

A Software Tool for Gamifying ITIL Processes

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Abstract

The difficulty in adopting good practices defined in the Information Technology Infrastructure Library (ITIL) for the provision of services by employees has been a challenge for companies to solve. The employees' low motivation has effects on the quality and performance of the services provided. We propose the use of a gamification solution to try to motivate users, by integrating the actions carried out within the ITIL processes with the defined activity loops and feedback offered in order to increase their interest and performance in complying with ITIL best practices. The chosen research methodology to guide this work was the Design Science Research. The demonstration was carried out by the development of the proposed gamification solution as an app for Jira Service Desk, which is based on XGamify. The evaluation was done using both Experimental and Analytical methods. Usability tests were performed and allowed us to evaluate the tool Interface. A critical analysis was performed as well, using the feedback retrieved from technicians and the users who tested our application. We conclude that the developed software tool integrates gamification with ITIL, being easy to use and having the potential to help technicians in the daily tasks.

Keywords

ITIL, Service Desk, Gamification, Motivation, Adoption, Jira Service Desk.

Resumo

Um desafio presente a ser resolvido pelas empresas tem sido a dificuldade em adotar as boas práticas definidas no ITIL para uma boa prestação de serviços pelos seus funcionários. A baixa motivação dos funcionários tem efeitos na qualidade e desempenho dos serviços prestados. Propomos o uso de uma solução de gamificação para tentar motivar os técnicos, integrando as ações realizadas dos processos ITIL com os loops de atividade e o feedback oferecido, tendo como objetivo aumentar o seu interesse e desempenho no cumprimento das melhores práticas do ITIL. A metodologia de investigação escolhida para orientar este trabalho foi a Design Science Research. A demonstração foi feita através do desenvolvimento da solução de gamificação proposta como uma aplicação para o Jira Service Desk, tendo como base o XGamify. A avaliação foi feita usando métodos Experimentais e Analíticos. Foram realizados testes de usabilidade que nos permitiram avaliar a interface da aplicação desenvolvida. Testes de usabilidade foram realizados e nos permitiram avaliar a interface da ferramenta. Foi também realizada uma análise crítica, tendo em conta o feedback obtido dos técnicos e dos utilizadores que testaram nossa aplicação. Conclui-se que a ferramenta de software desenvolvida consegue integrar gamificação com ITIL, sendo de fácil utilização e com potencial para auxiliar os técnicos nas suas tarefas diárias.

Palavras Chave

ITIL, Service Desk, Gamificação, Motivação, Adoção, Jira Service Desk.

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Acronyms

BPM	Business Process Management
DSR	Design Science Research
DSRM	Design Science Research Methodology
IT	Information Technology
ITIL	Information Technology Infrastructure Library
ITSM	Information Technology Service Management
KPIs	Key Performance Indicators
PBL	Points, Badges and Leaderboards
SDT	Self-Determination Theory
SLA	Service Level Agreement
SUS	System Usability Scale
XP	Experience Points

1

Introduction

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Information Technology Service Management (ITSM) has a significant importance in nowadays companies. It allows to control and manage the Information Technology (IT) services provided to customers, ensuring the correct use of resources and the quality of services provided.

Information Technology Infrastructure Library (ITIL) is a framework that defines a set of good practices that companies' employees should follow, containing information about the various activities and processes in order to provide quality and efficient service delivery [3]. However, a challenge found is related to the lack of these practices adoption, which are often rooted on employees' lack of motivation, leading to a weaker performance in the services provided [4,5]. It is important for a company to provide high-quality services, to remain competitive, efficient and satisfy their customers. Thus, it is crucial to change employees' behaviour in order to comply with the defined good practices and to improve the performance of the activities of the ITIL processes.

In order to address the problem of non-adoption of ITIL practices, gamification was the approach chosen. Gamification is one possible way to motivate users to follow the ITIL processes and feel engaged in performing their activities. Gamification is a popular approach that consists of using game elements in other non-game contexts to motivate people and engage them in their activities in order to achieve their goals [6,7].

Our main objective is to develop a solution for gamifying ITIL processes. Our proposal is a gamification solution which provides the means for users involved in the processes to receive feedback and to feel progress when performing their tasks. We will follow the gamification design framework introduced by Werbach and Hunter [2] in order to design the gamification solution.

To demonstrate the proposal, a software tool was developed based on XGamify as an app for the Jira Service Desk. The gamification elements (components as badges and points, as well as mechanics such as feedback) were implemented and integrated with the ITIL tools already available in Jira Service Desk.

The evaluation was done using both Experimental and Analytical methods. Usability tests were performed and allowed us to evaluate the tool Interface. Users were asked to perform tasks in the system and a simulation was prepared in an organized and artificial environment. To assess the solution usability, users also answered a System Usability Scale (SUS) questionnaire after performing the tasks.

In order to communicate the research, a paper has been submitted and another one is being finished for submission. In the first one, the authors present a literature review of gamification for ITIL. The second consists of an exposé of the identified research problem, the proposed solution and the obtained results.

1.1 Research Methodology

In order to conduct this research, several Design Science Research (DSR) approaches were studied [8], being Design Science Research Methodology (DSRM) the process followed since it synthesizes prior literature on the topic. Hevner *et al.* [9] described guidelines to direct and evaluate a good design-science research. They state that “design science is inherently a problem solving process” [9] and through the creation and application of an artefact (being either constructs, models, methods or instantiations), it is possible to understand the problem and its solution.

DSRM is an iterative process, hence we will use a process model composed by six activities. [1]

1. **Problem Identification and Motivation:** Specify the research problem and explain the importance of a solution. The problem should be atomized for the solution to capture its complexity. The definition of the problem will be used to develop the artefact that will provide a solution for the proposed problem. Also, the definition of the problem motivates the researcher and the audience to pursue the solution and to accept the obtained results.
2. **Define the Objectives for a Solution:** “Identified problems do not necessarily translate directly into objectives for the artefact because the process of design is necessarily one of partial and incremental solutions.” [1] Therefore, after the problem definition, there is the need to specify the objectives for a solution. These can be quantitative or qualitative and imply knowing the state of the problem and the analysis of existing solutions.
3. **Design and Development:** Define the desired artefact’s functionalities and its architecture, followed by its creation.
4. **Demonstration:** Clearly show that the idea works and the artefact can be used to solve the stated problem. This can be demonstrated by the use of the artefact in experimentation, simulation, case study, proof, or other appropriate activity.
5. **Evaluation:** Evaluate the created artefact, by observing and measuring how well it supports the solution to the problem. Compare the objectives of a solution to the results observed from the use of the artefact in the *Demonstration*. This comparison can be done through the use of different metric and analysis techniques. The results obtained can be used to improve the effectiveness of the artefact.
6. **Communication:** Communicate the problem, its importance and the artefact’s utility and effectiveness.

The approach we use is problem-centred, which is the basis of a nominal sequence, starting with activity one. In Figure Figure 1.1 we adapted the DSRM process model to our research and, as we

can see, after the *Evaluation* phase it is possible to re-iterate over the *Design and Development* phase allowing improvements in the artefact. Peffers *et al.* [1] adds that “the nature of the research venue may dictate whether such iteration is feasible or not.” In the *Communication* phase it is also possible to point out feasible improvements, leaving it to subsequent projects.

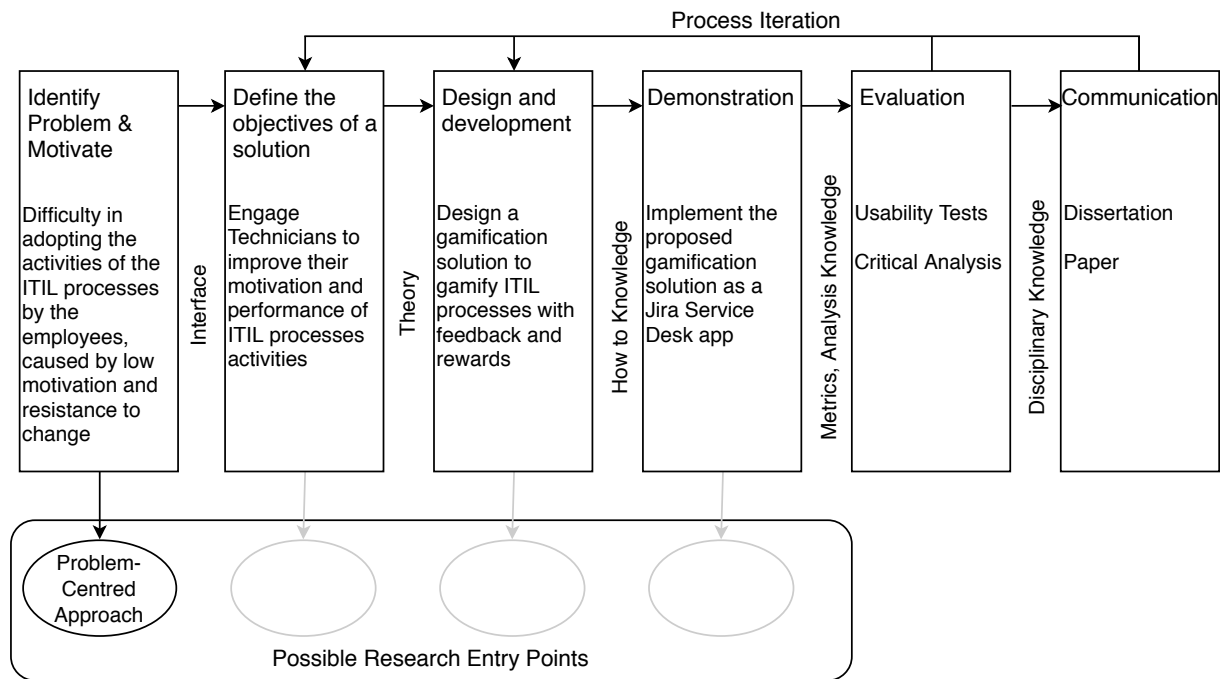


Figure 1.1: DSRM Process for this research work (adapted from [1])

The DSRM had an impact on the structure of the document created and on the way the research was carried out.

This thesis is organized as follows: Section 1.2 exposes the research problem identified and this master’s thesis motivation. In Chapter 2 a theoretical background is presented, containing a clarification of the most important concepts for the report. This is followed by the related work regarding the scope of this research, presented in Chapter 3. Chapter 4 comprises the proposed solution following a design framework, demonstrated and evaluated in Chapter 5 and Chapter 6 respectively. Finally, in Chapter 7 we conclude the document with a research overview, some limitations and future work to be addressed concerning the gamification solution.

1.2 Research Problem

According to the problem-centred approach of DSRM, a research must be started with the *Problem Identification and Motivation* activity. Therefore, in this section, we begin by providing some theoretical concepts, followed by the identification of the problem.

In recent years, with the exponential rising of IT, the boundaries between traditional technology (i.e. hardware and software) and business are becoming increasingly diffuse. To cope with this, ITSM strategies have emerged. These strategies focus on covering issues related to people, processes, and infrastructure technology to manage the quality of IT services and align them with business needs.

ITIL v3 is one of the most widely accepted ITSM framework, consisting of a set of documents that provide guidance and best practices for managing an organization's IT services [3, 10–13].

However, and despite ITIL's proven benefits, many organizations do not succeed when it comes to adopt the ITIL processes and fail to follow the proposed best practices [4]. It is not easy to implement ITIL [14], mainly due to the organizational culture change that such initiatives imply [5]. These challenges can be partially explained by employees' resistance to follow ITIL best practices [15].

The faced problem is **the difficulty in adopting ITIL processes in companies, mainly due to the lack of motivation and resistance to change by companies' employees.**

Since this can seriously disturb the functioning of a company, in the following chapters we will analyze the theory described in ITIL, as well as study if gamification can help addressing the problem.

2

Theoretical Background

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In this chapter we introduce the literature review of the subjects in this thesis context. It helps understanding some theoretical concepts related with ITIL and gamification.

2.1 ITIL

ITIL is an acknowledged and widely used ITSM framework. ITIL is a set of documents providing guidance and best practices for implementing ITSM in organizations, including the processes and facilities to support service management.

ITIL was created more than 20 years ago by the United Kingdom Office of Government Commerce, evolving and changing "its breadth and depth as technologies and business practices have developed" [3]. ISO/IEC 20000 is the formal and universal standard for the ITSM, allowing organizations to be audited and certified. ITIL is useful because it offers a body of knowledge convenient for achieving that standard [3].

The success of ITIL is due to the fact that it describes good practices that allow organizations to provide benefits to customers, obtain return on investment and reach success. When adopted, ITIL enables organizations to:

- Offer services that create value for customers, thus improving customer relationships;
- Integrate the strategy for services with the business strategy and customer needs;
- Make constant analysis, monitoring and optimization of IT services as well as the performance and costs of service providers;
- Adopt standard approaches to service management across the entire enterprise;
- Change organizational culture in order to achieve the defined success criteria.

ITIL has been evolving throughout these years and the current version (ITIL v3) is a process-based framework which provides a service lifecycle. This lifecycle emphasizes the importance of coordinating and controls the various functions, processes and systems of the IT services. It considers the strategy, design, transition, operation and continual improvement of IT services, being these the five phases of ITIL and divided into a set of five publications:

- **Service Strategy:** provides guidance on how to design, develop, and implement ITSM as a strategic asset that can better serve customers. It also describes in detail the processes and activities crucial for effective service strategy which are: strategy management for IT services, service portfolio management, financial management for IT services, demand management and business relationship management [10];

- **Service Design:** has the goal of designing new services, along with changes and improvements to existing ones. The key processes supporting service design are: design coordination, service catalogue management, service level management, availability management, capacity management, IT service continuity management, information security management and supplier management [11];
- **Service Transition:** a phase where new or changed services are transitioned into operations. The processes and activities on which service transition depends are: transition planning and supporting, change management, service asset and configuration management, release and deployment management, service validation and testing, change evaluation and knowledge management [12];
- **Service Operation:** this phase focus on the daily activities and infrastructures used to deliver services. The processes and activities crucial for effective service operation are: event management, incident management, request fulfilment, problem management and access management [3];
- **Continual Service Improvement:** this publication helps organizations measuring the IT service provider performance and improve the efficiency and effectiveness of IT processes and services [13];

These phases are iterative, but do not have a fixed implementation order. Organizations do usually adapt and implement these guidelines so that they are aligned with their particular needs and reality.

Service desk is a concept used in ITIL that represents a single point of contact for customers (users) to communicate and coordinate with service providers (technicians). The service desk is the primary point of contact for users when there is a service disruption, for service requests, or even for some categories of change requests, being useful for several IT groups and processes [3, 12]. Usually, ITIL uses a concept named Service Level Agreement (SLA) at Service Level to help measuring if a certain service is being delivered correctly and helping the organization to deliver on their promises.

In short, we realize that ITIL is something complex, recommending good practices for the services provided. However, as seen before in section 1.2, companies still fail to adopt it, mainly to the lack of motivation and resistance to change by companies' employees. This being said, one possible way to solve the employees' motivation is the usage of gamification. Hence, we will study it in the next section.

2.2 Gamification

Some of the problems associated with people's lack of motivation or engagement have been addressed by using game concepts and their distinct way of thinking about challenges. Although the use of these techniques and the way of thinking are not something new, they have been associated to a more recent term that is 'gamification' [16].

The definition of gamification given by Deterding *et al.* is “the use of game design elements in non-game contexts” [6]. Burke added that its use was to “engage and motivate people to achieve their goals” [7], providing a whole different user experience.

Gamification aims at making activities related to real-world problems and goals rewarding for themselves, thus creating incentives without incurring into high costs.

Despite being related to gaming, gamified systems are not full-fledge; they just use parts of games in an already existing process [6].

Game elements are the building blocks for creating a game. Werbach and Hunter [2] propose a list of game elements divided into three categories:

- **dynamics**, representing the highest level of abstraction of a gamification solution (*e.g.* progression);
- **mechanics**, processes that engage the users (*e.g.* feedback);
- **components**, concrete forms that dynamics and mechanics can take (*e.g.* badges).

When playing games, players feel appealed and engaged. However, the focus of gamification is not *playfulness* but rather the *gamefulness*. *Play* is associated with the gameplay, unpredictable actions and free behaviours followed by the players, while *gamefulness* observes and identifies the games' structure, constituted by the rules, objectives and competition associated with the determination to achieve them [6, 17].

Gamification is usually associated with a concept called Points, Badges and Leaderboards (PBL) that represents three game elements that are usually applied in gamification systems. Werbach and Hunter [2] did a research on over a hundred implementations of gamification, noticing that those three elements were very common. They concluded that, when used right, PBL are powerful, practical, and relevant.

Points allow users to keep a score, these are collected usually through tasks performed and work to motivate those players who like to collect things.

Badges are usually a visually representation of an achievement. They motivate users by providing information of reached goals or by providing a guidance for users to know what has to be done in order to reach achievements.

Leaderboards give context to the progression of each user. One can compare his results with others. This can motivate people to try to reach more and want to overtake those who are ahead of them looking to carry out their activities in order to get more points. However, this can lead them to perform the activities hastily, reducing their quality and only for the purpose of obtaining punctuation. There is still another situation when a person feels that he can not reach the top of the leaderboard and becomes unmotivated. Thus, leaderboards can be dangerous and should be applied carefully.

In short, gamification allows to understand the game components responsible for those behaviours and apply this knowledge to improve different contexts.

2.2.1 Motivation

So far, we have seen that gamification can be used to motivate a person. However, it is not something that is implemented overnight or without thinking carefully. Its implementation should take several aspects into account, especially those that focus on users' behaviour.

Ryan and Deci [18] stated that "to be motivated means to be moved to do something." They also added that "a person who feels no impetus or inspiration to act is thus characterized as unmotivated, whereas someone who is energized or activated toward an end is considered motivated." This concept is further extended with the understanding that there are two kinds of motivation, intrinsic and extrinsic.

Gamification aims to increase players' intrinsic motivation, i.e. doing the activities because they want to, instead of feeling pressured. Sometimes users will encounter repetitive and tedious tasks, so it may be necessary to use other methods to motivate them, such as extrinsic rewards. Extrinsic motivation can go through a simple addition of experience that shows each user's progress to the point of rewarding them for their work.

To better understand people and how to change their behaviour, Deci and Ryan [19] created the Self-Determination Theory (SDT) that says that in order to understand human motivation, it is required a consideration of innate psychological needs for competence, autonomy and relatedness.

Competence is also known as mastery and concerns the capability of dealing with the external environments efficiently. Autonomy is the inherent capacity of feeling in control of your own life, so that your actions have meaning and are aligned with your own values. Relatedness has to do with interaction with other people and the desire to compare one's results with others, feeling the ability to distinguish themselves positively.

When a task activates one or more of these innate human needs, it tends to be intrinsically motivating, in other words, regardless of the context, it will be interesting, fun, and people will do it willingly. [2]

Having an idea on what motivates people in performing their tasks, it is necessary to understand what can be done to contribute to that motivation and how the use of gamification complements this.

Werbach and Hunter [2] defined the usage of activity cycles when addressing gamification. Activity cycles are generally used to keep a user engaged in the tasks he has to perform. There are two types of activity loops: engagement loops and progression loops.

Engagement loops are used for the individual user action, concerning, at a micro level, what the users do, why they do it and what the gamification system response is. Figure 2.1 illustrates the activity cycle related to the engagement loops and the idea goes through a logical cycle consisting of three phases. The user performs an action to accomplish a goal. Then, a feedback will be given informing

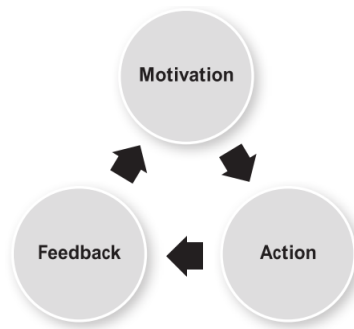


Figure 2.1: Activity Cycle (taken from [2])

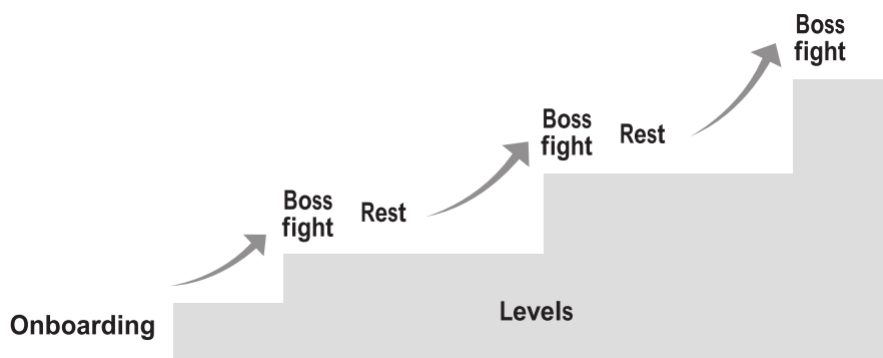


Figure 2.2: Progression Stairs (taken from [2])

that the action was accomplished which will be a motivating factor. When motivated, the user will take an action to overcome a possible challenge.

Progression loops, also known as progression stairs, take into account the user’s progress, analysing its journey at a macro level. The idea behind is to create a bigger context to users, where their daily activities contribute to a major challenge. Figure 2.2 illustrates an example of progression stairs and, as we can see, the concepts come very closely to games where players’ progress is incremental and translate into smaller steps with some major challenges at the end of each segment. In a gamified system, this “Boss fight” concept can be seen as a context related challenge that defies players sufficiently to feel a rewarding-like sense of pride and accomplishment. After this step, when looking back, players have a feeling of competence which motivates them to reach further.

2.2.2 Gamification Design Framework

Gamification is not an exact science. Werbach and Hunter [2] refer to it as a “fusion of art and science”, involving both emotional concepts such as fun, play and user experience, as well as engineered measures and sustainable systems to serve concrete business objectives.

Due to the possible complexity in the adoption of gamification, the creation of a gamification solution

must follow a development process. Thus, it was necessary to study several possible methods and frameworks that already exist.

Mora *et al.* [20] made a literature review on several gamification design frameworks, categorizing them according to the academic background, whether the scope encompassed the complete gamification processes or focused on a specific step and if the approach was designed for a generic environment or specific to a certain business context. This study allowed us to do an analysis on each framework features and check its completeness. The authors found that the best-known and complete gamification design framework is the one introduced by Werbach and Hunter which is presented in six steps. First, (I) the business objectives are defined, understanding the goals of the gamified solution. Then, (II) the target behaviours are delineated. The next step includes (III) the description of the players (those who will use the solution), allowing to understand their needs and possible motivators. Then, (IV) the activity loops are devised, (V) taking the fun element into consideration. Finally, (VI) the gamification solution is deployed with the appropriate tools [2].

3

Related Work

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So far there has been some research that relates gamification with ITIL and its best practices. In this chapter we introduce related work on the subjects in this thesis context. It helps understanding some previously done experiences and study advantages and drawbacks on using gamification together with the ITIL best practices.

3.1 Gamification in ITIL

Some authors have attempted to improve ITIL implementation and adoption with gamification, whose works are worth analysing. Thus, in this section we explain some of the work done in the area of gamification applied to ITIL

Raflesia and Surendro designed a conceptual framework integrating ITIL with gamification to build, implement, and maintain a productive service support with fully engaged employees [21]. This framework is based both on a gamification framework design created by the authors (to develop game mechanics for a service system) and the Service Life Cycle Development, a seven-stepped approach to manage service application.

The proposed framework starts with the assessment of the feasibility of implementing a gamified service. If the solution is feasible, the service support state and the users are analysed, and the gamification contents and rules are designed. After presenting the design and its validation, the solution is implemented. Finally, the system is monitored and evaluated to ensure that it is running properly.

Following this, the authors developed ELROND, a gamified service desk system for improving workers' motivation and service quality, which implements the incident management process [22]. The solution has a score system based on redeemable points that increase or decrease based on the urgency level and the time of completion of a closed incident, and Experience Points (XP), which are always given, since all actions increase service desk operators' experience. These points can be seen by all users in a leaderboard and in the user's profile.

Players are characterized in the first login, where users must fill a pop-up questionnaire to know their user type (based on Marczewski model [23]). This allows the system to present users with the gamification elements most likely to motivate them. These elements are presented after closing an incident and calculate the points. Badges are given based on redeemable points, while virtual goods, exclusive and unlockable content, social status, and quests emerge based on XP value. This creates a competitive environment, where service desk operators are rewarded accordingly to their performance.

The proposal was evaluated during one week on a governmental enterprise in Indonesia that had slow response for incident handling. The authors concluded that ELROND helped to increase engagement, motivation, and productivity of service desk operators in the organization.

Orta *et al.* presented a method for gamifying the incident management process, based on ITIL best

practices and Werbach and Hunter's gamification framework [24].

The method proposes that ITIL's Critical Success Factors and the Key Performance Indicators (KPIs) supporting them can translate the business goals, while the ITIL process' activities can be helpful in determining target behaviours. The authors suggest that players should be characterized according to service management teams' organizations, and using data from sources like interviews or measurements of actual professionals' behaviour.

The authors describe an example of use for a hypothetical case study, where several game elements are used to try to solve the problems identified in the hypothetical organization. Future work includes the method's definition and implementation in real organizations to gather data that allows improvements. Additionally, the authors propose the development of a method for other ITSM processes.

In another work, the same authors proposed a conceptual framework to motivate IT managers to perform model simulations, to allow them to make better decisions and improve ITSM processes [25]. The framework starts with the identification of the process to be improved, including its resources, inputs/outputs, KPIs and Service Level Objectives. Afterwards, the simulation model is built, and subsequently the gamification solution is implemented following the gamification framework proposed by Werbach and Hunter [2]. The authors exemplify the application of the framework with a case study linked with the capacity management process. However, this is just a conceptual application, as the tool was not really implemented nor evaluated.

Brito *et al.* proposed a learning approach for IT Service Transition that blends gamification with Business Process Management (BPM) concepts, intended to ease learning and usage of ITIL's Service Transition processes [26]. Using the solution, which was built as an extension of a BPM tool, professionals win points for performing their tasks within deadlines, progress through levels (which are represented with badges), and might win unexpected bonus awards. This competition environment is enhanced with a global leaderboard.

A case study was conducted with a team of four people working in a small Brazilian software development company, which was migrating a sales support IT service from Palm OS to Android devices. Preliminary results show that the team was able to learn and operate faster and more effectively with the gamification solution, suggesting that gamification can indeed make learning and working more effective and efficient in IT Service Transition.

Conceição *et al.* investigated the feasibility of combining gamification and ITIL in Service Desk to both attenuate the impacts caused by its implementation in an organization and improve the incident treatment quality [27].

Consequently, the authors argue that ITSM quality can be improved and propose an initial model for gamifying the incident management process in Service Desk. When an incident is created, the solution identifies the skills required to solve it, and instantly assigns a Service Desk operator to work on the

incident (*i.e.*, incidents are assigned depending on the operator's level).

Operators can collaborate to solve incidents that demand more and diverse skills. After solving an incident and closing the correspondent ticket, a reward is given to the operator based on the incident's difficulty and relevance. Rewards can take the form of points, badges, or levels, for example. This information is presented in rankings, where operators can compare their performance with his/her co-workers, thus boosting competition. All this is intended to create a more interesting and engaging environment, where incidents can be faced as challenges and opportunities to work on skills, which in turn might improve implementation of ITIL best practices in an organization. However, this is a subjective model, with no game elements proposed.

To support the hypothesis of the investigation, a survey was conducted with eight Service Desk operators in a Brazilian public organization. Respondents were found to have a positive predisposition to face challenges, with the majority understanding the importance of following ITIL best practices. The authors conclude that some evidence exists to support the feasibility of combining gamification and ITIL best practices to improve ITSM quality on Service Desk, keeping in mind that the game rules and goals must be correlated with each aspect of ITIL.

Jääntti and Kallinen conducted a study to understand how to improve service desk employees' motivation and rewarding [28]. The 25 interviews conducted with service desk employees of a Finnish service desk organization revealed that workers are motivated by factors such as positive feedback, personal development, problem solving, and challenges. On the other hand, lack of personal feedback, inconsistent work practices, process bottlenecks, and routine works (which can be automated) are likely to demotivate these workers.

Based on this analysis, the authors propose a systematic procedure for compliment handling and rewarding, consisting on having service desk workers complimenting colleagues, an action that is translated with rewards. The proposal was evaluated in the organization, resulting in a set of recommendations for implementing this procedure.

3.1.1 Commercial Solutions that support Gamification in ITIL


There are some available solutions that cover ITIL processes while applying gamification techniques. Most of these commercial solutions focus on the ITIL Service Operation phase, being incident management the process that is mostly implemented. This might be explained by the fact that it is the process that offers the most immediate and major costs reduction and quality improvements [29].

Service Now developed an ITSM cloud-based platform¹ that simplifies the way work gets done and supports some ITIL processes. Innovise ESM (now Engage ESM²) developed a solution for gamifying

¹Service Now: <https://www.servicenow.com/products/it-service-management.html> (Accessed on 14-10-2018)

²Engage ESM: <http://www.engage-esm.com/> (Accessed on 14-10-2018)

The screenshot shows a web-based form for creating an achievement. At the top, there's a title bar with a back arrow, the text 'Achievement', a red indicator for a 'Required field', and buttons for 'Update', 'Delete', and a refresh icon. The form fields are as follows:

- Name:** Ring The Alarm!
- Active:**
- Table:** Incident [incident]
- Icon:** [Update] [Delete] 
- Description:** Congrats! You just escalated your first Priority 1 Incident. Make sure you invoke the Major Incident Process!
- Trigger Condition:**
 - Impact is 1 - High
 - and Urgency is 1 - High
- Count Required to Unlock:** 1
- Experience Points:** 10,000

At the bottom, there are 'Update' and 'Delete' buttons.

Figure 3.1: Achievement creation form in Innovise’s “Engage” tool for Service Now
 Screenshot taken from the solution demonstration video available at: <https://youtu.be/LWHjHg03dUY> (Accessed on 14-10-2018)

the Service Now ITSM tool. An organization can fully customize a set of achievements (whose creation form is presented in Figure 3.1), which provide immediate positive feedback, that in turn should reinforce target behaviours and increase performance. A progress bar indicates how far a user is from unlocking an achievement, a moment when users receive points and a badge that visually represents the achievement. Users can see their achievements in a portal, which is a separate website, not integrated in ServiceNow. Additionally, users can compare their performance with all players through a leaderboard, or can decide to compare their profile with one opponent.

Collab developed a gamification solution for OneContact³, the company’s contact centre solution. Organizations can fully customize the game elements available for their workers. By unlocking quests, challenges, and achievements, employees receive XP, which can be traded for rewards. Employees can also compare their performance with their peers in the leaderboard. With this, organizations are able to create a healthy competition among contact centre agents and other departments. Although it is not focused on any specific ITIL process, it might result in an improvement in the service quality of the contact centre. Figure 3.2 shows a prototype of the gamification dashboard where users can check their progress, statistics among other elements.

InvGate is an ITSM software vendor that developed a gamified service desk solution⁴. Organizations can configure the XP given for performing behaviours linked with the request fulfilment and incident management processes, or might create new and more complex quests, which can have time limits. Afterwards, users can use points to redeem virtual or tangible rewards. In Figure 3.3, the user profile displays information about the active quests, including their progress and the points and badges they are

³Collab gamification: <https://www.collab.com/en/onecontact-gamification/> (Accessed on 14-10-2018)

⁴InvGate Service Desk gamification: <https://www.invgate.com/service-desk/gamification/> (Accessed on 14-10-2018)



Figure 3.2: Collab user's dashboard

Screenshot taken from Collab gamification portal available at: <https://www.collab.com/g/> (Accessed on 14-10-2018)

worth. The solution's goal is to improve individual and team motivation and productivity through healthy competition, with the ultimate goal of improving performance and service delivery.

RedCrittter Connector⁵ is a gamification platform for adding gamification to organizations' business processes. This platform has an integration for ZenDesk⁶, allowing organizations to reinforce behaviours linked with the ITIL processes supported by the tool. Organizations can configure the achievements that are worth points, reward points (a virtual currency for the solution), and badges. Users can evolve through skills, compare their performance in leaderboards, and receive positive and immediate feedback for every action (as displayed in Figure 3.4). Also, there is a virtual store where users can redeem virtual goods using the reward points earned. This healthy competition is intended to help increasing procedure adherence, among other more specific goals. However, although game elements are linked with actions rooted in ZenDesk, they are only presented in RedCrittter Connector.

GamEffective developed a solution for an organization to promote the adoption of BMC Remedy by their employees [30]. To increase the number of useful produced articles, a gamification solution was implemented rooted on the narrative of building a city. The more articles produced, the more assets (like buildings) the city had. If those articles were useful, they contributed more to the city growth. This story-line was complemented with individual and team challenges, reminders to use the app or for milestones, and performance feedback, including comparison with colleagues or past results. GameEffective stated that this solution increased the usage rate, with players creating twice more articles than employees not playing the game.

⁵RedCrittter Connector: <https://redcrittterconnector.com/> (Accessed on 14-10-2018)

⁶Zendesks: <https://www.zendesks.com> (Accessed on 14-10-2018)

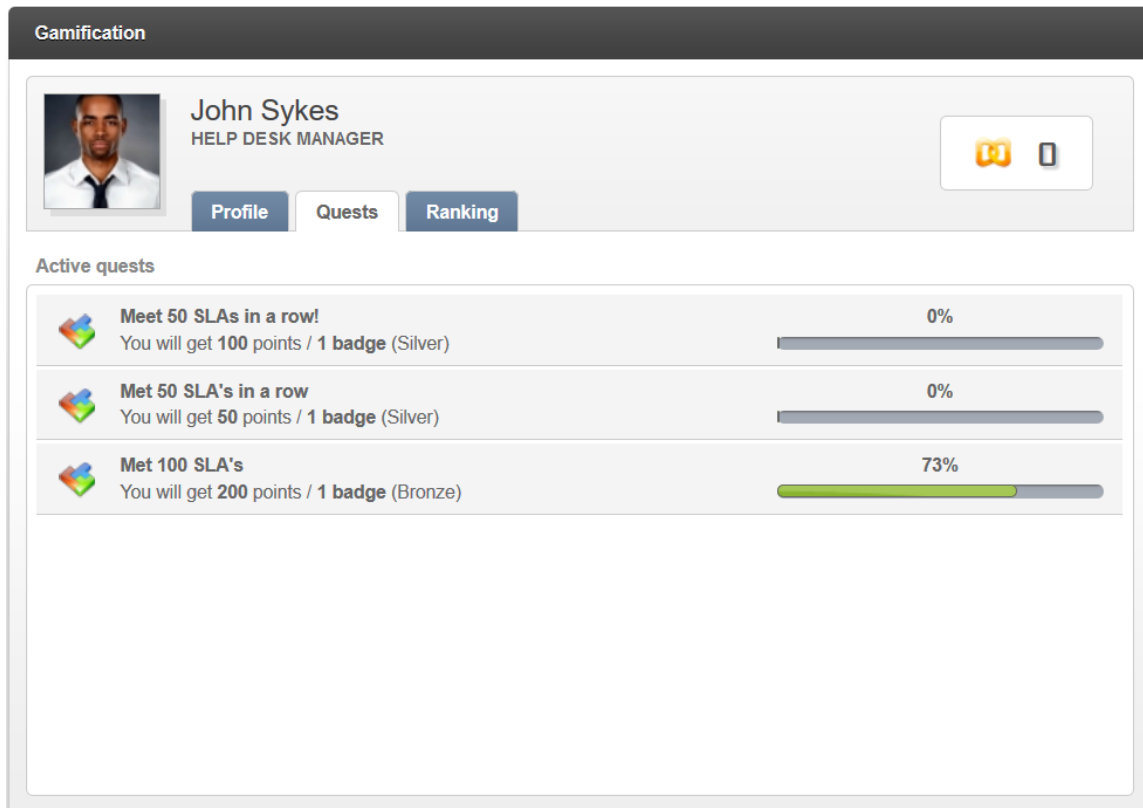


Figure 3.3: InvGate user's profile, including information about his/her active quests

Screenshot taken from a solution demonstration available at: <https://www.invgate.com/service-desk/other-capabilities/> (Accessed on 14-10-2018)

The Tables 3.1 and 3.2 present a summary of the ITIL processes that were focused on the commercial solutions analysed and the used game elements, respectively.

3.2 XGamify

Marques *et al.* [31], through the use of semi-structured interviews, studied failures in Portuguese companies during the software development process, mapping these against the existent literature and identifying possible sources of problems.

In a later study, Costa [32] defined one of the main problems as being the software development process workers' lack of motivation and commitment, deciding to develop a software tool where gamification would be used on the Scrum projects, with the goal of raising teams' engagement, and motivation to adopt the Scrum methodology. XGamify is an app for Jira Software⁷ (a software development tool used by agile teams) where gamification techniques and elements were used to promote the adoption of

⁷Jira Software: <https://www.atlassian.com/software/jira> (Accessed on 14-10-2018)



Figure 3.4: RedCrittter Connector's feedback messages for actions performed in ZenDesk
 Screenshot taken from: <https://redcrittterconnector.com/solutions/zendesk> (Accessed on 14-10-2018)

Table 3.1: ITIL Processes covered by the analysed Commercial Solutions

Commercial Solution	ITIL Processes				
	Incident Management	Problem Management	Request Fulfilment	Change Management	Knowledge Management
Engage's ServiceNow add-on	X				
Collab Gamification Solution					
InvGate Service Desk	X		X		
RedCrittter Integration for ZenDesk	X	X	X	X	
GamEffective solution for BMC Remedy					X

good practices among teams. Each user has XP that is earned every time a specific action is performed and allows users to achieve new levels, becoming more experienced as they do their activities. This progress can be viewed through a dashboard that was created, alongside with users' effort, productivity and contribution for a specific Sprint. This tool was used in a Portuguese company and allowed to evaluate the results based on obtained metrics and interviews. It was concluded that the usage of the gamification app was a positive experience and that the company employees would continue to use it. It also allowed to receive feedback in order to keep improving it.

Table 3.2: Game Elements covered by the analysed Commercial Solutions

Commercial Solution	Game Elements									
	Experience Points	Badges	Achievements	Leaderboards	Feedback	Progress Bar	Rewards	Challenges/ Quests	Levels	Virtual Currency/ Goods
Engage's ServiceNow add-on	X	X	X	X	X	X				
Collab Gamification Solution	X		X	X			X	X		
InvGate Service Desk	X						X	X		
RedCrittter Integration for ZenDesk	X	X	X	X	X		X		X	X
GamEffective solution for BMC Remedy					X			X		

3.3 Discussion

As seen, gamification, when applied correctly, follows its purpose and helps to motivate people when they carry out their activities. However, we have seen that it is necessary to implement gamification cautiously as it may not meet the expected objectives. To avoid this, the use of a framework is recommended. Of the various existing frameworks, the one defined by Werbach and Hunter [2] is the most complete and used.

From the related work analysed it was possible to observe software implementations and conceptual models used to approach the ITIL processes together with the use of gamification. Almost all the work presented is conceptual or a definition of a possible solution, not having much information about its execution and conclusions. Although the results presented and the interviews were based on a small sample or performed in a short period of time, there were no specific problems pointed out, proving that an improvement can be observed after the introduction of gamification.

The solutions presented are specific to each case and there is no generic solution that meets the needs of the various ITIL processes. Thus, it is necessary to take into account the various solutions and their success factors observed in the related work. Of the works presented, generally the Service Transition and the Service Operation lifecycles are the main phases approached. In three of these solutions the incident management process is covered, while the request fulfilment is covered in two solutions as seen in table 3.1. This might be explained by the fact that incident management is the process that of-

fers the most immediate and major costs reduction and quality improvements [33]. Other ITIL processes covered include problem management, change management, and knowledge management.

The game elements are summarized in table 3.2, most solutions attribute points for performing good behaviours, while providing performance feedback. Leaderboards and competition are two other game elements widely applied in these solutions.

In addition, the various solutions only addressed the support technicians, not considering the users who have a key role in the processes when registering tickets in the system nor with the interaction between their activities. This is relevant and interesting to think about when designing a solution.

Therefore, based on related work, it will be possible to take good examples into account, avoid making certain mistakes when defining a gamification proposal for ITIL and try to address existing gaps.

4

Proposal

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This chapter approaches both the objectives definition and the design and development steps of DSRM. We will identify the proposal objectives and explain how it can solve the problem mentioned in section 1.2.

4.1 Objectives

The main objective of this proposal is to **develop a solution for gamifying ITIL processes**, allowing technicians to comply more with ITIL best practices using gamification methods.

Another objective is the understanding of existing and desired behaviours, providing feedback in order to align with ITIL good practices in a fun and engaging way that will motivate players intrinsically to properly perform their activities. We will have in mind the importance to improve their performance while they feel motivated to do a good job and improve service quality.

Having said this, we will follow the gamification design framework described in section 2.2.2 to solve our problem. This choice was based on the literature and because this framework is the most used and detailed.

4.2 Design and Development

In order to achieve the previously mentioned objectives and to solve the identified problem, we propose the development of an artefact that allows to improve the adoption of good ITIL practices.

As identified in section 1.2, ITIL is not easily implemented and often the target good practices are not followed because people lack motivation to change their behaviour and perform well. Since ITIL is a good approach to improve the organization's operations and services, it is desired that people are motivated and that they comply with the defined practices.

To cope with this, we propose the **development of a gamification solution that provides technicians with feedback based on their behaviours and actions, allowing to record metrics associated with the actions performed in the solution related to ITIL processes.**

In order to develop a gamification solution suitable for ITIL processes, it is necessary to do more than just choose some game elements or do what might be fun for the players. Hence, we decided to use the gamification design framework introduced by Werbach and Hunter [2] and apply the six steps into our context to guide our work.

The following sub-sections will describe the application of those steps, delineating a generic gamification solution for the ITIL processes used in the service desk. Simultaneously, we will present the application of the proposal in the chosen processes.

In addition to the research done on the topic, we collaborated with a Bank (Company A) and an

IT service management company (Company B). This collaboration helped us understand beyond the theory of ITIL and the related work described in Chapter 3 since it allowed us to engage in a real environment. Both companies contributed in some way to some decisions taken. Although the solution is designed to be generic and focused on ITIL processes, having the knowledge input of the culture and the daily users' tasks was very helpful to elaborate the solution specifications.

The contributions and ideas were taken from a set of meetings over many months where we were able to discuss the solution requirements and features, as well as how the ITIL processes and services were being implemented in both companies.

First, a project was being carried out in Company A that aimed at getting the company's employees to use the Jira Service Desk, following ITIL good practices, and later to integrate a gamification solution. Due to this, it was possible to work with a team of IT managers and service providers for six months. We presented our gamification solution proposal, began its implementation and did a demonstration throughout the development. It was not possible to integrate the gamification platform in the company in order to obtain data to analyse and compare results before and after the gamification solution.

Later in Company B, it was possible to follow the same approach, having meetings with a team where the business solutions director was present, as well as the responsible for the IT service providers, and presenting our gamification solution for feedback. Because Company B did not use the latest version of Jira Service Desk, it was not possible to integrate our solution.

However, a different evaluation approach was followed. The evaluation methods applied to the artifact created were first Experimental and later Analytical, and is explained in detail in chapter 6.

4.2.1 Define Business Objectives

In order to build an efficient gamification solution, we must define clearly the goals we want to achieve. The main business objective for our solution is to increase technicians' adherence and motivation to comply with ITIL best practices.

The proposed gamification solution will focus on certain ITIL processes of two of the lifecycle phases introduced in section 2.1, these being Service Operation and Service Transition, since these depend strongly on service desk. The idea is to increase the use of the service desk and in turn comply with the good practices of ITIL. Thus, the defined objectives revolve around the service desk and the technicians responsible for providing the services.

Based on the analysis of the research problem and related work, a set of objectives for our gamification solution were defined:

- Increase the quality of service provided by technicians, increasing customer relationship;
- Decrease the time taken by technicians to provide the service;

- Improve the technicians compliance with the SLA defined in the organization;
- Track provided services by technicians, as well as the correct usage of the service desk by users, keeping both technicians and users informed of their performance.

At some point in the development, other set of objectives came across. However, due to reasons that we will explain are not part of the gamification solution.

Company A was facing a problem concerning the interaction between users (the ones who request services) and technicians (the ones responsible for providing the service and finding a solution to the user's request). They wanted the gamification solution to also be used by users who create issues, so the following possible objectives were defined: (I) Prevent users from going personally to technicians or make phone calls, communicating through the service desk; (II) Improve the quality of the tickets created by users in the service desk, providing detailed information; (III) Reduce the number of unnecessary tickets, i.e. those that refer to something that can be resolved without assistance from a technician (e.g. can be resolved following an already defined step-by-step guide);

Analysing this set of goals, we realized that the way in which they could be achieved relied heavily on rewarding users for creating issues in the application. This is problematic for the gamification solution because, as McGonigal [17] mentioned, a user may become focused on “*playfulness*” instead of “*gamefulness*”. This would likely lead to an increase in the number of issues created in the service desk, some of them unnecessary rather than a meaningful and real issue.

Thus, these objectives will not be taken into account in the design of the gamification solution.

4.2.2 Delineate Target Behaviours

In order to achieve the defined objectives, desired behaviours must be defined for the technicians. The gamification solution will support these behaviours and allow to analyse the performance of the players (technicians) and keep improving the solution design. These behaviours will be controlled through the use of defined metrics.

We want players to use the gamification solution while performing their daily tasks, and for this we need them to be motivated and performing well. They are required to provide good quality services, resolving tickets raised by users within defined metrics defined on the system. ITIL practices propose a set of KPIs for each process, which are the most important metrics that can be measured to actively manage and report a process, IT service or activity. Therefore, when choosing which processes are desired to be targeted, their metrics are taken into consideration and used to help delineate the target behaviours. The four chosen processes are Incident Management, Request Fulfilment and Problem Management from the Service Operation lifecycle, and Change Management from the Service Transition lifecycle, due to their usage of service desk. Taking into account the ITIL metrics for each process, we

extracted the desired behaviours that are presented in the table A.1 in the Appendix A.

We also expect users to try to perform better (concerning their KPIs) and one way to do it is by creating a competitive environment. Company B proposed that technicians should be able to compare their performance with their colleagues when it comes to the gamification solution.

4.2.3 Describe your Players

McGonigal [17] defends the idea that reality is broken, explaining that games, contrary to reality, offer something meaningful to players that life does not when it comes to self-motivation and confidence. In this step, we try to understand the gamification solution' players and discover what drives their motivation.

SDT suggests that the human organisms tend to engage in interesting activities when feeling encouraged and one way to provoke this encouragement is through positive feedback that enhances intrinsic motivation. This feedback is important to boost users' motivation and engagement, allowing them to perform better and feel encouraged to do their work. Another way is based on the idea of challenges, constant creation of interests and novelties in their routine [19].

It is possible to adapt this idea to the reality of our players and see how it is possible to meet their needs.

Players are technicians who have to deal with issues on a daily basis and provide quality services. This can be an exhaustive work so the gamification solution should be transparent and motivating.

Service desk technicians are likely motivated by better and frequent individual feedback; empowering and engaging in decision-making; personal development and careful career planning; and challenging tasks that can break the routine [28].

4.2.4 Devise your Activity Loops

As seen before, technicians are expected to perform their tasks quickly and efficiently because their actions affect the business operations of a company and the relationship with customers. In order to get players to behave as expected, it is necessary to define activity loops that allow an action to trigger a series of activities and behaviours from the solution.

As previously said, there are engagement loops and progression loops. First it is desired to implement an engagement loop, where actions performed are acknowledged by the solution and a feedback is given to the user. Every time a user does an action that produces value or it is important in the ITIL processes context, some way of feedback will be presented, showing users that they are performing a good job. Besides, users are given some kind of reward based on the performed action and will be motivated to keep doing a good job. The way to provide feedback and rewards must be related with

specific game elements and activities.

In the long term, it will be possible for the users to see all their actions performed and what has to be done to achieve new levels. This is part of the progression loops where users' levels represent their expertise and badges are the challenges they are aiming at. Here we are already talking about examples of tools and game elements that will be desired to go alongside the activity loops.

Typically, activity cycles tend to contribute to the evolution of the player and track the activities that the player performs correctly. However, together with both companies, it was decided that it would also be presented feedback when users do not perform their activities within stipulated metrics. Thus, it is also important to show feedback to the technicians so that they can improve.

Table A.2 contains a mapping that allows us to analyse for each of the process metrics, which gamification elements are more adequate. Here we are interested in seeing feedback that is directly linked to the activity loops.

4.2.5 *Don't forget the Fun*

The idea behind a gamified solution is to have players participating voluntarily. Players should have fun when using the solution in such a way that they use it again without the need for extrinsic rewards. As Ryan and Deci [18] pointed out, "when intrinsically motivated a person is moved to act for the fun or challenge entailed rather than because of external prods, pressures, or rewards". This does not exclude the use of extrinsic rewards, however it is desired to have a balance in the solution between the extrinsic and intrinsic rewards.

The gamified solution should be easy for everyone, the interface should be simple and appealing. One way to increase fun alongside motivation, as said before, is the usage of activity loops. As players are motivated by overcoming challenges and receiving rewards or positive feedback for it, it is natural to feel the element of fun, enjoying the performed tasks.

4.2.6 *Deploy the Appropriate Tools*

In this step, all the analysed details must be understood and thought as the game elements and tools are chosen.

Based on the previous steps, it was possible to observe gamification components that translate into elements that will integrate into the developed system. Besides, a mapping was done between the gamification techniques to be used and the metrics obtained from the execution of the processes (observed in Table A.2 in Appendix A). In this table, we see that all the three elements presented (Badges, XP, immediate feedback and leaderboards) fit very well for the ITIL metrics. We will later see in section 5.2 what metrics will be taken into account for our solution.

A list of the main features to be in system include:

- The gamified solution must support *XP* and badges that are obtained by technicians when part of a project;
- Technicians perform their tasks, such as resolving issues, being awarded *XP*;
- Technicians must be able to visualize their performance and progress, viewing ITIL metrics such as the issues resolved within *SLA* and by reaching new *levels*;
- Players can edit their profile, choosing what *badges* to display;
- The solution must provide *feedback* to technicians. This can be through reminders, warnings or achievements unlocked;
- The solution should track players' tasks, rewarding the players with *good badges* when they perform well and *bad badges* when they are not complying with the ITIL best practices;
- Technicians can compare their progress with other users of the same team.

The proposal was implemented as a software tool and we are going to describe it in the next chapter (chapter 5), being the continuation of this step - *Deploy the Appropriate Tools*.

5

Demonstration

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As mentioned, we worked with Companies A and B to discuss ideas, which led to the solution evolving in terms of functionalities and elements. What we are going to present in this chapter is the continuation of the sixth step of the Werbach and Hunter framework [2] - *Deploy the Appropriate Tools* - started in section 4.2.6, being the implementation of the proposed solution as a software tool. First we talk about Jira Service Desk and the reasons behind its usage, followed by the solution features and the illustration of the developed software.

5.1 Jira Service Desk

There are several Service Desk applications available that assist with the ITIL Processes, such as ServiceNow¹, ZenDesk² and Jira Service Desk³. The latter, Jira Service Desk, assists the provision of services by the team of technicians and communication between these and users. It is a product provided by Atlassian which offers the ITIL-certified service desk for IT teams and users. It is highly configurable and has a primed set up which supports service request, incident, problem and change management ITIL processes.

Jira Service Desk is IT service-centred, meaning that it is focused on delivering a service to end users with some semblance of customer service. The service desk provides features such as SLA and Customer Satisfaction reporting. Jira Service Desk also allows multiple integrations. It is possible to integrate the service desk with Confluence⁴, another product provided by Atlassian, which works as a Knowledge Base and allows users to find the help they need and possible suggestions to solve their problems.

For these reasons, our solution was implemented as a Jira Service Desk app to gamify some of these processes, allowing the deployment of a gamification system into the existing environment. The decision to develop an app for Jira Service Desk is not only associated to its features, stability and strong user base. The development of the application was based on XGamify (described in section 3.2), a Jira Software app developed in the scope of software development projects using Scrum as an agile methodology. XGamify contained base elements that are similar to those we needed for our app. Since XGamify is designed to be used in a different scope, it was first necessary to create a foundation to start developing our app for the implemented ITIL processes. It was possible to reuse the XGamify database and its entities, extending the app with further ITIL components and changing the desired behaviours. Since the app was created based on the XGamify, the same name was used for the Service Desk component, being this part called 'XGamify ITIL'.

¹ServiceNow: <https://www.servicenow.com/> (Accessed on 14-10-2018)

²ZenDesk: <https://www.zendesk.co.uk/> (Accessed on 14-10-2018)

³Jira Service Desk: <https://www.atlassian.com/software/jira/service-desk> (Accessed on 14-10-2018)

⁴Confluence: <https://www.atlassian.com/software/confluence> (Accessed on 14-10-2018)

5.2 App Features

An administrator may choose to enable the app interface for each project existent in the Service Desk. When enabled, technicians can easily navigate to the gamification extension by selecting XGamify from the project sidebar (item *a* in Figure 5.1). Here they have access to all the information concerning the gamification solution.

Next, we will analyze the various gamification elements used in the application.

Users earn **XP** based on their daily activities performed. This helps recording their progress, keeping a score. **XP** is given to users and can be of two types: specific to a project or global. This allows users to have an idea of their progress on a project level and at the same time a general idea of all the projects where they are participating. Simultaneously, this **XP** is converted to a **level**. Each level corresponds to a step reached by the user, it is directly linked to the progression loops and it becomes harder to achieve as they become more experienced. Table A.3 in Appendix A has the information about the leveling system implemented, with the levels names and **XP** users must acquire to level up. Thus, whether internal to a project or in general, a user is constantly trying to reach new levels. The **XP** values were defined by us, scaling the level of difficulty to reach them. However, in order to see if they are coherent, it is necessary to validate through the use of the tool by users

In service desk, an issue is specific to each type of ITIL process, which may be an incident, a problem, a request fulfilment or a change request. Depending on the type issue, the information to be filled in its creation, the **SLAs** defined for each one and the way to solve them differs.

Regardless of the type of issue, its resolution is accounted for in a similar way. The app detects when a user resolves an issue and checks whether it has been resolved within the stipulated **SLA** (may vary depending on its type) and triggers a set of behaviours in the gamification system. If the user resolved an issue within **SLA**, the user is given 6**XP**, while resolving outside the **SLA** only gives the user 1**XP**. Here we introduce two game elements that are related with mechanisms of the application: badges and feedback.

The first game elements described are the **badges**. As mentioned in the section 4.2.6, users are eligible to earn badges for two actions: (I) Good Badges - earned when users perform well repeatedly and are used to encourage them to pursue specific milestones. When users win these kind of badges, they also receive **XP**. The greater their difficulty, the more **XP** is received. (II) Bad Badges - users must try to avoid these ones. They represent a wrong user behaviour consecutively concerning ITIL practices. With these badges, we tried to make repeated bad deeds fun. This way, the feedback is given to users, but they do not feel it in such a negative way. Table A.4 in Appendix A has a list of all the badges available. Later, in section 5.3.3 we will present how these are displayed in the developed app. The use of rewards for specific actions encourages users to pursue specific goals or to try to avoid certain behaviours.

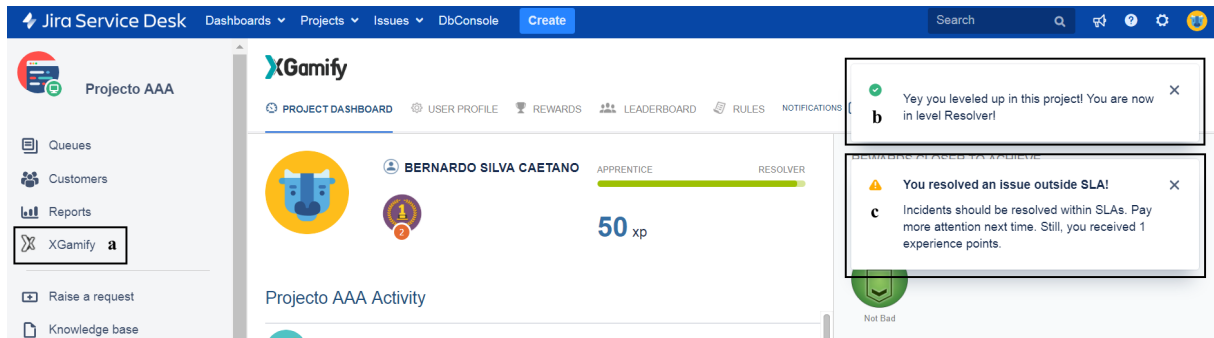


Figure 5.1: XGamify app selected in Jira Service Desk and Notification Examples

Another game element used is feedback. Based on the task performed, the user is offered feedback in the form of a **notification** in the Jira Service Desk. This notification can be of three types: (I) Success - notifying users when a desired action occurs (*e.g.* resolving an issue within SLA) or when an achievement has been unlocked (*e.g.* earn a good badge); (II) Information - reminds users of situations that are about to happen (*e.g.* close to earn certain badge); (III) Warning - Signal users when the performed action is not appropriate (*e.g.* resolve issue outside SLA or earn a bad badge). The feedback presented regularly is a gamification mechanics that helps engaging users while they perform their tasks. It consists of immediate feedback, either positive or negative, being the idea to either give motivation to keep performing well or notify them that they can perform better. Figure 5.1 contains two types of notifications, presented as item *b* and *c*. Item *b* illustrates the notification that pops up whenever a user levels up in the application, representing a notification of type *success*. Item *c* illustrates a notification of type *warning*, telling the user that he resolved an issue outside of the stipulated SLA and that he should perform better next time. Table A.5 in Appendix A contains a list of the most important notifications triggered by our app.

5.3 App Sections

The app is divided into multiple sections, allowing technicians to access information about their progress (by project or globally), check recent activities, rewards earned and possible milestones to achieve.

The choice of the color palette used throughout the application was taken with the help of guidelines⁵ defined by Atlassian and to make the integration very transparent to the users of the Service Desk.

A video⁶ was made with a demonstration of the various sections of the application, as well as a description of the various elements presented and behaviors. Further on, the implemented app sections will be described.

⁵Service Now: <https://atlassian.design/guidelines/marketing/foundations/color-usage> (Accessed on 14-10-2018)

⁶XGamify ITIL demo: <https://youtu.be/pLcBwuh5gY> (Accessed on 15-10-2018)

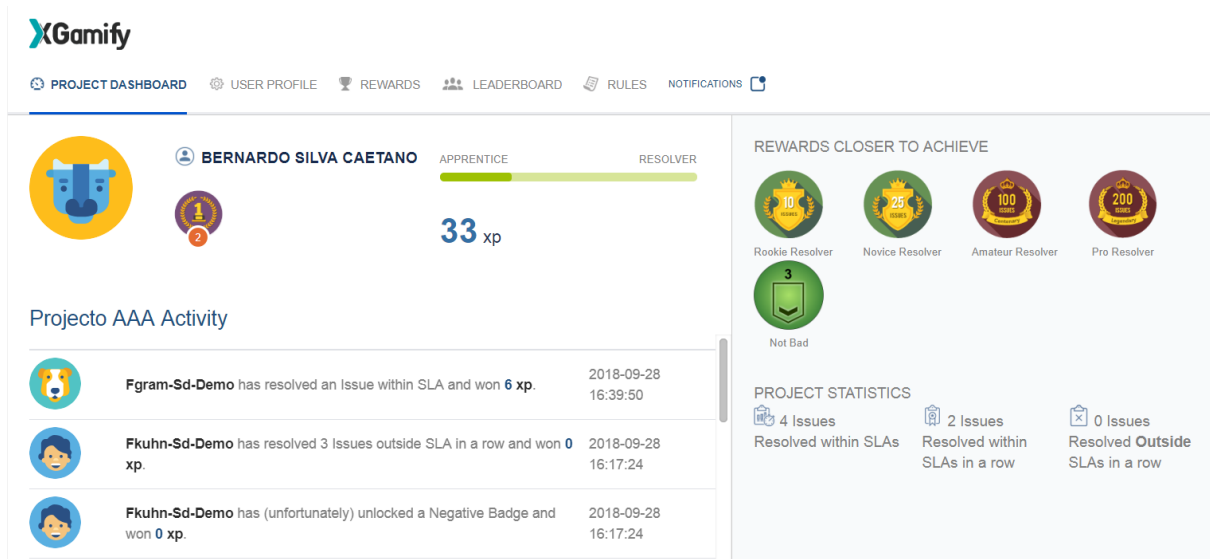


Figure 5.2: Project Dashboard section

5.3.1 Project Dashboard

This section corresponds to the first page of the app presented to the user. Project Dashboard (illustrated in 5.2) contains various user information in the current project. Users have access to their personal information such as their profile picture, name and their featured badges. Users can also observe the amount of XP and the level that they have in that specific project. A progress bar is presented so that users can have a visual idea of their progress level and evolution. Hovering it displays again the current XP and the required amount to level up.

Below that information there is a list of the activities in the actual project; users can see all of them registered in the app, whether performed by them or by other colleagues. They are presented chronologically so they can see what the most recent activity was.

On the right, rewards, that are to be unlocked, are shown. This allows users to aim for specific goals they are going to work on. In addition, project-specific metrics for the user are presented. As seen before, ITIL defines KPIs for its processes and here we display the user statistics concerning the project. Every issue resolved is tracked and a set of counters were created so that we can inform users about: (I) the total of issues resolved within SLAs; (II) the number of consecutive issues resolved within SLAs in a row (III) the number of issues resolved *outside* SLAs in a row, to avoid unwanted behaviour.

5.3.2 User Profile

This section is similar to Project Dashboard, with the difference of having information on multiple projects instead. Here, we present the total XP and level of an user, with different scales from the project levels.

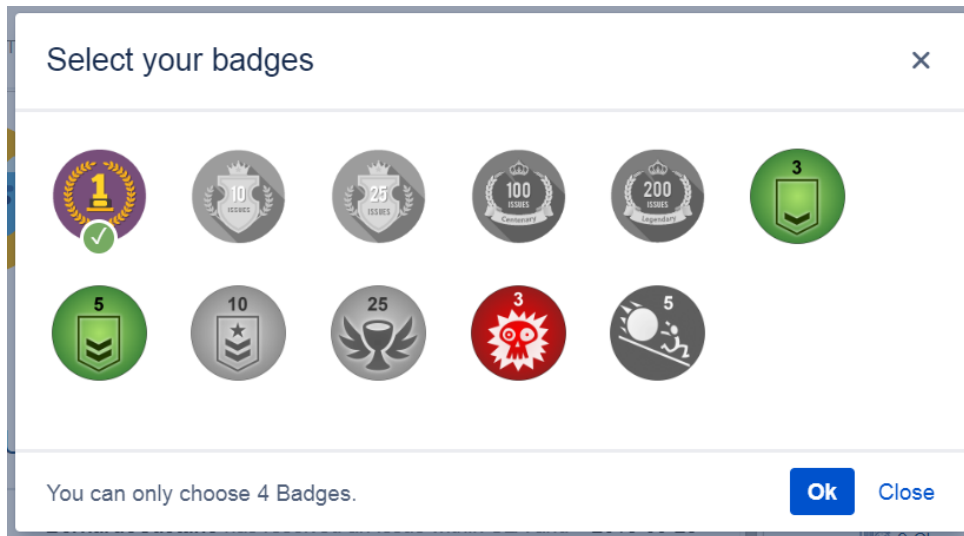


Figure 5.3: Edit badges to be displayed

Users can edit their badges, choosing the ones they want to display in their profiles (see Figure 5.3). Also, the activity feed is related to all projects the user is working on, including the associated events, sorted by the most recent. This section is displayed at Figure 5.4.

Instead of having the closest badges as the project dashboard section (described in section 5.3.1), we allow users to edit the featured projects, displaying metrics for each one of the selected ones. Besides, in order to provide users with a global view of their work, we also provide a global status area with user metrics. This information provides the user with synthesized knowledge he could not have had before since he would need to access multiple reports and Jira Service Desk sections to retrieve that information.

Again, our goal is to provide important information to the user without requiring multiple transitions to analyse it.

5.3.3 Rewards

Rewards are earned and correspond to badges that users can visualize and display to other players. In this section all the badges, achieved or not by the user, are displayed. All rewards that the user already has are normally displayed, with the right colour saturation, and with a number below indicating how many times the user has achieved that reward so far. The category *Total within SLA* is global to all projects, counting the number of issues resolved independent of the current project. The category *Within SLA in a row* is specific to each project and can only be achieved once per project. The category *Outside SLA in a row* is specific to each project as well but can be achieved multiple times, so that users take attention to the undesired behaviours. On the other side, the non-achieved badges are greyed but

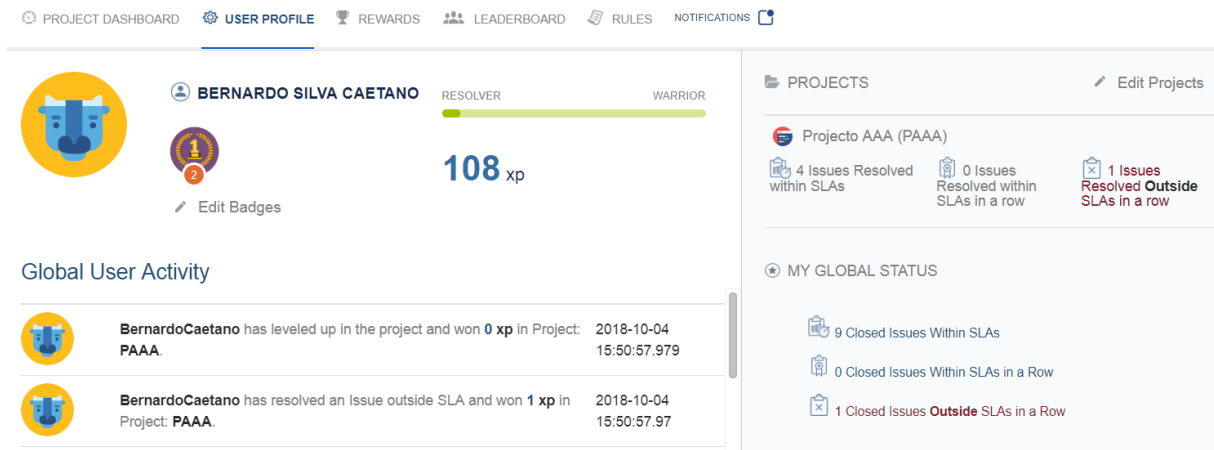


Figure 5.4: User Profile section

users can consult the conditions they must fulfill to achieve it. Description is available when the user hovers a single reward with the mouse.

Figure 5.5 illustrates the reward section. Badges are divided according to their category and subcategory. All the badges presented relate to the issue resolution category, being divided into three groups, each referring to a different sub-category. The first two relate to good badges, indicating good behaviour and therefore the use of green colour in the group header. The last, corresponding to bad badges, is in red, indicating an achievement that is not desired by users and badges that users must avoid obtaining.

The choice of colours took in consideration the guidelines from Atlassian. They describe that red is rarely used because it can have a negative connotation. Since that is precisely what we desire from the bad badges, it helps warning the users that those badges represent something they should try to avoid. While green corresponds to a vibrant colour and that stands out, its usage shows the user the good badges. Green is also complementary to red, hence another reason for its usage.

As seen before, table A.4 in Appendix A has a list of all the badges in the app.

5.3.4 Leaderboard

In Jira Service Desk, technicians are associated to teams that might change from project to project. For that reason, it is important for users to be able to compare their performance with others’.

In this section, illustrated in Figure 5.6, the team members are displayed with available information such as the user profile picture, his/her name and progression elements (XP, featured badges and featured projects).

Rewards List

ISSUE RESOLUTION - TOTAL WITHIN SLA



First Resolve



Rookie Resolver



Novice Resolver



Amateur Resolver



Pro Resolver

ISSUE RESOLUTION - WITHIN SLA IN A ROW



Not Bad



Still on Course



A True Service Provider



The Dream

Resolve 25 issues within SLA in a row.

ISSUE RESOLUTION - OUTSIDE SLA IN A ROW - BAD



Ouch!



What are you doing?

Figure 5.5: Reward section with the mouse over "The Dream" badge

5.3.5 Rules

This section contains information about the usage of the app. It describes the leveling system, as well as how to obtain XP, rewards and other details about the gamification elements. It offers answers to some possible questions the users might have. This section's interface is shown on Figure 5.7

Users by roles

Roles: All ▾










SERVICE DESK TEAM				
Avatar	Name ↓	Experience Points	Featured Badges	Featured Projects
	Bernardo Silva Caetano	51 xp		PAAA
	Franklyn Gram	17 xp		
	Freda Kuhn	3 xp		
	Roxana Carron	0 xp		
	Vincent Wong	35 xp		PBBB PAAA

Figure 5.6: Leaderboard section

Game Rules

GENERAL
GOT ISSUES WITH ISSUES?
MEANINGFUL FEEDBACK
PROGRESSION MADE VISIBLE
EVERYTHING PUT TOGETHER

You can check your project's state in the "**Dashboard**" section

- Visualize your project profile and the project activity feed.
- **Eager** for rewards? Know which of them you are closer to achieve.
- Check your current project statistics and see how your performance is.

You can check your global's state in the "**User Profile**" section

- Visualize your global profile, which you can customize the rewards you want to show.
- Check the the activity feed of all your projects.
- Check your global Status and choose the projects you want to feature.

Figure 5.7: Rules section

6

Evaluation

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This chapter corresponds to the *Evaluation* step of the DSRM. In DSR, the artifact should be validated applying evaluation methods. These can be Observational (by doing case studies or field studies), Analytical (performing Static Analysis, Architecture Analysis, Optimization or Dynamic Analysis), Experimental (through Controlled Experiment or Simulation), Testing (either Functional Testing or Structural Testing) or Descriptive (using Informed Arguments or constructing Scenarios) [9].

Previously we talked about Company A and B that collaborated for the app design. Initially, to compare the efficacy and utility of the developed app, it was supposed to do an integration in the Jira Service Desk used by these and then evaluate it. However, due to complications we did not manage to do this evaluation.

The evaluation methods applied to the artifact created were first Experimental and later Analytical. The Experimental methods used were a Simulation with artificial data, and a Controlled Experiment, focused on the artifact Interface and features, allowing us to study its usability. For the Analytical method, Dynamic Analysis and user tests allowed us to study the artifact qualities.

Taking into account the evaluation criteria described by Prat *et al.* [34], we selected a few to evaluate our artifact's performance. The ones we found most relevant belong to goal and environment (more specifically, consistency with people) dimensions. In the goal dimension, through users' feedback, as well as dynamic analysis, we will evaluate the artifact's Efficacy and its Validity. In the Environment dimension, being the evaluation criteria the consistency with people, we will analyse the artifact's Utility, Ease of use and Understandability.

6.1 Usability Test

In order to test the usability of the developed app's user interface, we resorted to empirical methods, being user tests the chosen approach. These are described as irreplaceable usability practices since they allow observers to evaluate if users meet the expected results and give direct input how real users use the system [35].

The test was applied to 12 users, in which three are very familiar with Jira and had already had previous experience with the Jira Service Desk; another two are experts in ITIL, being very knowledgeable in its processes and practices, delivering daily services using another service desk software.

These performed a set of 10 tasks in total, divided in two parts, covering the most important features of the app. The first part contained 7 tasks (see the Document B.1 in Appendix B for the script used) in which users were intended to explore the tool and access different sections of the app, allowing us to understand if users were able to consult information and retrieve it from the presented interface.

The second part (see the Document B.2 in Appendix B for the script used) starts after a task performed by one of the observers and represent a technician's daily task (resolution of an issue), triggering

a set of notifications and behaviours in the application. The reason a simulation was performed, was due to the issue resolution action being part of the Jira Service Desk and we are only interested in testing our gamification app and its integration in the Atlassian software.

While users were performing their tasks, an observer was taking notes, allowing a dynamic verification and later a more concrete analysis of the observed behaviours.

Before performing the user tests, a simple introduction of the research was presented, as well as an explanation of Jira Service Desk and how the XGamify app is integrated. Besides, a simple demonstration of the XGamify sections was shown to every user, followed by requesting for a signed consent (form available in Document B.3 in Appendix B) allowing the recording of images and sound. The screen was captured, as well as the users' dialogue for further analysis.

During the test, the time users took to complete the set of tasks was measured. We calculated the time average, its standard deviation and the confidence interval (with $\alpha = 0.05$) for each set of tasks. Since it was a first approach of the users to our interface, we had special attention to their behaviours and to the doubts that came up during the test. This will be discussed later in section 6.2.

All users have completed their tasks, with the exception of one user who has made a mistake.

The average time to perform the first set of tasks was 5 minutes and 49 seconds, the lowest time being 3 minutes and 20 seconds and the highest 10 minutes and 8 seconds taking into account the time users were writing the answers to script questions. Also, future time should be in the interval of [0:04:42, 0:06:57] with 95% of confidence level (using a normal distribution).

For the second set of tasks, the mean time to perform them was 2 minutes and 42 seconds, being 1 minute and 36 seconds the lowest time and the highest being 4 minutes and 4 seconds. With 95% of confidence level, the confidence interval for this set of tasks is [0:02:14, 0:03:11].

To assess usability after the tests, users were asked to answer a questionnaire regarding the tool's user interface usability. The questionnaire used is SUS, which is a "reliable, low-cost usability scale that can be used for global assessments of systems usability" [36]. Bangor *et al.* [37] did an empirical evaluation of "nearly 10 year's worth of System Usability Scale" and proved that SUS fulfills the need to quickly and easily collect user's subjective rating of products' usability. They conclude it is a highly robust and versatile tool to evaluate usability.

The questionnaire consists of 10 questions using a scale of 1 to 5 (1 meaning that the user strongly disagrees and 5 meaning (s)he strongly agrees with the statement). The results of the questionnaire are presented on Table C.1 on Appendix C.

The results of the questionnaire result on 83% of users giving a score equal or above 85 points with an average score of 87.5, hence and considering the work of Bangor *et al.* [37] the interface gets a traditional school grade of B. Analyzing each question in detail we can conclude that:

- 83% users agree or strongly agree that they would like to use the interface;

- 92% users disagree or strongly disagree that the interface is unnecessarily complex;
- 92% users agree or strongly agree the interface was easy to use;
- 83% users disagree or strongly disagree they would need support of a technical person to be able to use this interface;
- 92% users agree or strongly agree that the various functions in the interface were well integrated;
- 100% users disagree or strongly disagree there was too much inconsistency on the interface;
- 91.6% users agree or strongly agree that most people would lean to use the interface quickly;
- 100% users disagree or strongly disagree the interface is very cumbersome to use;
- 100% users agree or strongly agree they felt very confident using the interface;
- 100% users disagree or strongly disagree they would need to learn a lot of things before they could get going with the interface.

6.2 Critical Analysis

In this section, we do a critical analysis to the software application developed. This analysis takes into consideration our opinion, the notes taken by the observer while the users performed the requested tasks, as well as the feedback obtained by Company A and B.

Nielsen and Landauer [38] found a mathematical model to find how many user tests should be performed in order to find usability problems in a system. Later, Nielsen [39] concludes that it takes only five users to perform the usability test to find “almost as many usability problems as you would find using many more test participants”. We chose to perform more than five user tests, having users experiencing Jira Service Desk for the first time (and the concepts of ITIL), as well as experts concerning ITIL concepts and other service desk softwares. However, it was possible to observe that certain problems were identified by several users, and that their interactions with the system when facing a problem were similar.

While users were performing the tasks (available in Document B.1 and Document B.2 in Appendix B), it was possible to observe their actions, understanding which were more complicated or created uncertainty. When users finished the test, they were asked in an informal way (in order to encourage the dialogue between these and the observer), which features and application elements were confusing or could be more explicit. This allowed us to take valuable information which we will discuss now.

When asked about the level name and XP, some users struggled to understand that the level names were on top of the progress bar, but easily identified the user XP. When questioned about those tasks

performed and possible doubts, users explained that, although it was not obvious, they ended up understanding the level system. We believe this can be a common behaviour for all users who are unfamiliar with the application and therefore a scaffolding mechanism that might be used to solve the problem and to guide users through fundamental steps clarifying some basic elements of the system.

We then noticed another possible problem to be addressed. Users had difficulties in understanding how the presented information differed between a specific project and a global one. The information is separated into two of the application sections (Project Dashboard and User Profile), however, two of the users explained they expected to have all the information presented into a single Dashboard. Once again, a scaffolding mechanism, explaining the difference between Project and Global users' information would likely help addressing this problem as well. This problem was also identified in XGamify [40].

Users find the activity feed very useful, having the information they need to understand what are the interactions between the service desk and the gamification app. However, when in the activity feed appears that a certain user resolved an issue, we do not point out which issue was resolved (Issue identifier) neither link to the service desk issue. In order to better integrate the app developed, linking the activity with the issue page would benefit the user for fast access and extended information.

Although leaderboards were easily understood by users, we received users' feedback that the project technicians should be, by default, ordered by rank (more XP first). This means that whenever a user goes to the leaderboard section, he expects that the list of users presented already shows to user with the best performance to be listed first. Besides, some users tried to click on the other users' name, expecting to visualize more information about other users.

After performing the simulation, where an issue is resolved in the Jira Service Desk, users received feedback through notifications. These notifications are very useful since they provide information about the behaviours in the application. When asked about the information presented after the issue resolution, most of the users were able to visualize its content and answer to what was required (XP earned by resolving the issue and what badge had been unlocked) just by looking at the notifications. Other users, who closed the notification or changed to another section, managed to figure out that the same information presented in the notification was presented in the activity feed and were able to continue the test.

In another task, where users were asked to edit badges and choose a certain badge to be featured, we noticed another problem with this activity and user interface. As seen in figure 5.3 in section 5.3.2, the badges only appear as a picture, not having a name associated to the figure. Here, we came across a design problem causing all users who performed the tasks to be uncertain what badge to select because there was no name attached to each badge. We told users to proceed with the tasks, selecting another badge. Having said that, we have come to regard this action as success, even if it is not the initial task. This delay may have caused an increase in measured times. With this, we managed to understand that

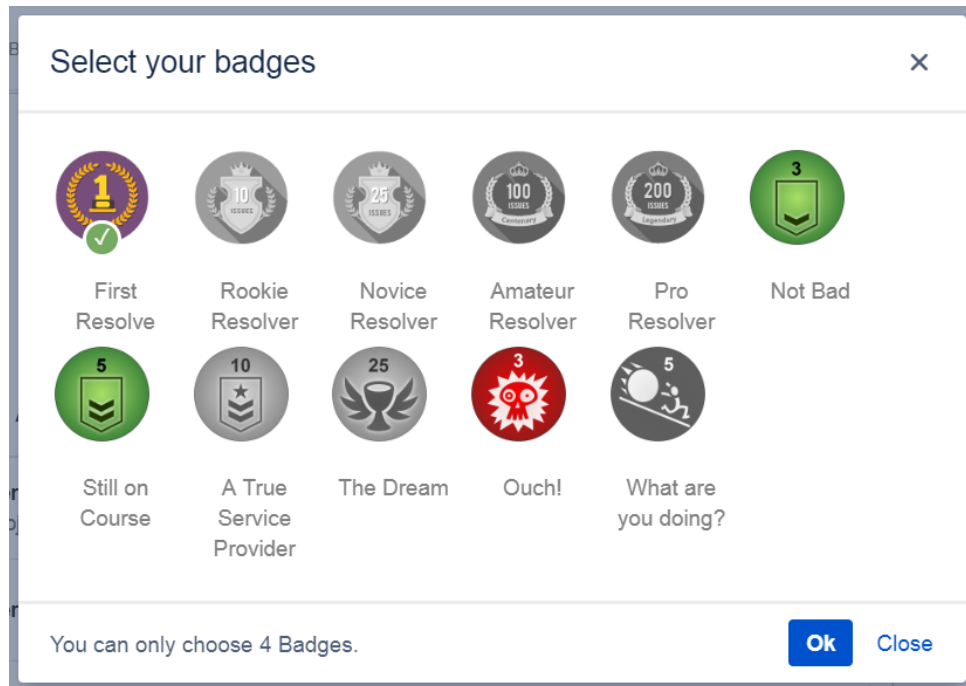


Figure 6.1: New edit badges interface

users were able to find how to change the featured badges, which was our main purpose with the task. Not ruling out the interface problem, and being important for visualization purposes, after all the user tests were done, we changed the gamification app interface. New interface can be seen in Figure 6.1.

In general, we realized that users understood the gamification elements. It was interesting to see that when they had certain doubts, since it was their first time using the system, they tried to explore and quickly understood what was requested and how the elements were embedded in the application. For this purpose, we did not randomized the tasks order. We wanted to test the set of tasks as a whole and not individually, understanding that it takes users a few tasks to get warmed up and acquainted with the interface.

It was of our interest to try to understand the application Efficacy and its Validity. That is, whether the system in a real environment would help to try to achieve the defined objectives. Thus, through qualitative feedback with users familiar with the use of service desk and ITIL process excerpt, it was possible to draw certain conclusions. Firstly, users said that it depends a lot on the importance given to the app by technicians and their superiors. Measured metrics, just as earned badges could be analysed after a certain period of time and taken into account as a performance factor. As one of the users said, "technicians would surely like it because it would motivate them to provide better service". They also stated that the application was transparent to day-to-day work and therefore seemed it would not distract the technicians from their tasks. They believe inserting such an easy to use application can help motivate teams, stating that "it (the XGamify) was simple and applying this version would be the best

approach not to confuse or distract employees, at least in a first phase”.

6.3 Discussion

The tasks performed by the users were successfully concluded, leading to the belief that the gamification elements tested were understood by the users. The SUS questionnaire results also prove that the system was acceptable, being rated on average as excellent (above 85) and getting a traditional school grade of B [37]. From the demonstration presented in Chapter 5, we meet the objective of designing and developing a gamification solution and software tool, respectively.

Overall, the evaluation method provided satisfactory results that corroborate the fulfillment of the solution’s objective.

One last note is related to the language in which the design application was presented. All users understood what was asked and the interface elements. However, English is not their main language.

In the next chapter, a conclusion of the research is presented by discussing the lessons learned, design and prototype limitations, and topics for future work, namely addressing the identified limitations.

7

Conclusion

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We have seen that there is the problem of motivation and possible difficulty when adopting ITIL processes. These processes benefit when users are willing to do the activities voluntarily, achieving a better performance and probably a better quality than if they were forced to do those activities. We performed some research regarding this theme and also looked at some literature related to gamification to have some insight about it and how it could be used to solve our research problem.

Only one DSRM iteration was done to the gamification solution design, its demonstration and respective evaluation. The proposed gamification solution was designed using the gamification design framework [2] and it is designed to provide feedback to technicians regarding their tasks concerning the ITIL processes, as well as rewarding them for their performance. The demonstration was the development of a software tool as an app for Jira Service Desk. The evaluation was done using user tests, including SUS questionnaire and a set of informal questions to users about the tested app, and a critical analysis done by us.

7.1 Lessons Learned

Despite ITIL's proven benefits, organizations still fail to adopt its processes and, because of the employees' resistance [15], fail to follow the proposed practices [4].

We studied gamification as a way to try to solve this problem. We learned that a good gamification solution can indeed help solving a certain problem and motivate users. However, when wrongly applied, it can harvest undesired results. Users must feel engaged in their daily activities and gamification can help with the fun factor. The context must be clear and with the help of game elements and mechanics, we can design a gamification solution appropriate to our context.

From the related work (chapter 3), we studied some software implementations, as well as conceptual models used to approach the ITIL processes together with the use of gamification. The work presented proved that an improvement can be observed after the introduction of gamification, even though there was not much information regarding the software executions or conclusions. The solutions presented are specific to each case and there is no generic solution that meets the needs of the various ITIL processes.

We started by collaborating with two companies. At first, it was intended to test the developed gamification app for Jira Service Desk in both companies. However, due to internal problems related to them, it was not possible to carry out the evaluation in a real environment where users implement the ITIL processes. We ended up to take into account these companies feedback which proved to be useful when designing the gamification solution. For example, as described in section 4.2.1, the idea of targeting the users who create tickets in the service desk was put on hold, so we could focus on technicians and avoid possible flow of issues created without great significance or importance.

Here, we believe that even when designing a general gamification solution to target a specific context

(ITIL processes), there should be some feedback and understanding where it is going to be used.

Performing the user tests was very useful since we were able to obtain very valuable information for parts that can be improved. It was also possible to understand an impact that could have on a real environment. We learned that it was helpful to mix people who were interacting with the Jira Service Desk for the first time, with others who already knew the software, as well as experts in ITIL. The feedback was different and focused on different aspects, which allowed us to do a comprehensive critical analysis.

As we worked with companies, we realize that it may not be easy to meet our goals with their needs. Contingencies occurred which made it impossible to test the application in company A. Company B aimed to migrate the systems to a more current version of the Jira Service Desk, where later it would be possible to test the application; however, since migration is an internal process and a very time consuming task, it was not possible to, once again, obtain results of a timely use for this dissertation.

Working with companies has this risk associated with it, but we still believe that the conclusions of this study can be valuable and with more time it would be possible to make a more quantitative assessment in a real environment.

7.2 Communication

In order to communicate the research, a paper has been submitted. In this paper, the authors present a literature review of gamification for ITIL. It has been submitted to Information Technology and Management Journal¹ (Q2) and it is being processed.

We plan to submit an article to ECIS² with the research done in this dissertation. We will expose the identified research problem, the proposed solution and the obtained results to the relevant audiences and scientific community.

7.3 Research Limitations

Although there is some documentation regarding development for Jira Service Desk, since it is itself built on Jira, it presents restrictions in what can be modified or added regarding new elements and mechanisms. This raised some difficulty when developing an app to integrate with Jira Service Desk.

From the user tests and feedback from users, it was possible to found that users expected the tool to be more integrated with the Jira Service Desk, allowing, for example, users to directly consult the issues solved from the activity feed. Nevertheless, this tool limitation has no implications in the main objective of creating a gamification solution for the ITIL processes.

¹<https://link.springer.com/journal/10799>

²<http://ecis2019.eu/>

As seen in section 7.1, we expected to use the developed software tool in both companies' Service Desk. Not being able to do this, the tool was evaluated as a socio-technical product in an organized and artificial environment rather than in a real context.

7.4 Future Work

Based on the results and feedback obtained in the user tests, the app should be improved regarding some visual elements and mechanics. These have been discussed in section 6.2, being some of them already improved (such as the badges names when choosing those to be featured).

Besides visualization, integration is another aspect discussed by users. Here we plan to link Jira Service Desk elements to the information we present in our app. For example, linking the activity about a resolved issue with the real issue identifier, allowing a more flexible connection between these two.

Another element to take into account might be the language used. English was the language chosen. However, it might be desired to allow users to change it according to their choice.

We plan to evaluate the gamification app in a real context. This will help us see if what happens is much different than expected. Depending on the environment, we will see if the gamification elements should be rebooted after a period of time. This means that the metrics, the XP and the badges might benefit when starting from the beginning after a period of time. This allows yearly or monthly evaluations for example. We will also examine how the metrics collected can be used by the company in order to reward the technicians for their performance. This evaluation will contain both the user tests approach to understand the usability, as well as a more quantitative analysis of data recorded during the usage of the system.

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Tables

Table A.1: Mapping between processes, behaviours and metrics

ITIL PROCESSES	KPIs/METRICS	BEHAVIOURS
Incident Management	No. of repeated incidents	- Resolve incident
	Incidents resolved remotely	- Reopen incident
	No. of escalations	- Assign incident
	No. of incidents	- Specify incident
	Avg. initial response time	
	Incident resolution time	
	First time resolution rate	
	Resolution within SLA	
Incident resolution effort		
Problem Management	No. of problems	- Identify problem
	Problem resolution time	- Resolve problem
	No. of unresolved problems	- Specify problem
	No. of incidents per known problem	- Report new Known Error
	Time until problem identification	
	Problem resolution effort	
Change Management	No. of major changes	- Implement change
	Number of Change Advisory Board meetings	- Specify change
	Time for change approval/rejection	
	Change acceptance rate	
	No. of emergency changes	
Request Fulfillment	No. of requests	- Fulfill a request
	Breakdown of requests per Stage	- Close request
	Size of current backlog of outstanding requests	
	Avg. of elapsed time for handling each type of request	
	No. of requests completed in the agreed times	
	Percentage of requests completed in the agreed times	
	Avg. cost per type of request	
	Level of client satisfaction with the handling of requests	

Table A.2: Mapping between processes, metrics and Game Techniques

ITIL PROCESSES	KPIs/METRICS	GAMIFICATION TECHNIQUES			
		Immediate Feedback	Experience Points	Badges	Leaderboard
Incident Management	No. of repeated incidents		X		
	Incidents resolved remotely	X	X	X	
	No. of escalations				
	No. of incidents	X	X	X	X
	Avg. initial response time	X	X	X	
	Incident resolution time	X	X	X	X
	First time resolution rate	X	X	X	
	Resolution within SLA	X	X	X	
Problem Management	Incident resolution effort	X			
	No. of problems	X	X	X	X
	Problem resolution time	X	X	X	X
	No. of unresolved problems	X	X		
	No. of incidents per known problem				
	Time until problem identification	X	X	X	
Change Management	Problem resolution effort	X	X	X	
	No. of major changes	X	X	X	X
	Number of CAB meetings		X	X	
	Time for change approval/rejection				
	Change acceptance rate	X	X	X	X
Request Fulfillment	No. of emergency changes		X	X	
	No. of requests	X	X	X	X
	Breakdown of requests per Stage				
	Size of current backlog of outstanding requests				
	Avg. of elapsed time for handling each type of request	X			
	No. of requests completed in the agreed times	X	X	X	X
	Percentage of requests completed in the agreed times	X	X	X	
	Avg. cost per type of request				
Level of client satisfaction with the handling of requests					

Table A.3: Global and Project leveling system

Level Name	Global XP	Project XP
Newbie	0	0
Apprentice	51	26
Resolver	101	51
Warrior	201	101
Hero	401	201
Pro	801	401
Boss	1601	801
Master	3201	1601
Veteran	6401	3201
Max Level	12801	6401

Table A.4: XGamify Badges

Image	Name	Condition	Category
	First Resolve	Resolve 1 issue within SLA	Issue Resolution within SLA
	Rookie Resolver	Resolve 10 issues within SLA	Issue Resolution within SLA
	Novice Resolver	Resolve 25 issues within SLA	Issue Resolution within SLA
	Amateur Resolver	Resolve 100 issues within SLA	Issue Resolution within SLA
	Pro Resolver	Resolve 200 issues within SLA	Issue Resolution within SLA
	Not Bad	3 Incidents resolved in a row within SLA	Issue Resolution in a row within SLA
	Still on course.	5 Incidents resolved in a row within SLA	Issue Resolution in a row within SLA
	A True Service Provider	10 Incidents resolved in a row within SLA	Issue Resolution in a row within SLA
	The Dream	25 Incidents resolved in a row within SLA	Issue Resolution in a row within SLA
	Ouch ("Negative" badge*)	3 Incidents resolved in a row outside SLA	Issue Resolution in a row outside SLA
	What are you doing? ("Negative" badge*)	5 Incidents resolved in a row outside SLA	Issue Resolution in a row outside SLA

Table A.5: Information about XGamify Notifications displayed to users

Event	Type	Title	Description
Reminder when good badge is close to achieve	Information	The <i>*Name*</i> badge is close!	You completed 90% of this badge progress.
Reminder when bad badge is close to achieve	Warning	The <i>*Name*</i> badge is close!	Be careful, the <i>*badge name*</i> badge is close!
Unlocked badge	Success	You unlocked the <i>*Name*</i> badge.	
Resolved incident within SLA	Success	You resolved an incident within SLA	Good work! You received 6XP.
Resolved incident outside SLA	Warning	You resolved an incident outside SLA	Incidents should be resolved within SLAs. Pay more attention next time. Still, you received 1XP.
Leveled up in project	Success	Level up!	"Yey you leveled up in this project! You are now in level <i>*level name*!</i> "
Leveled up globally	Success	Level up!	Yey! You have just leveled up to <i>*level name*!</i>

B

User Tests

B.1 Usability Test Part I - Consulting Information

User Interface testing:

This user test has the objective to evaluate the user interface of the add-on developed to motivate technicians to perform quicker and provide better quality services using a gamification solution.

This test has a duration of approximately 10 minutes and tasks should be performed by the presented order.

IMPORTANT: do not forget that what is being tested is the system, not the participant! If at any time you choose not to perform the test or some particular task, indicate to the Observer and proceed.

Part I (Consulting Information)

1. What is the level name where the user is in the **Project AAA**? _____; How much experience do you have in this project? _____;
2. What is the level name where the user is (in general)? _____; How much experience do you have in total? _____;
3. What was the last activity to be carried out in Project AAA and which user did it? _____;
4. Check the requirements to unlock the badge: "*The Dream*":
_____;
5. How many "*First Resolve*" badges does the user have? _____;
6. Which user is in rank 3 (in terms of *XP*) and the respective *XP*?
_____;
7. How many issues did the user close within the SLA in Project AAA?
_____;

B.2 Usability Test Part II - Issue Resolution and Profile Configurations

Part II (Issue Resolution and Profile Configurations)

1. What was the XP obtained for (only) resolving the Issue? ____; Unlocked a reward/ badge? If so, which one? _____;
2. Configure the profile to show the latest badge unlocked. Done? Yes No
3. Set up profile to feature project BBB and view its statistics. Done? Yes No

Thank you for your participation!

B.3 Usability Test Part III - Consent Form

Consentimento Informado para a realização de testes com os utilizadores

Declaro que tomei conhecimento e autorizo a que, no decorrer dos testes com utilizadores no âmbito da tese de mestrado: “*A Software Tool for Gamifying ITIL Processes*”, as minhas interações com o sistema sejam gravadas. Consinto ainda a tomada de notas sobre essas mesmas interações. Declaro também que autorizo o uso desses dados, de forma anónima, para fins educativos e de investigação, sem mais nenhum fim alternativo fora dos mencionados anteriormente.

(assinatura)

C

SUS Results

Table C.1: SUS Results

Question/Users	1	2	3	4	5	6	7	8	9	10	11	12
I think that I would like to use this system frequently	4	4	4	4	3	4	4	5	3	4	4	4
I found the system unnecessarily complex	2	1	2	1	1	2	2	1	2	1	1	1
I thought the system was easy to use	5	5	5	5	4	4	4	5	4	4	5	4
I think that I would need the support of a technical person to be able to use this system	2	1	2	4	1	1	2	1	1	2	2	1
I found the various functions in this system were well integrated	5	4	4	4	4	5	4	4	5	4	4	4
I thought there was too much inconsistency in this system	1	2	1	1	1	2	1	1	1	1	2	1
I would imagine that most people would learn to use this system very quickly	5	5	5	5	5	4	4	5	4	5	5	5
I found the system very cumbersome to use	1	1	1	2	1	2	1	1	2	1	1	1
I felt very confident using the system	4	5	4	5	4	4	5	4	4	4	5	4
I needed to learn a lot of things before I could get going with this system	1	1	1	1	1	2	1	1	1	1	2	1
SUS Result	90	92.5	87.5	85	87.5	80	85	95	82.5	87.5	87.5	90