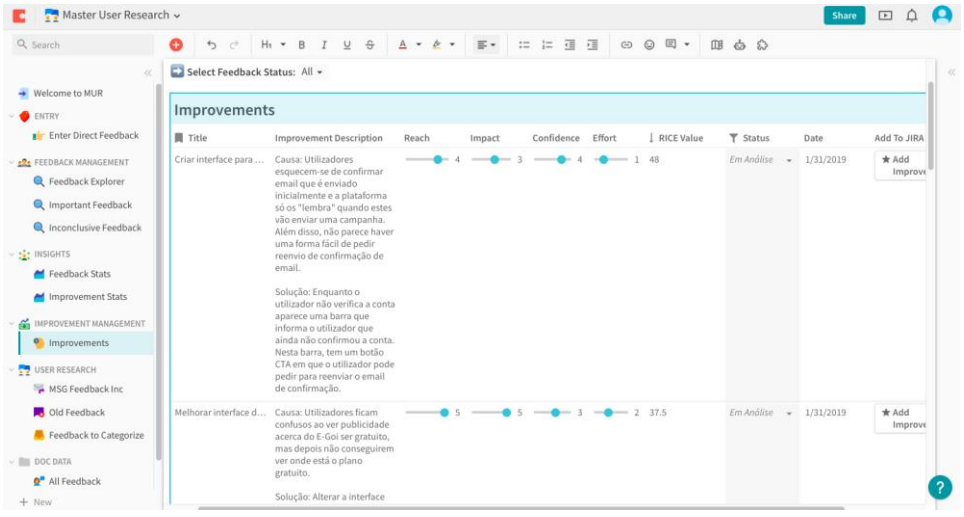

Figure 17 - Improvements management section of the feedback repository created in Coda

- User Research - Three sections created exclusively to be operated only by the person in charge of User Research that allow the application of the processes of collecting more information when feedback is classified with the "inconclusive" label, removing feedback from the repository and categorizing feedback with categorization errors by the ETL system.
- Doc Data - Logistics layer in the system created on the Coda platform that aims to receive and save all information, as well as configure categories, tags and notifications.

6.2.4 Results of PoC

In order to obtain concrete data on the effectiveness and efficiency of the system, the whole set of processes and sequence of steps described was applied to all feedback obtained in January and February of this year in E-Goi.

The results obtained are summarized in figure 18. So, in January, a total of 755 feedback inputs were analyzed, which, when executed in the ETL system, were reduced to only 83 (about 90%), followed by manual analysis procedure that culminated in 8 defined improvements. In February, the numbers were not very different (in %), denoting some positive coherence in the developed system. So, out of a total of 1157 feedback entries, ETL managed to filter about 90%, being the output 116 inputs, which resulted in 20 improvements.

Summarizing, in two months, almost 2000 data inputs were analyzed, resulting in 28 defined improvements.

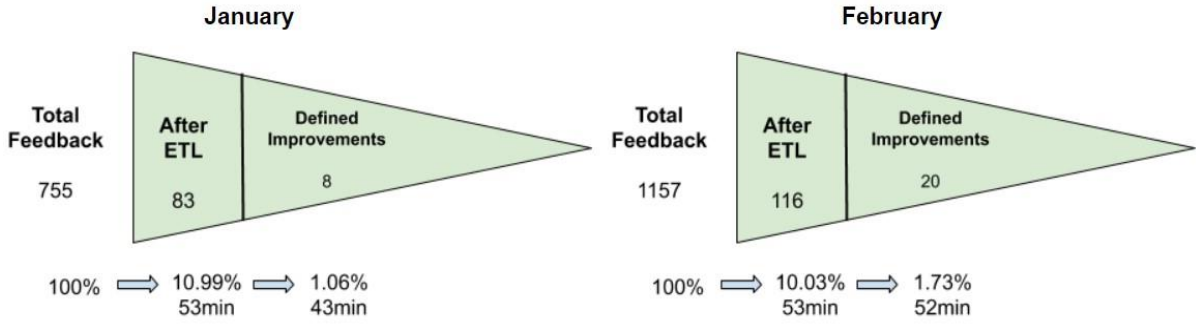

Figure 18 - Results funnel obtained on proof of concept in January and February

Regarding the times presented in figure 18, the value of 53min (equal in both funnels) corresponds to the time it took me to extract the various databases, organizing the CSV files in folders with correct names, open the Pentaho Data Integration software, execute the created project, extract the results for the Google Sheets file and wait for the execution of Zapier which aims to pass all feedback inputs to the repository created in Coda service. On the other hand, the second value presented 43min in January and 52min in February corresponds to the time of application of the management process of feedback and scoring and integration of improvements in Jira.

Therefore, a process that, before MUR was purely manual and time consuming, took to less than two hours per month to collect, filter, categorize, analyze and transform into empiric-based improvements. Nevertheless, this aspect of process time improvement will be further detailed in the next topic of applying a continuous improvement methodology.

More advanced results (see table 9) demonstrate that the categories with the highest feedback number and improvement/feedback ratio are "User Account" and "Email". Regarding the

categorization errors of the ETL system, only five cases (an error of approximately 2.5%) were obtained in the total of the two tests, a positive value to be pointed out. Additionally, the average of the ratio between improvements and feedback received, in the two analyzed months, is 13.44%. It's also notable that some categories receive more feedback inputs than others, being a very relevant information to consider in prioritizing product areas development.

As an example, one of the 28 improvements created based on feedback analyzed corresponds to adding a new payment option to the free account registration with a less invasive method such as integration with Facebook's personal user. The idea is to allow this registration by referring the platform to three or more friends or family members. This is based on five feedback inputs, including a user who indicated on the 20th of February in the cancellation form the following: "I made a mistake several times to connect e-goi to my Facebook account.".

Table 9 - Number of feedback inputs analyzed and improvements on proof of concept

	JAN 2019				FEV 2019			
	ETL Time (extract, transform and load) 0:53:00				ETL Time (extract, transform and load) 0:53:00			
Feedback categories	Total Inputs	Analysis Time	#Improvements	#Improvements / #Feedback	Total Inputs	Analysis Time	#Improvements	#Improvements / #Feedback
User Account	19	0:11:00	4	21,05%	27	0:17:00	13	48,15%
Cnames and Senders	1	0:00:30	0	0,00%	2	0:00:30	0	0,00%
Payments	16	0:06:00	1	6,25%	10	0:07:00	1	10,00%
Lists	2	0:00:30	0	0,00%	3	0:00:45	0	0,00%
Email	8	0:08:00	2	25,00%	13	0:06:36	1	7,69%
Forms	5	0:05:00	1	20,00%	4	0:07:00	2	50,00%
Slowness	1	0:00:30	0	0,00%	3	0:00:45	0	0,00%
Campaigns	2	0:02:00	0	0,00%	5	0:01:15	1	20,00%
Integrations	2	0:02:00	0	0,00%	3	0:01:00	1	33,33%
Reports	2	0:01:00	0	0,00%	0	0	0	0
SMS and Smart SMS	0	0	0	0,00%	2	00:01:30	1	50,00%
Autobots	1	0:01:00	0	0,00%	0	0	0	0
Push	0	0	0	0,00%	0	0	0	0
API	0	0	0	0,00%	0	0	0	0
Affiliates	0	0	0	0,00%	0	0	0	0
Transactional	1	0:00:30	0	0,00%	0	0	0	0
Others	23	0:05:00	0	0,00%	44	0:09:30	0	0,00%
	83	**0:43:00**	**8**	**9,64%**	**116**	**0:52:51**	**20**	**17,24%**
	Total Feedback		755	100,00%	**Total Feedback**		1.157	100,00%
	After ETL		83	10,99%	**After ETL**		116	10,03%
	PM's Analysis		8	1,06%	**PMs Analysis**		20	1,73%
	Total Analysis Time			**1:36:00**	**Total Analysis Time**			**1:45:51**
	Categorization Errors			3	**Categorization Errors**			**2**

6.3 Applying a continuous improvement methodology

From a standpoint of improvement, the crucial thing to keep in mind is that Master User Research (MUR) is an ongoing process that should be applied in a cycle-oriented way in order to optimize SaaS product management, which in this specific case is directed to the area of digital marketing and automation of marketing processes. The main goal is to provide sustainable improvement and eliminate waste in all processes and systems of user research and user feedback management.

Combining all the aspects of MUR explained above, including the ETL, the repository and the processes, with this cycle-oriented logic which aims to a progressive improvement is a feasible to solution to build a product continuous improvement system based on internal and external feedback. Making it possible to collect, analyze and use internal and external user feedback of E-Goi (or other SaaS) in order truly understand what the users think and, based on this empiric knowledge, build new or improve features of the product. Being so, this some valuable information for the first and third research questions (RQ 1 and 3).

In particular, it is complex to define in a specific number what is in fact the improvement that this project brings to E-Goi compared to the feedback management previously applied, because the feedback has never been truly analyzed, as it is actually proposed by the present project. However, in analogy, the MUR system showed in the proof of concept to be able to analyze 1912 feedback inputs in approximately 3h and 21min (201 minutes). Indicating that, in a similar context, if E-Goi were to analyze the approximately 14,862 feedback entries received on average per month it would take approximately 1562 minutes or 26 hours.

Considering that usually a working day corresponds to 8 hours, this process of using feedback for product improvement, without using the proposed and developed system, would take a collaborator of the company more than three working days of work. Thus, from 1562 minutes to 201 minutes, this project (system and set of processes) is able to reduce by 87.13% the workload required to handle all the feedback that the company receives on average in one month. That is a very significant improvement.

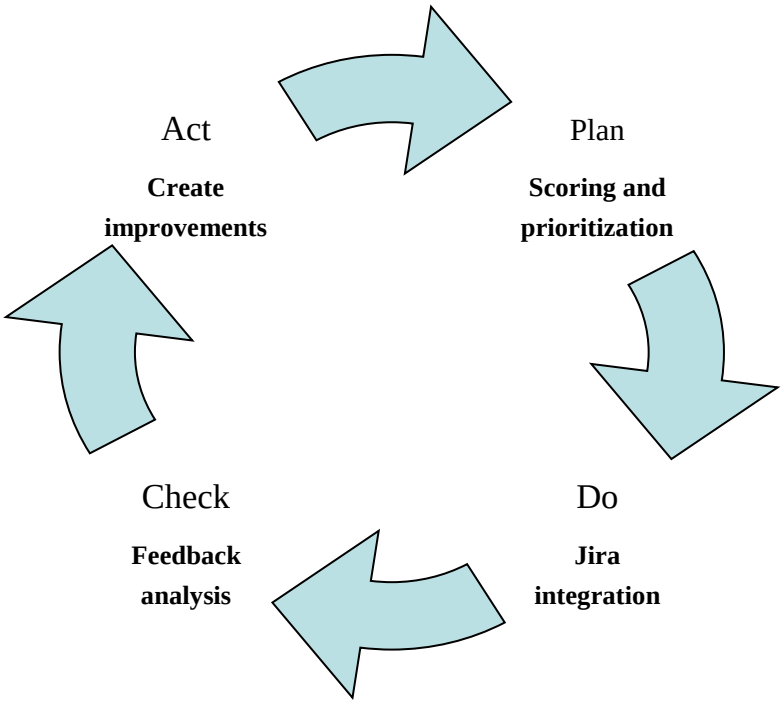

Figure 19 - PDCA methodology applied to MUR system

In sequence, in this project was always considered the concept of continuous improvement from the beginning, in particular the PDCA or Deming cycle methodology. In fact, the link between planning the improvements to be developed (scoring and prioritizing improvements), the creation of improvements based on the feedback obtained (feedback management process in the repository), the analysis of all the feedback obtained (ETL system, repository created and manual feedback process) and integration with the company's task manager to initiate the

development of the improvements (integration created with Jira) is based on the various phases of the cycle (see figure 19).

In fact, the empirical development process is increasingly reinforced with this system, given that all planned improvements are always based on feedback from a user, whether internal or external to the organization.

In addition, the development process adapting to the PDCA cycle and to the MUR is continuous, being regularly repeated in the same order, resulting in a progressive improvement of both E-Goi and MUR system, since E-Goi developments are now much more customer focused and the ETL system can only get better with more and more small improvements on the filtering and keyword system. It is not one event or one-time action, it's an evolutionary process.

Using the developed system, E-Goi is improved by always knowing what users really think of the platform, being able to continuously develop the right features or solving the most impactful problems and to do all this is in regularly repeated never ending cycle.

In the other hand, MUR gets more precise and useful in each iteration by applying the process of optimization of the options used in the ETL process, adding more feedback to the repository to empirically support improvements and removing old feedback that no longer is valuable to product development. As much as this user research and feedback management system get better, the filtering and categorizing gets more precise, feeding the repository with more valuable information, resulting in more and better improvements. It corresponds to a constant search to find problems, reduce waste (anything for which the customer is not willing to pay), and to find solutions to minimize them.

7 Conclusion and future research

7.1 Conclusion

This user research management project remains active in the company and runs every month to review all feedback received from the indicated sources. Although it is a radical change in the sense that feedback has never been given so much importance and a member of the product team has had to assimilate new responsibilities at the level of user research, the results are very positive and the focus is to increasingly make SaaS product development empirically based.

With the development of MUR, it becomes possible, efficient and effective to analyze a large amount of feedback data inputs, resulting in a greater real knowledge of what users actually think of the service.

In fact, the project allowed to reduce, in an analogous comparison, 87.13% of the workload required to handle all the feedback that the company receives on average in one month. It also allowed to apply a continuous improvement cycle, adding feedback as a plausible and crucial source in empirical development and continuous product improvement. The proof of concept applied in the company resulted in an automatic filtering of 90% of the feedback inputs received through the ETL system, a ratio between created improvements and feedback received of 13.44% and a total of 28 planned improvements, all empirically based (with one or more associated feedback inputs). All this in two monthly analyzes that took about 201 minutes, well less than the 1562 minutes that would be necessary if MUR wasn't applied.

Analyse user feedback is a key aspect to really know what the customers think. That's one of the conclusions of this project. This is a source of information that is huge in SaaS products, it can be from all forms and available through many means and data architectures. It's crucial to gather it, filter it, merge all in one repository, analyse and plan improvements based on customers really think.

The main idea that many theoretical articles present about feedback management in SaaS products is to centralize all feedback in a single repository. This is an important step on MUR. However, using an effective ETL system that allows filtering of relevant data and categorization, as well as applying the system in a PDCA or an agile development cycle (see figure 19), just like MUR does, may be the difference between having a useful feedback management system or having one that consumes too much time compared to its valuable outputs.

This project managed to prove that studying and understanding what users really think of the service is a possible and successful job. The point is not to have too much or too little feedback to analyse, but to analyse only relevant feedback, since that's the information that will have an impact on empirical development and on the business itself.

To finalize this conclusion, it's important to directly address the defined research questions, pointing out what and how this study managed to answer to them. So, here they are followed with the conclusions.

1. Research question 1 (RQ 1) – How can a SaaS company build a product continuous improvement system based on internal and external feedback?

To do this, there are five main steps to follow, that can be summed up in: ETL, repository, processes, PDCA and implementation. The first one, designated ETL, is based on the fact that a SaaS has plenty of feedback sources, each one with a different data architecture and many user feedbacks inputs. Therefore, an ETL system should be built to gather, transform (merge, filter and categorize) all the feedback inputs from different data sources, being it internal or external. Then, this system must be able to upload the output results in a repository used to centralize all user research data resulting from ETL execution and manual addition of feedback inputs.

Until this, ideally the system works on real-time and in an automatic way, moving now to the definition of processes that declare all actions and responsible for each of the steps: manually adding feedback, managing feedback in the repository, optimizing the ETL system, prioritizing the improvements created from the analysed feedback, and removing feedback that no longer has value from the repository.

It's missing just one crucial aspect, making sure this user research isn't a unique and individual process, but rather a continuous set of actions that happen cyclically and aim to produce real and progressive product improvements. Thus, the PDCA cycle should be used in planning / prioritizing improvements, integrating improvements with the development task management system, analysing the feedback in the repository to define new improvements, and determining what the user thinks of the improvements made, re-iterating the cycle continuously and progressively.

2. Research question 2 (RQ 2) – How can a company that provides a SaaS know what their customers really think of their service?

The short answer to this research question is to take care and analyse correctly all the information provided by the users. In fact, a SaaS system, such as E-Goi platform, receives a lot of user information daily. It is up to the company to define processes for collecting this information, be it proactive through usability tests, analysis of analytical tools, among others, or reactive, for example, through a good customer service. However, what has been detected with the study, in case of E-Goi, is that the problem is not having to look for more information, but rather having too much information and lack of processes or resources to analyse it.

So the process should be to collect all feedback provided by users, filtering and centralizing it in a repository, as well as setting well defined processes in order to keep the system organized, efficient and effective, this is a way to enable the company to manage all user feedback and, therefore, always know what the customer really thinks of this SaaS. The process of filtering, categorizing and centralizing, as well as extracting and uploading all data must be done using an ETL system. This system is then responsible to upload all valuable inputs, already categorized, in a repository which main goal is to preserve all valuable information related to product information in a single place. Here, it starts the process in which the product managers analyze all the new feedback inputs on the repository, reading them and, by doing that as well as iterating this system, knowing what users really think.

3. Research question 3 (RQ 3) – Does user research help a SaaS company to apply empirical software development and continuous improvement techniques?

Knowing the behavior, needs and motivations of the users is the goal of user research and, using it to enhance product development, is the main goal of the developed system. In fact, by always knowing what users really think of the platform, we are able to continuously develop

the right features or solving the most impactful problems and to do all this is in regularly repeated never ending cycle, enabling the use of continuous improvement methodologies.

More than that, by having an evolved and effective user research process we make it more agile and easy to transform user feedback inputs into real product improvements, increasing and reinforcing empirical software development. Also, it's a way to make sure the SaaS is always improving according to real and up-to-date knowledge of the users.

7.2 Future Research

User research and feedback management are never finished jobs. Users desires and needs change in a very fast rate, it's crucial to keep evolving and adapting the system and processes in order to always know what users really think of the service and apply empirical development.

As future projects, it is recommended focusing on the following three studies. The first one is to study the relationship between forms of feedback collection and the quality of feedback received. The quality of the feedback received is of crucial importance to development, and all of this may be very much related to how (in what moments, with what questions, in which platform spaces, etc.) we question the user to share information.

Second, developing a new MUR ETL system, in which currently the filtering and categorization are based on a keyword system that requires manual intervention to add improvements. The new system should be based on machine learning and natural language processing. This is a very complex development that, as far as MUR and E-Goi are concerned, was not necessary at this stage, I obtained a lot of coherence and few errors in the results, but in a scalability perspective this will be the way to go.

Finally, the third project to be developed is a single integrated MUR system. In E-Goi, the system that works is the one created in PoC. It is a functional MUR version with proven results that continues and will continue to be used. However, the plans are to implement a single integrated system, automating the extraction of the databases through scripts, reformulating the ETL system by developing it in E-Goi's internal environment and the reformulation of the loading process so that it can load all the data directly in the feedback repository (Coda), without the necessity of intervention of external elements like Google Sheets or the Zapier.

In a constantly evolving market, a service with a high growth rate and with users spread around the world, knowing the user and developing empirically is the main path that many SaaS products seek to follow and that make a user research management so much required.

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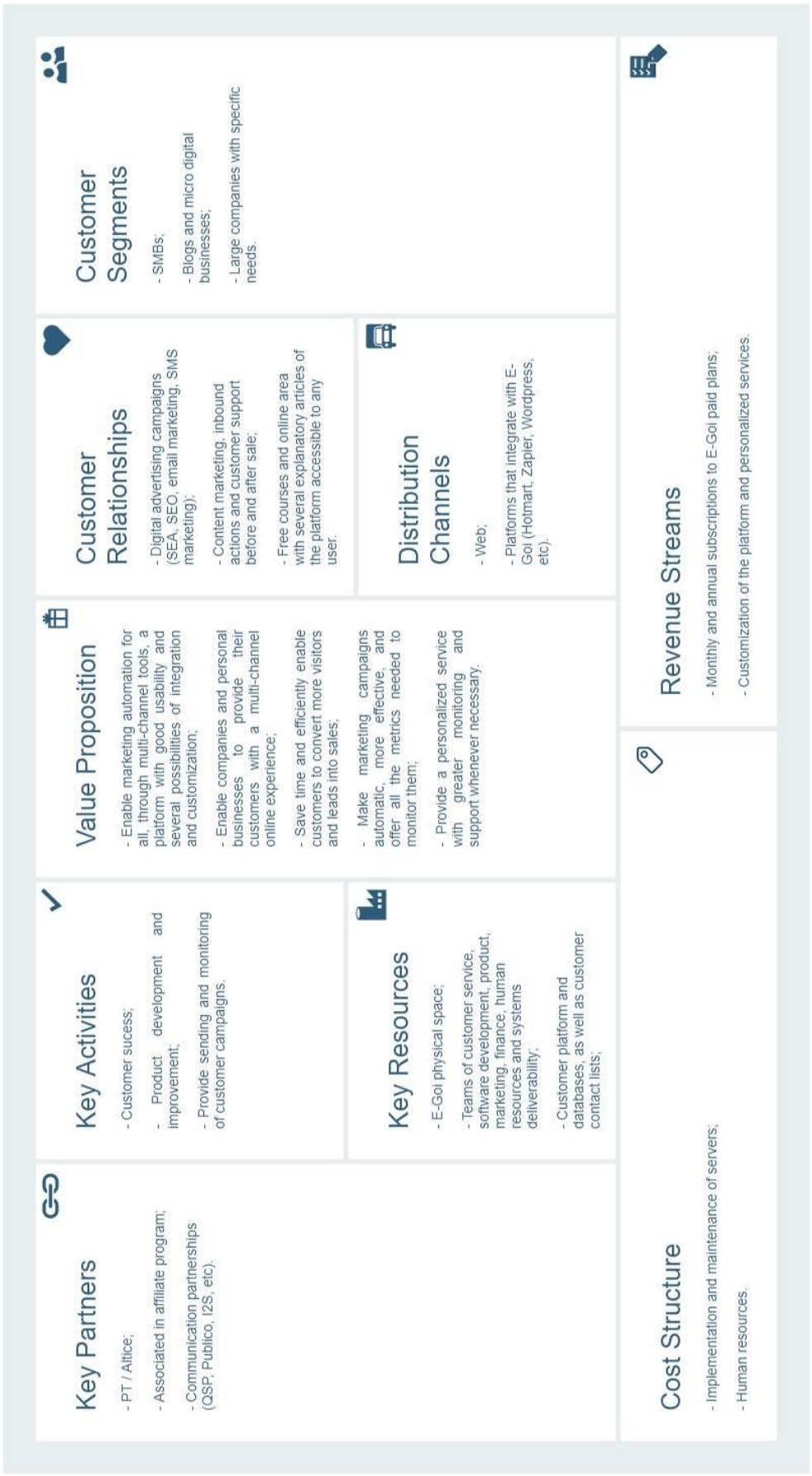
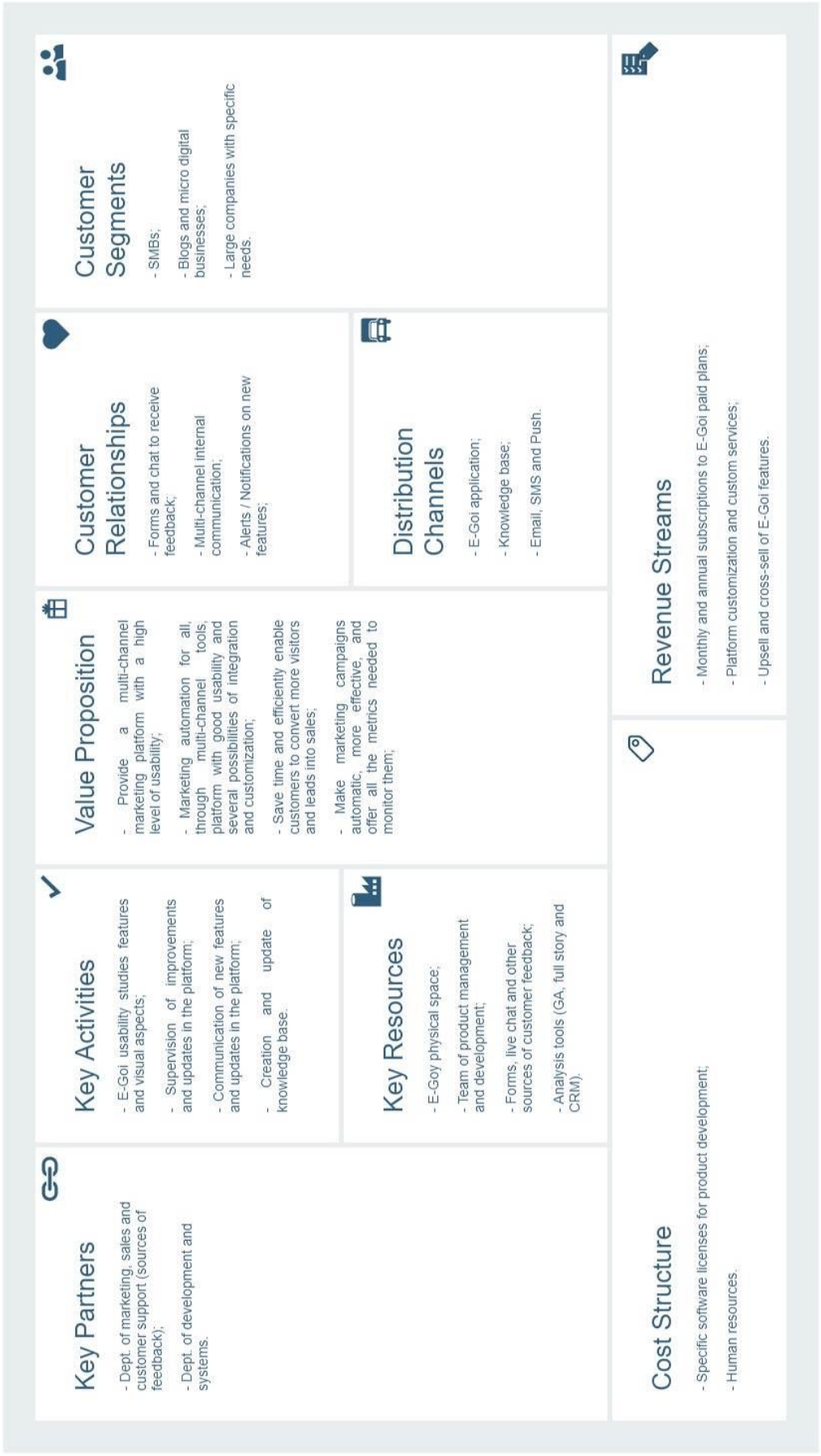
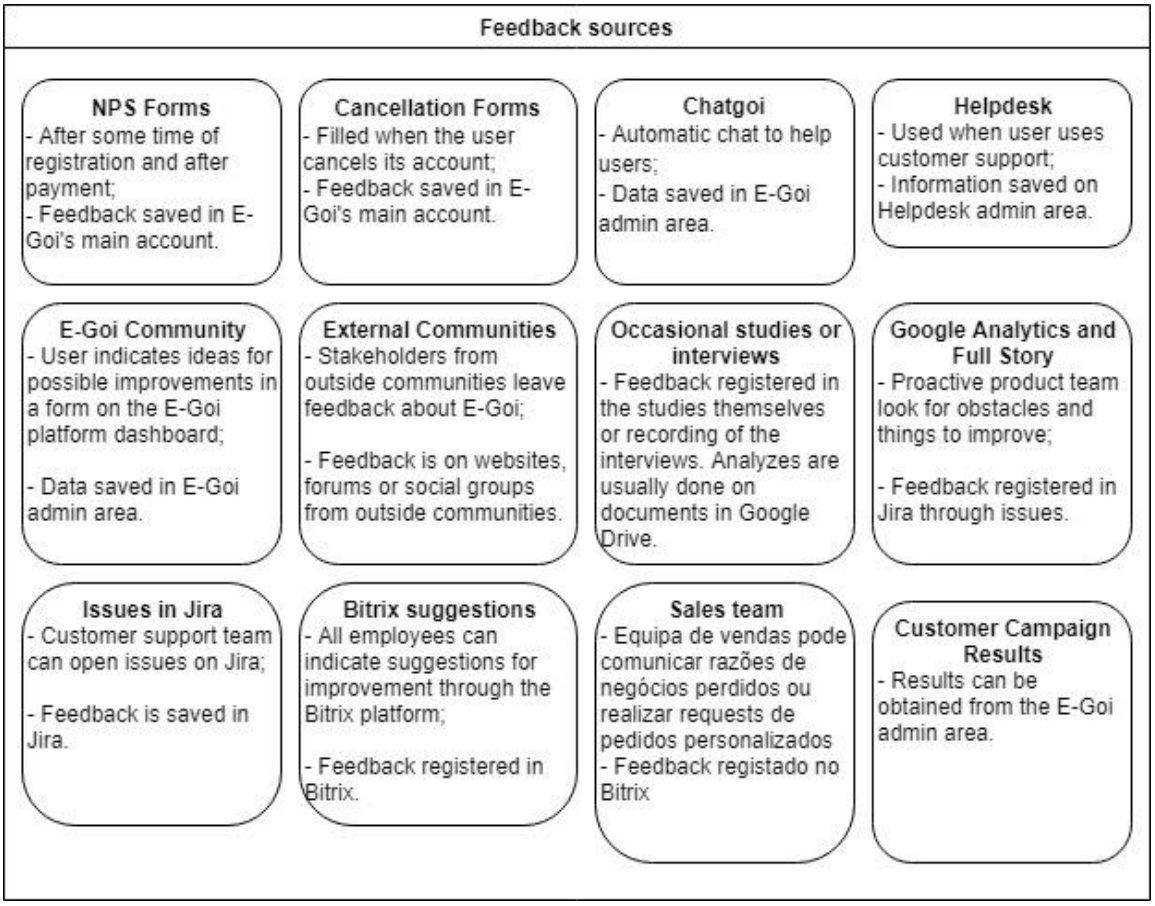
APPENDIX A: E-Goi business model



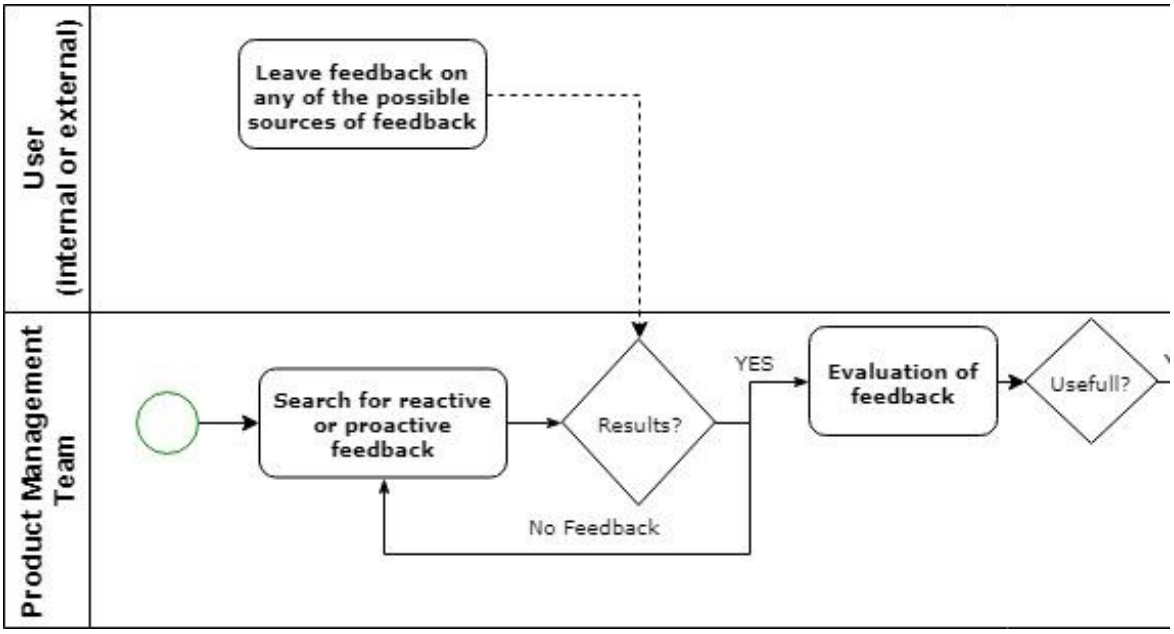
APPENDIX B: E-Goi product management business model

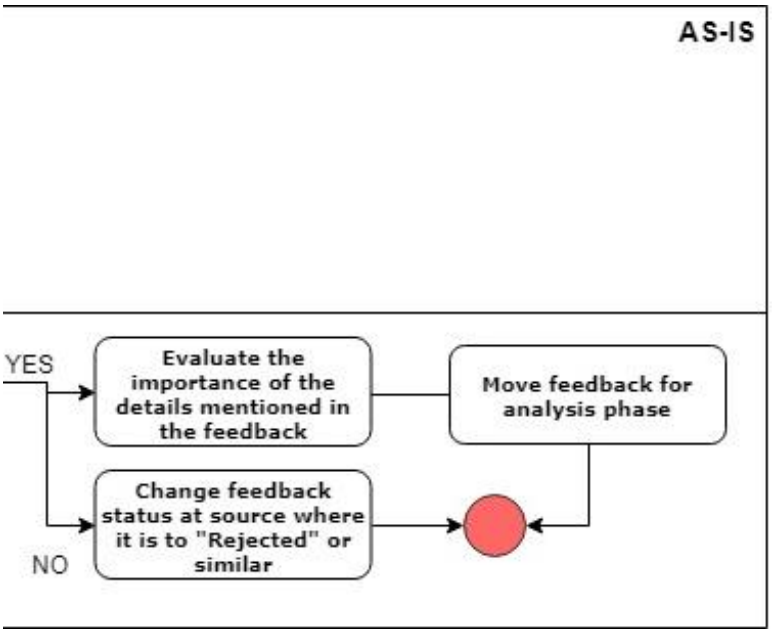


APPENDIX C: Feedback sources of E-Goi

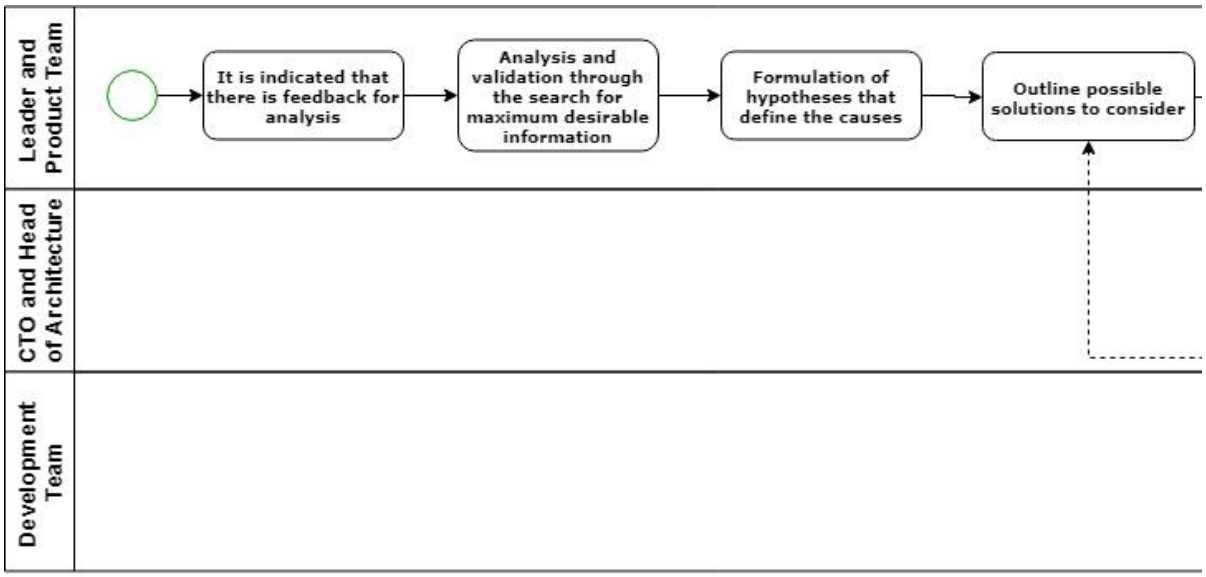


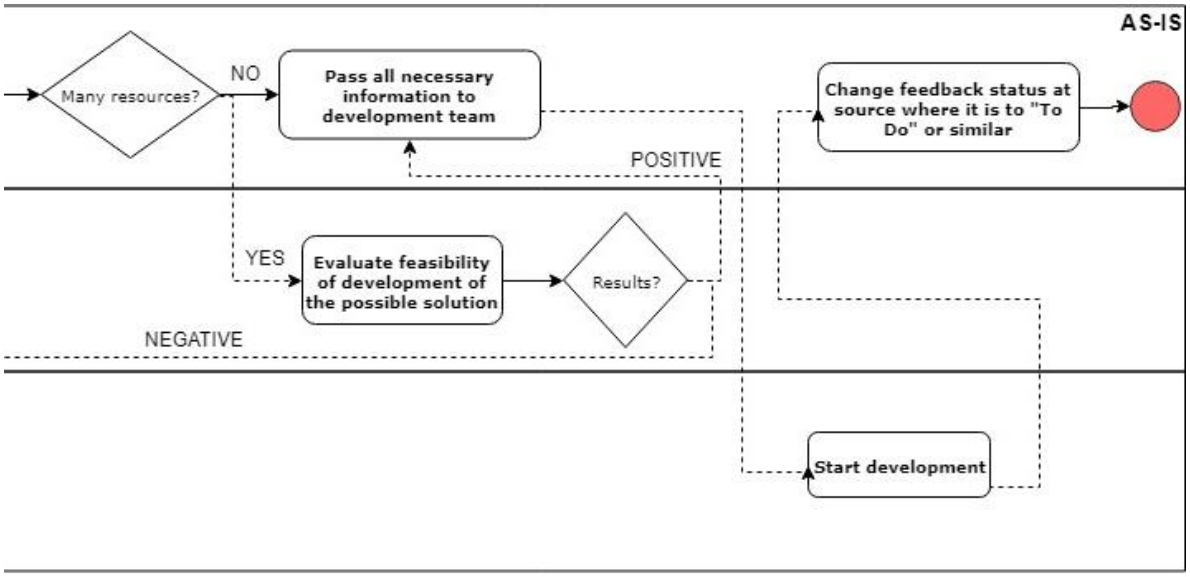
APPENDIX D: Swimlane representative of feedback collection AS-IS





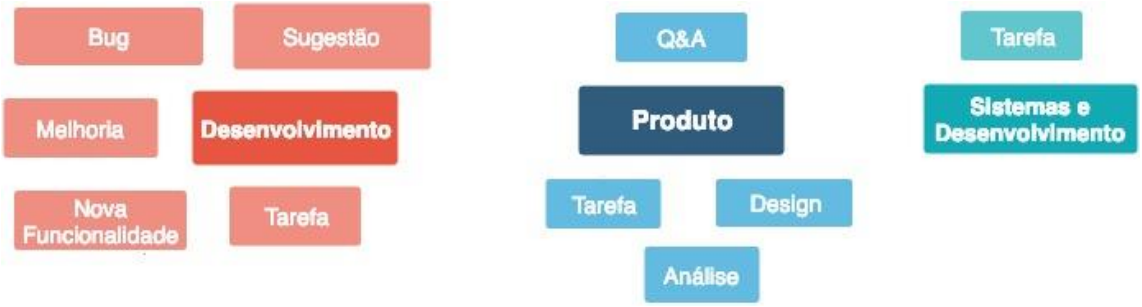
APPENDIX E: Swimlane representative of feedback analysis AS-IS



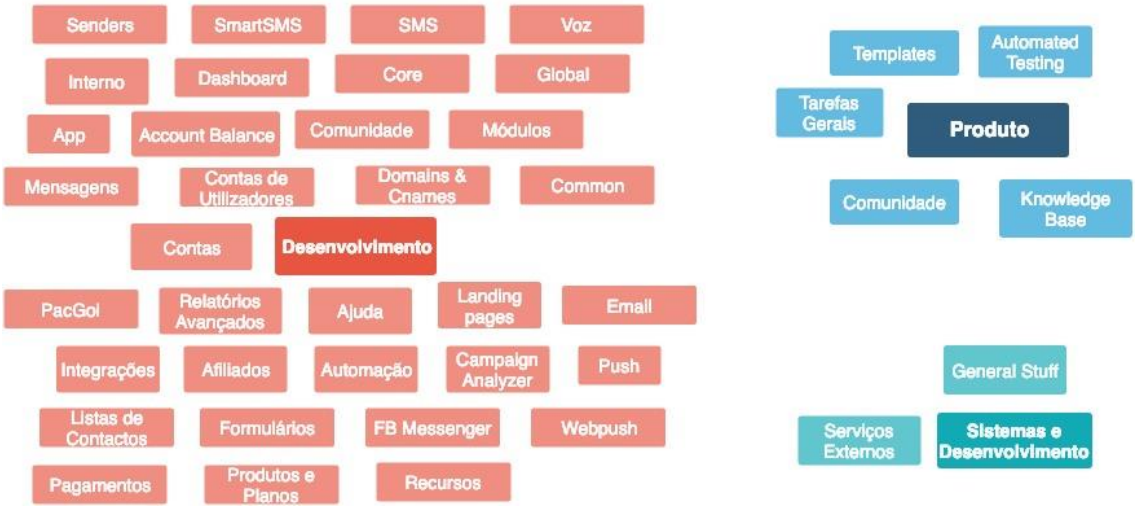


APPENDIX F: Types and categories of issues in E-Goi's Jira

Types of issues that can be selected in Jira:



Categories of issues that can be selected in Jira:



APPENDIX G: Number of interactions of E-Goi's sources of feedback

- Number of interactions with Chatgoi

	# Interactions	Variation	# Useful
Aug 18	3035		1383
Sep 18	2592	-17,09%	1181
Oct 18	2787	7,00%	1189
Nov 18	2512	-10,95%	1019
Dec 18	2008	-25,10%	793
Jan 19	2611	23,09%	1087
TOTAL	15545	N/A	6652

Notes: The "useful" factor represents the percentage of users who interacted with Chatgoi and, after being presented with explanatory results from the knowledge base, replied that the articles submitted were useful; In this analysis, only single interactions were counted (deleting the duplicates through the algorithm I created for this purpose).

- Number of issues created in Jira

	Development	Product	Systems
Aug 18	221	20	199
Sep 18	256	33	242
Oct 18	314	49	378
Nov 18	234	33	522
Dec 18	154	18	488
Jan 19	149	34	500
TOTAL	1329	187	2329

- Number of tickets created, and related issues (bugs and improvements) created

	# Created tickets	# Bug issues created	# Improvement issues created
Aug 18	9464	36	13
Sep 18	8265	56	11
Oct 18	10763	58	16
Nov 18	11760	34	9
Dec 18	12008	30	8
Jan 19	12339	44	4
TOTAL	64599	258	61

Note: In the Helpdesk source, it's possible to see how many interactions result in improvement actions or bugs resolution on the platform.

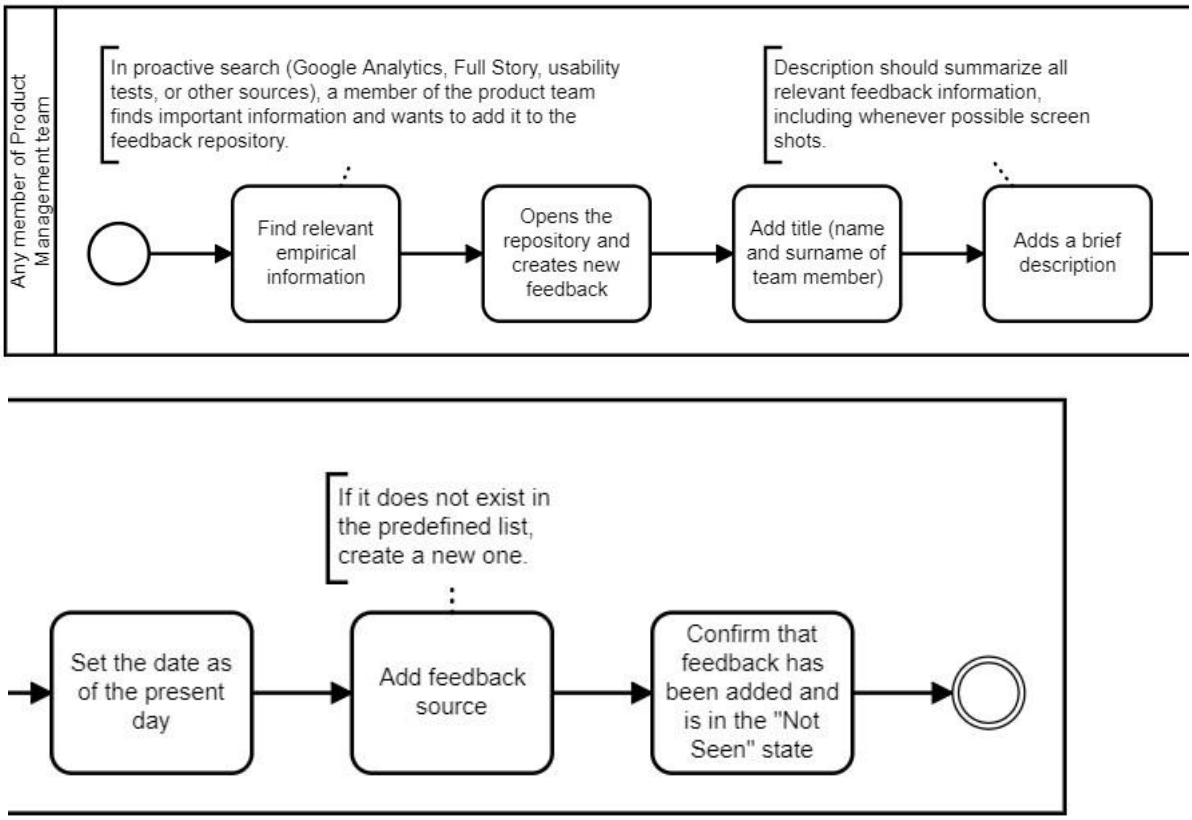
- Number of completed cancellation forms

	# Answers in PT-PT	# Answers in PT-BR	# Answers in ES	# Answers in EN
Aug 18	61	478	56	33
Sep 18	48	368	27	24
Oct 18	60	447	18	30
Nov 18	96	473	18	29
Dec 18	79	410	29	26
Jan 19	77	548	32	39
TOTAL	421	2724	32	39

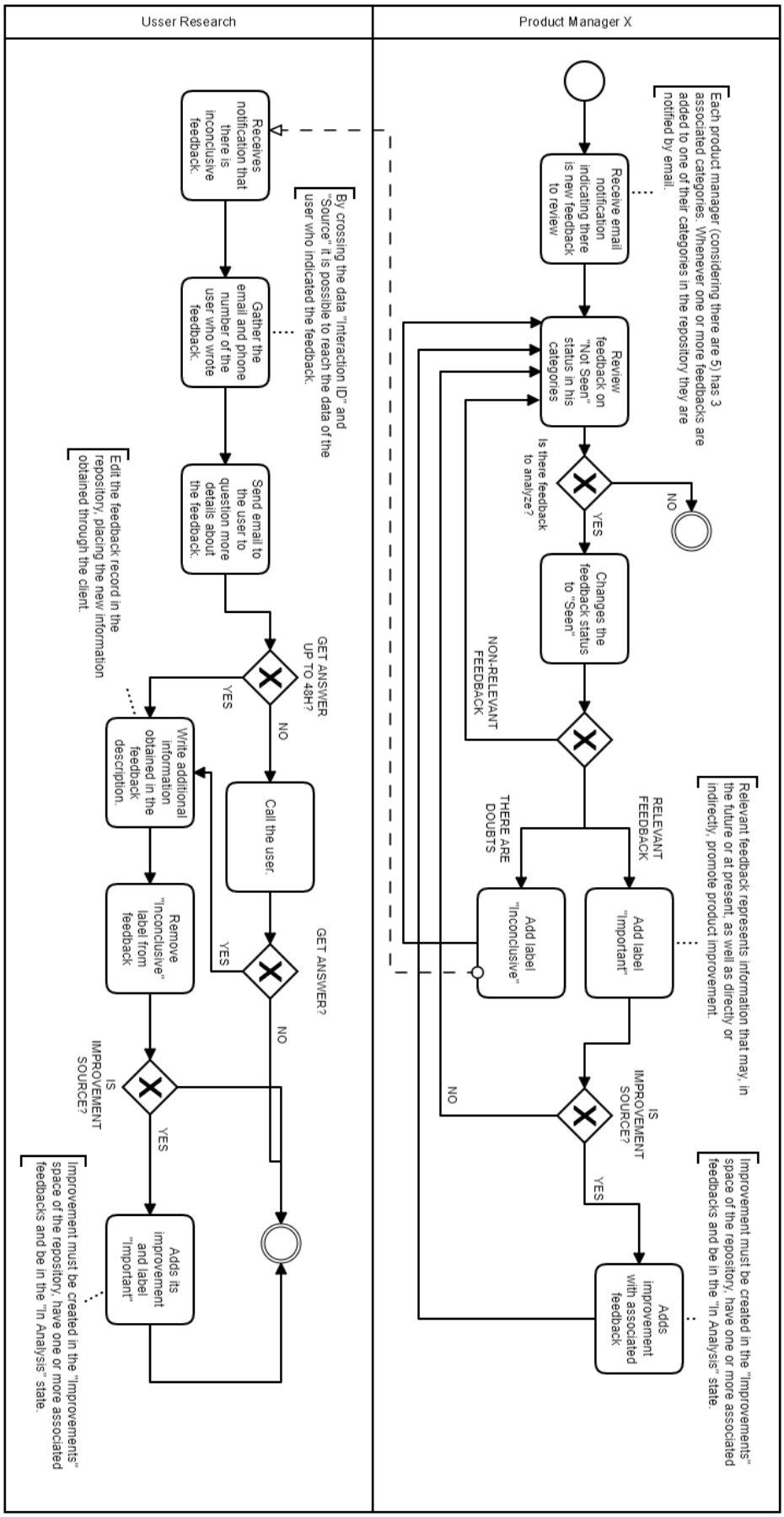
- Number of completed NPS forms

	# Answers
Aug 18	331
Sep 18	101
Oct 18	257
Nov 18	448
Dec 18	137
Jan 19	135
TOTAL	1409

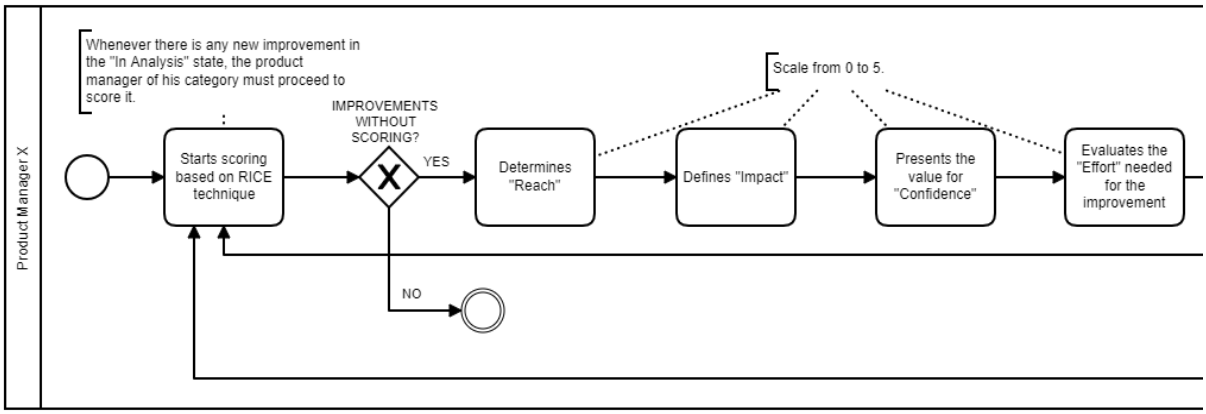
APPENDIX H: Process of manually adding feedback

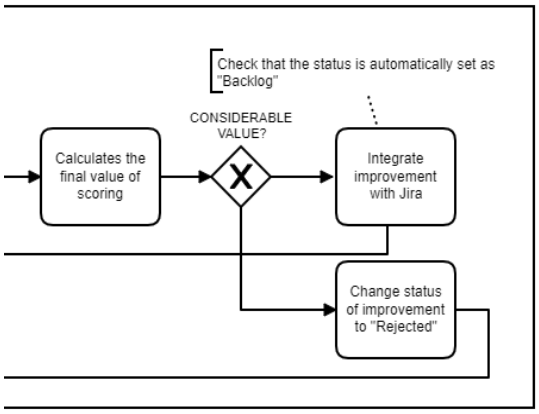


APPENDIX I: Process of feedback management in the repository

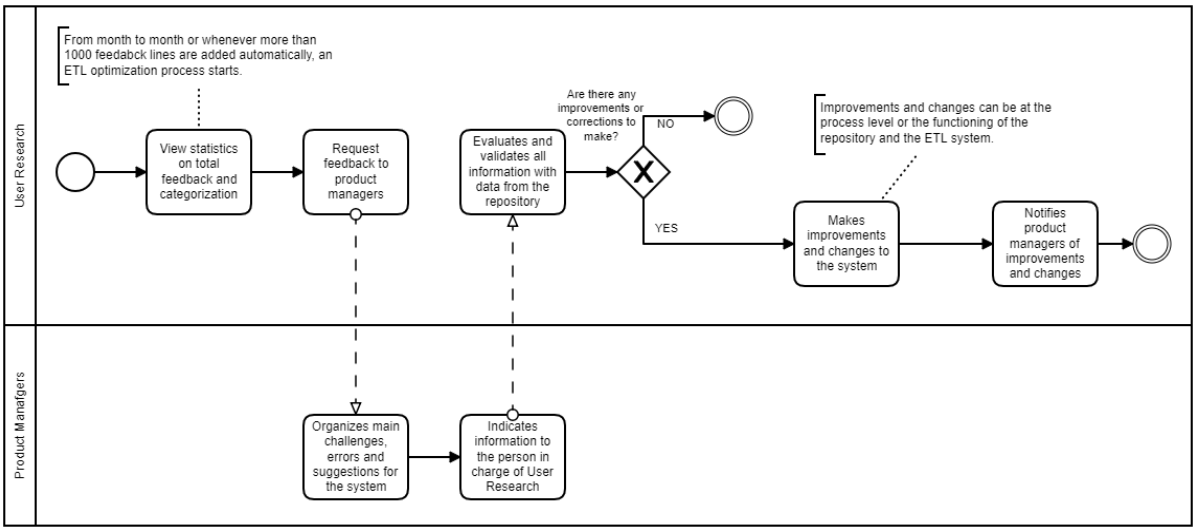


APPENDIX J: Process of improvement scoring and integration with Jira

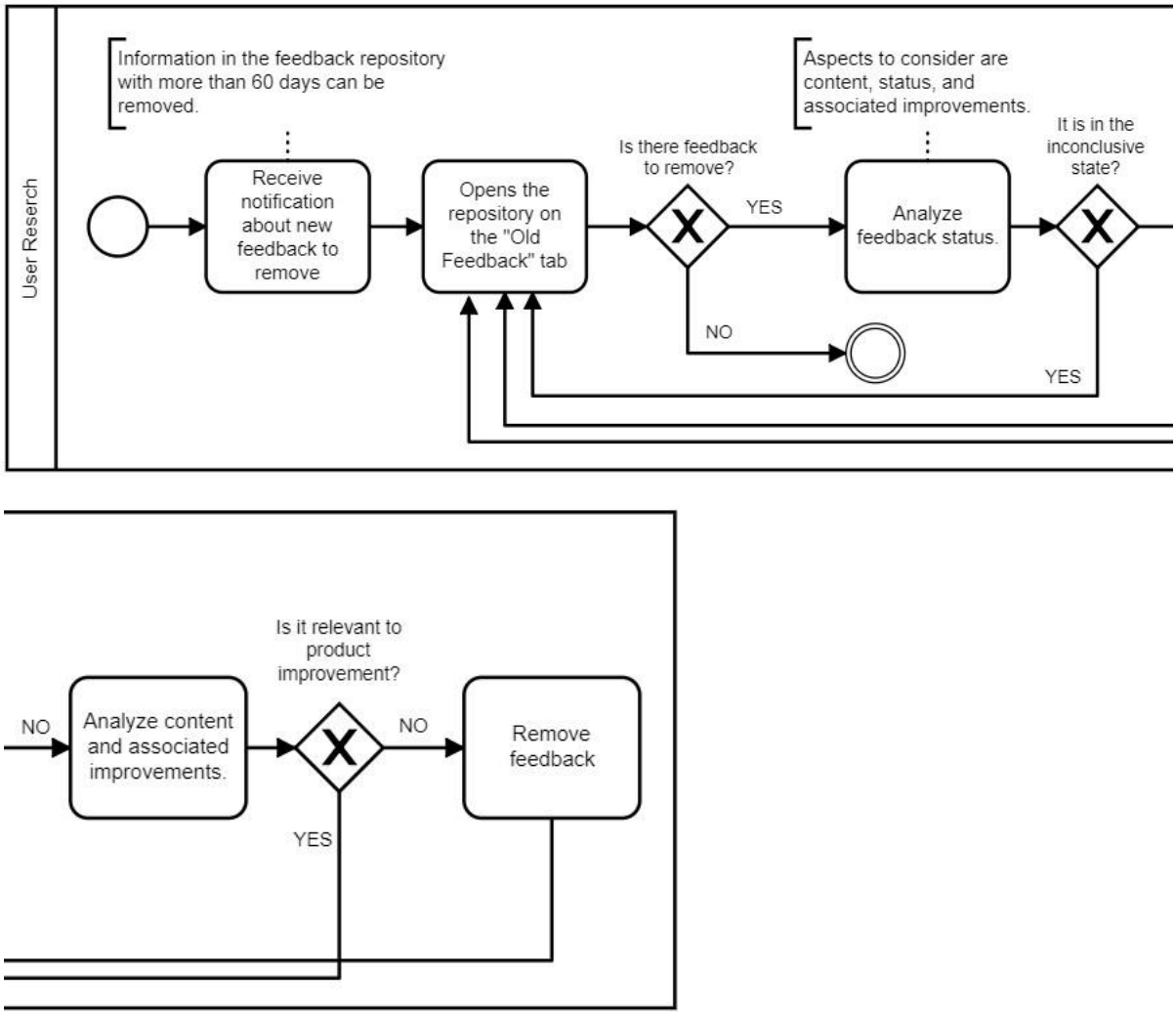




APPENDIX L: Process of optimization of the options used in the ETL process



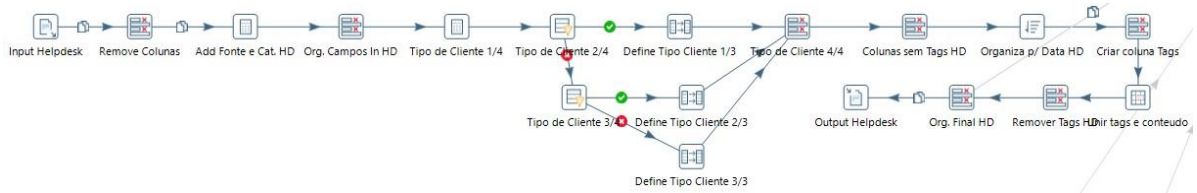
APPENDIX M: Process of removing feedback from repository



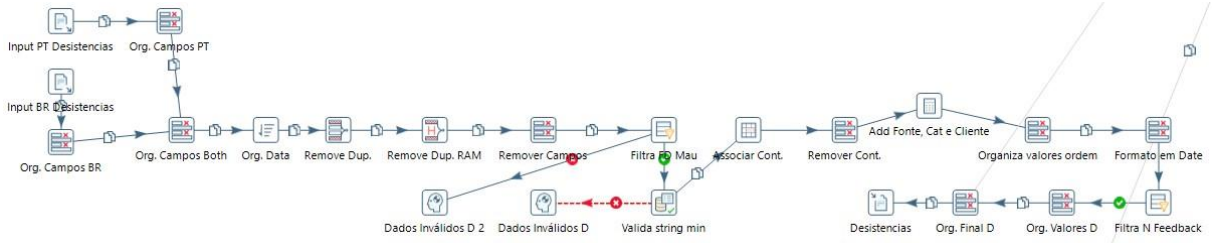
APPENDIX N: Project created in Pentaho Data Integration (ETL)

- Steps of input and transformation of E-Goi Community database

- Helpdesk database input and transformation steps

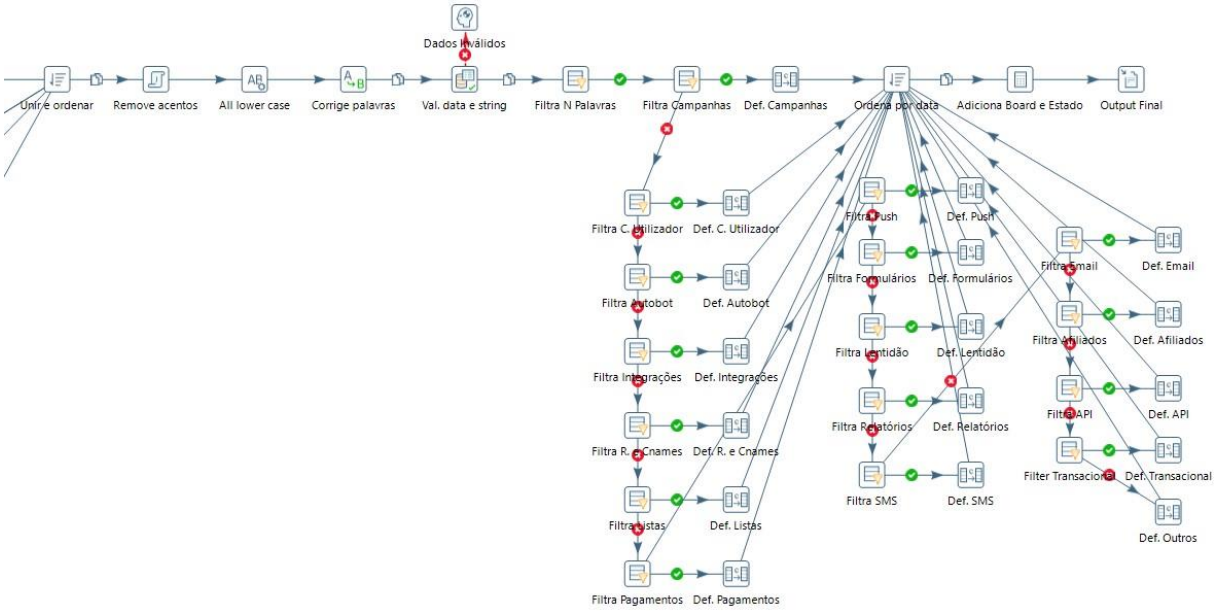


- Steps of input and transformation of database of the cancellation forms



- Steps of input and transformation of database of the NPS forms

- Steps for database merging, filtering, and categorizing feedback



APPENDIX O: POC Feedback extraction to CSV files