

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 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 an easy to use and having the potential to help technicians in the daily tasks.

Keywords: ITIL, Service Desk, Gamification, Motivation, Adoption, Jira Service Desk

1. Introduction

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 correctly, ensuring the correct use of resources and the quality of services provided.

ITIL 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 [1]. 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 [2]. It is not easy to implement ITIL [3], mainly due to the organizational culture change that such initiatives imply [4]. These challenges can be partially explained by employees' resistance to follow ITIL best practices [5]. It is important for a company to provide high-quality services, to remain competitive, efficient and satisfy their customers. Thus, 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.**

In order to address the problem presented, gamification was the approach chosen. 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]. Gamification is a way to motivate users to follow the ITIL processes and feel engaged in performing their activities.

With this, 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 a the gamification design framework introduced by Werbach and Hunter [8] 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 or mechanics as feedback) were implemented and integrated with the available ITIL tools 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, a System Usability Scale (SUS) questionnaire was answered by users.

In order to conduct this research Design Science

Research Methodology (DSRM) was the chosen approach. 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. It includes six activities [10], being these: Problem Identification and Motivation; Define the Objectives for a Solution; Design and Development; Demonstration; Evaluation; Communication. DSRM had an impact on the structure of the document created and on the way the research was carried out.

2. Theoretical Background

In this section we will analyze the theory described in ITIL, as well as study if gamification can help addressing the problem.

2.1. ITIL

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 [1]. It was published by the Office of Government Commerce (OGC), and is currently in version 3.0, also known as ITIL V3.

ITIL is structured into five phases of service life-cycle, each corresponding to one publication:

- **Service Strategy:** provides guidance on how to design, develop, and implement ITSM as a strategic asset that can better serve customers [1];
- **Service Design:** has the goal of designing new services, along with changes and improvements to existing ones [1];
- **Service Transition:** new or changed services are transitioned into operations [1];
- **Service Operation:** this phase focus on the daily activities and infrastructures used to deliver services [1];
- **Continual Service Improvement:** this publication helps organizations measuring the IT service provider performance and improve the efficiency and effectiveness of IT processes and services [1];

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 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 [1]. 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.

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' [11].

Gamification is "the use of game elements and game-design in non-game contexts"[8] 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-fledged; 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 [8] propose a list 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); and 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, 12].

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 [8]. Points allow users to keep a score, badges are usually a visually representation of an achievement. Leaderboards gives context to the progression of each user.

Ryan and Deci [13] 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 pressurized. Extrinsic motivation can go through a simple addition of elements such as PBL.

To better understand people and how to change their behaviour, Deci and Ryan [14] 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.

Activity cycles are generally used to keep a user engaged in the tasks he has to perform [8]. There are two types of activity loops: engagement loops - for the individual user action (micro level) - and progression loops - take into account the user’s progress (macro level).

Gamification is not an exact science. Werbach and Hunter [8] 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. The best-known and complete gamification design framework [15] is the one introduced by Werbach and Hunter which is presented in six steps.

3. Related Work

So far there has been some research that relates gamification with ITIL and its best practices. Here we introduce related work of the subjects helping to understand some previously done experiences and study advantages and drawbacks of using gamification together with the ITIL best practices.

Two groups of researchers authored two papers each, meaning that, to the best of our knowledge, only five groups of researchers are trying to address this field so far. Despite presenting research on the area, only Surendro1 *et al.* [16] and Brito *et al.* [17] works present concrete and implemented proposals, which are very poorly evaluated. Orta *et al.* [18] provide a conceptual framework for improving ITIL processes with gamification. In another work, Orta *et al.* [19] and Rafle-

sia *et al.*[20] provide as well a conceptual framework for improving ITIL processes with gamification, completed with an example of usage. Finally, Conceicao *et al.* [21] presents a vague, not implemented nor evaluated proposal, and Jäntti *et al.* [22] proposes a non-technological procedure, only focused on peer complimenting and rewarding. None of these solutions are customizable, but the authors of one paper defend that such solution should be, so that it aligns with organizational needs. Four of the analysed papers are focused on the incident management process, and three papers address the service desk function. Moreover, the capacity management and problem management processes are also addressed. However, two papers only cover the ITIL phases in general (Service Operation and Service Transition). Regarding game elements, these works mostly focus on leaderboards, badges, points, levels, feedback, rewards, competition, and progress.

On the other hand, only five commercial solutions were found, suggesting that industry is not evaluating the benefits of implementing gamification for ITIL best practices adoption. From these tools, three are based on popular ITSM tools supporting ITIL, despite not being integrated in the tools themselves. The other two solutions are standalone tools.

All commercial solutions are highly configurable, meaning that the promoted behaviours depend on the organization’s configuration. Overall, most available solutions cover processes from the ITIL Service Operation phase, being the incident management the process where gamification is being implemented the most. This might be explained by the fact that incident management is the process that offers the most immediate and major costs reduction and quality improvements [23]. 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.

This analysis revealed that there are very few works studying the effects of using gamification to improve adherence to ITIL best practices, which in turn are very poorly evaluated, or not evaluated at all. A significant difference between papers and commercial solutions lie on the customization degree, having the industry focusing on aligning gamification with organizations’ needs, while academia does not focus on this.

3.1. XGamify

Marques *et al.* [24], studied failures in Portuguese companies during the software development process. In a later study, Costa [25] defined one of the main problems as being the software development process workers’ lack of motivation and com-

mitment. The author decided 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 Software¹ (a software development tool used by agile teams) where gamification techniques and elements were used to promote the adoption of good practices among teams.

4. Proposal

We will identify the proposal objectives and explain how it can solve the identified problem.

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 design a solution to solve our problem using gamification and following the gamification design framework described in section 2.2. This choice was based on the literature and because this framework is the most used and detailed.

4.2. Design and Development

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 processes chosen.

In addition to the research done on the topic, we collaborated with a Bank (Company A) and an IT service management company (Company B). 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.

4.2.1 Define Business Objectives

The main business objective for our solution is to increase technicians' adherence and motivation to comply with ITIL best practices.

¹Jira Software: <https://www.atlassian.com/software/jira> (Accessed on 4-1-2018)

The proposed gamification solution will focus Service Operation and Service Transition lifecycle, 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. 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.

4.2.2 Delineate Target Behaviours

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 Key Performance Indicators (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 processes chosen 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 in to account the ITIL metrics for each process, we extracted the desired behaviours.

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 [12] 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. SDT suggests that the human organisms tend to engage 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 [14]. 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 [22].

4.2.4 Devise your Activity Loops

In order to get players to perform their tasks quickly and efficiently, 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. Besides, users are given some kind of reward based on the performed action and will be motivated to keep doing a good job. 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.

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. 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 receive 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 to-be developed system. A mapping was done between the gamification techniques to be used and the metrics obtained from the execution of the processes, and we managed to see that Badges, Experience Points (XP), immediate feedback and leaderboards fit very well for the ITIL metrics.

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 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 section (chapter 5), being the continuation of this step - *Deploy the Appropriate Tools*.

5. Demonstration

During the time we worked with both companies, the tool has evolved in terms of functionalities and elements. Here we present the continuation of the sixth step of the Werbach and Hunter framework [8] - *Deploy the Appropriate Tools* - started in section 4.2.6, being the implementation of the proposed solution as a software tool.

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. Jira Service Desk² 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.

²<https://www.atlassian.com/software/jira/service-desk> (Accessed on 4-1-2018)

The service desk provides features such as SLA and Customer Satisfaction reporting.

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 3.1), a Jira Software app developed in the scope of software development projects using Scrum as an agile methodology. 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.

5.1. App Features

Users earn **XP** based on their daily activities performed. This helps recording their progress, keeping a score and possibly achieving new **levels**. Each level corresponds to a step reached by the user, is directly linked to the progression loops and it becomes harder to achieve as they become more experienced. XP is given to users and can be of two types: specific to a project or global.

Regardless of the type of issue (differ by ITIL process), 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.

The first game elements described are the badges. As mentioned in the section 4.2.6, users are eligible to earn badges for two reasons: (I) Good Badges - earned when users performs well repeatedly and are used to encourage them to pursue specific milestones. (II) Bad Badges - users must try to avoid these ones. They represent a wrong user behavior consecutively concerning ITIL practices.

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; (II) Information; (III) Warning; The feedback presented regularly is a gamification mechanics that helps engaging users while they perform their tasks. 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.

5.2. 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.

5.2.1 Project Dashboard

This section corresponds to the first page of the app presented to the user. Project Dashboard 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 level progress and evolution. Hovering it displays again the current XP and the required amount to level up.

Below 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.

5.2.2 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. Users can edit their badges, choosing the ones they want to display in their profiles. Also, the activity feed is related to all projects the user is working on, including the associated events, sorted by the most recent.

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 sections to retrieve that

information.

5.2.3 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 have are normally displayed, with the right color saturation, and with a number below indicating how many times the user has achieved that reward so far. On the other side, the non-achieved badges are greyed but users can consult the conditions they must fulfill to achieve it. Description is available when the user hovers a single reward with the mouse.

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 subcategory. The first two relate to good badges, indicating good behavior and therefore the use of green color 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.

5.2.4 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 that of others.

In this section the team members are displayed with available information such as the user profile picture, its name and progression elements (XP, featured badges and featured projects).

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 also offers answers to some possible questions the users might have.

6. Evaluation

The evaluation methods applied to the artifact created were first Experimental and later Analytical [9]. 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.* [26], 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 Efficacy and its Validity. In the Environment dimension, being the evaluation criteria the consistency with people, we will analyse the artifact 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. User tests was the chosen approach, since they allow observers to evaluate if users meet the expected results and give direct input how real users use the system [27].

The test was done 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 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 starts after a simulating performed by one of the observers and represent a technician's daily task (resolution of an issue), triggering a set of notifications and behaviors in the application.

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

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" [28].

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.*[29] the interface gets a traditional school grade of B.

6.2. Critical Analysis

This analysis is going to take into consideration our opinion, as well as notes taken by the observer while the users performed the requested tasks. 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.

When users finished doing the test, they were asked in an informal way (in order to encourage the dialog 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.

Some application components or visual elements revealed to be confusing for users. Some users struggled identifying the level names in which the users are. We noticed the distinction of the information presented in Project Dashboard and User Profile was hard at first. We believe both of these doubts can arise from all users who are unfamiliar with the application and therefore a scaffolding mechanism might be used to solve the problem, guiding users through fundamental steps and clarify some basic elements of the system. Users expected leaderboard to be ordered by rank (more XP first). Another problem was that, when selecting the featured badges, the app only shows the badge image and not its name. This is a design problem that caused users to continue with the test and it was important to face this issue so that we can solve it.

Users tried to click on some areas of the application, waiting for it to lead to another area. This might indicate that the application could be more integrated with Jira Service Desk. For example, the activity feed of a resolved issue should link to that issue for fast access and extended information and users should be able to view more information about their team members by clicking on their name/image.

After performing the simulation, where an issue is resolved in the Jira Service Desk, users received feedback through notifications. We were able to see the expected behaviour from users (retrieve information asked from notifications) as well as them exploring the application and finding the information in the activity feed, showing they understood how the app was integrated with Jira Service Desk.

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.

It was in 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 XGamify by technicians and their superiors. If measured metrics, just as earned badges were counted after a certain period of time and taken into account as a performance factor, then, 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 application can help motivate teams and said "it (the XGamify) was simple, but it might 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 [29]. From the demonstration presented in 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 relates to be 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.

7. Conclusions

We have seen that there is the problem of motivation and possible difficulty when adopting ITIL processes. Despite ITIL's proven benefits, organizations still fail to adopt its processes and, because of the employees' resistance [5], fail to follow the proposed practices [2]. These processes benefit when users feel 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 studied gamification as a way to try solving this problem. We learned that a good gamification solution can indeed help solving a certain problem and motivate users. 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.

We studied some software implementations, as well as proposals to approach the ITIL processes with the use of gamification. It revealed that there are very few works studying the effects of using gamification to improve adherence to ITIL best practices, which in turn are very poorly evaluated, or not evaluated at all.

The proposed gamification solution was designed using the gamification design framework [8], it is designed to provide feedback to technicians regarding their tasks concerning the ITIL processes, as well as rewarding for their performance.

The demonstration was the development of a software tool as an app for Jira Service Desk. Although there is some documentation regarding developing 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 it.

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. It provided satisfactory results that corroborate the fulfillment of the solution's objective.

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 problems internal to these, 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.

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, migration is an internal process and very time consuming, it was not possible to once again obtain results of a timely use for this dissertation.

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 Journal³ (Q2) and it is being processed.

Based on the results and feedback obtained in the user tests, the app should be improved regarding some visualization elements and mechanics. These have been discussed in section 6.2, being some of them already improved.

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 flexible connection between these two.

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. 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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