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Article

Toward an Enterprise Gamification System to Motivate Human Resources in IT Companies

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Abstract: In the age of Industry 4.0, competition between companies is becoming increasingly intense, and companies are turning to trends that aim to improve overall performance. Accordingly, the company ITEK decided to create a global gamification mechanism focused on motivating employees and encouraging them to perform their tasks in order to obtain incentives. For the construction and development of this mechanism, design science research and the 6D approach to gamification were used as methodologies, including tools from the aforementioned company that can be adapted to cloud tools in future applications. With this in mind, as a result, a base artifact with potential for future implementation can be shown, having interoperability and integrity for possible changes in companies with similar needs, an architecture related to the matter, and a proof of concept, proving that is possible to implement the solution in a real-world context. This article serves as a beacon to bring practical examples to the scientific and business community that can enrich and give light to new applications related to the themes of gamification, cloud, and human resources. As such, it can be expected that the next steps will include the application of the gamification model in the company ITEK, the documentation of its application, its results for employees, and the overall performance of the company. As a result and as proof of concept, an architecture was developed that allows for the integration of eight tools and 12 rules created for the gamification model.

Keywords: gamification; cloud computing; human resources; interoperability

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1. Introduction

In the age of Industry 4.0, competition between companies is becoming increasingly intense, and companies are turning to trends that aim to improve overall performance. Gamification can thus contribute to improving employee engagement by helping technological companies improve knowledge creation and business orientation [1]. As Deterding et al. propose, the definition of "gamification" is the use of game design elements in non-game contexts [2].

With this in mind, a global gamification approach was created and tested in a technological company that shall serve as an example for an extension of companies that possess the same needs—therefore defining it as a global model capable of motivating human resources to achieve established goals with views to receiving incentives.

Along these lines, with the above-mentioned theme in mind, the associated objectives focus on a main objective: the definition of a gamification mechanism in the context of technology companies. To achieve this objective, a survey of the existing solutions in the areas of gamification was carried out, comprising a survey of all the platforms and APIs used by the company ITEK (alias name) and a study of interoperability with the platforms selected and previously identified in the company. ITEK is a research and development company working in the areas of digital transition and data science with fewer than 20 employees.

Regarding structure, this article consists of a background, where the terms mentioned during the course of this article itself are clarified; materials and methods, where the methodologies and tools that were used or will be used to achieve the objective are mentioned; a section about the gamification model that includes the definition of the narrative, where the process of developing the topic and the steps taken to define the theory to be implemented are explained, the gamification rules, where the rules developed and implemented are described, and the gamification model itself, where the model defined based on the definition of the narrative and the gamification rules are disclosed; a section about the cloud gamification approach, where the environment, architecture, and the chatbot are described and explained; a discussion, where a line between the literature and the work performed is drawn and the final results are mentioned and the limitations and impacts are specified; and, finally, a conclusion, where the final statements of this article are made.

2. Background

This section covers all the topics mentioned in this article, focusing on gamification, cloud gamification, and gamification in human resources (HR), and also a short market survey of solutions similar to the one that is developed.

2.1. Gamification

Gamification is described as an emerging technological, social, cultural, or economic phenomenon [3] that enhances the involvement of employees, improves relationships between them, and challenges them to achieve goals. It is used as an experimental learning technique, and beyond that, it is used to encourage engagement with a product, a service, or a brand [4]. Gamification is considered an umbrella term for the use of video-game elements in non-gaming systems to improve user experience and user engagement [5]. The concept results basically from the inclusion of game components in applications/businesses, thus allowing employees to challenge themselves by gathering points, comparing leaderboards against other employees and their overall leaderboard position, and collecting badges, allowing them to set new goals for themselves based on game-based performance. Therefore, gamification is a combination of quantification, rewards, autonomy, and challenge, which makes it ideal for the workplace, as it attempts to harness the motivational power of games in order to promote participation, persistence, and achievements [6]. Moreover, gamification offers opportunities through motivation and rewards for staff to follow their own performance. In order to have contented employees, there is a need to ensure that the employees love the work environment and the job they do, giving room to improve themselves and support this with success [7]. If used effectively, it certainly boosts collaboration and feedback within the organization [8]. This information technology, whether the same applications or technological tools provided by organizations to their employees, uses gamification as a motivational factor for the use of these same tools, which in turn allows the attraction and retention of users, increases the return on investment, and improves the quality of data, ultimately increasing learning and sustainability. Gamification then has great potential in operation and decision support as it works as an additional layer in relation to tasks and activities with support from information systems [9]. It also has the power to enhance the user experience by immersing individuals in a gamified system that both engages and stimulates them [4]. This means that gamification can be used as a tool to enhance motivation and performance at work, meaning that gamification has the power to transform the workplace like a classroom [10]. However, for each benefit, there are concerns about creating standardized and global models in this area [11].

2.2. Gamification Design

Gamification design, on the other hand, is a different kind of experience. The concept of gamification started to gain widespread interest and a more research-oriented following in mid-2010 when companies began using gamification to describe their behavior platforms [4]. But for gamification design to work, it must include game design within itself, not just

game components. Games are not a replacement for thoughtful experience and interaction design, they are just an alternate lens for framing that process [12]. According to Högskolan and Skövde [13], to make a successful game, the design needs to assess and include different variants, such as self-representations, three-dimensional environments, narratives, feedback, reputation ranks and levels, marketplaces and economies, competition under rules, teams, communication, and, finally, time pressure.

2.3. Organizational Gamification

Another subject important to mention is organizational gamification, specifically in intra-organizational settings, as it can lead to better satisfaction, motivation, enjoyment flow, and knowledge-sharing behavior [14]. The degree of employee engagement and its impact on productivity has become a crucial factor for the survival and sustenance of any organization operating in the ever-changing business arena. With this, it becomes clear that gamification can be used as a powerful strategic tool in enhancing business results for organizations, provided it is applied with thought and integrated into the overall business process of the organization [8]. Therefore, organizational gamification is summarized by figuring out what lures and engages the user and providing appropriate feedback in between, thus increasing the level of engagement and paving the way to achieve success in the organization [15].

2.4. Motivational Information Systems

Motivational information systems are also a relevant theme to be explored considering the theme of this article, the subjects mentioned above, and the area of information systems that this article is included in. What makes motivational information systems, such as gamification, interesting is the fact that the systems at their core motivate and support the user toward a given activity or behavior, and the acceptance of this is mainly driven by usefulness in utilitarian systems, where usefulness is determined by the enjoyment of the use [16].

2.5. Resources on Gamification

Nowadays it is important to take into account the challenges that exist in organizations, which are often related to the efficient use of resources and quick decision-making, allowing for the introduction of a need for technology that can transform traditional processes with technological advances. These technological advances then allow organizations to implement gamification on their platforms, thereby opening up the use of this tool in various sectors.

According to Wanick V and Bui H [17], the purposes of gamification application in management mainly involve community building, brand loyalty, engagement, education, motivation, monitoring, persuasion, and productivity.

In marketing, gamification also has a very close relationship to loyalty programs, even though the application of gamification as a strategy allows marketers to obtain a history of product usage with monitoring tools and analytics, usually related to behavior regulation [17].

In human resource management, the motivational technique involves gamification as a tool to enhance motivation and incentives at work. As mentioned before, gamification transforms the workplace [17], infusing a feeling of ownership of performance and results. Having trackers to monitor the gamified process will help to audit the scope and evaluate the success of gamification, as the real-time data available in the tracker will enhance the return on investment of the gamified process [18]. Gamification can also be applied to reduce the educational gap at work and increase engagement with corporate responsibility actions promoted by a company, thus driving positive behavior [17].

In logistics and supply chain management, a challenge remains in teaching and training. Therefore, the strategy used in these areas focuses on the combination of simulations and role-play applications, merging real-world activities with academic activities. This

merge includes elements like quick feedback, leaderboards, and individuality that can lead to enhanced learning and engagement in general [17].

In finance, the challenge that leads this sector to the implementation of gamification is the need to measure every aspect based on the return on investment and have justification for future work and design. With this in mind, gamification in finance can be analyzed in two ways: its application inside banks and companies, integrating the whole process of business, and the gamification of personal banking, from the perspective of the individual [17].

According to Simpson and Jenkins [18], the application of gamification in a company's human resources is intended for business—guiding activities as a means to achieve personal goals and objectives, along with those of the company itself. Gamification is thus considered to play an important role in encouraging employees in order to attract, induce, train, engage, and retain them. It can therefore be assumed that, with the understanding of the benefits of gamification, HR professionals may be able to create their own gamification strategies involving others [19]. It is also important to mention, according to Nenadić and Agušaj [20], that the adoption of gamified practices in HRs, as well as in other areas, guarantees a competitive advantage in recruiting and attracting talent and may even make these practices or gamification elements a cornerstone for recruitment strategies in the near future.

2.6. Cloud Gamification

Cloud gamification, as the name implies, is the introduction of gamification and its gaming component into cloud services. This can be used to exploit all the potential configurable resources, using these resources to design and develop games for the appropriate and efficient use of gamification in an organization, thus enabling the removal of limitations and barriers in areas such as access at any time and place via mobile devices [19].

2.7. Gamification Design Patterns for User Engagement

A pattern is a combination of a problem and a corresponding solution that is described in a systematic and generic way so that it can be used over and over again in different situations [20].

According to Direkova, the author of the patterns that were followed for the mechanism created, design patterns that create game-like user engagement follow three aspects of user engagement. These three aspects are "Come and try the new gamified product or service", "Bring friends to try the new gamified product or service", and "Come back to retry the new gamified product or service (as frequent customers)" [21].

The first aspect identifies five different types of patterns: 1. prize and awards, which focus on attracting users interest; 2. visual storytelling, which focus more on visual features and not too much on text instructions; 3. visual cues, which emphasize the visual elements of a software application; 4. tutorials and coaching, where scenarios are designed to help users use gamified environments and understand how they operate; and 5. reward schedules, which focus on not giving too many rewards in the beginning, having levels of difficulty, and only unlocking badges based on the experience of the user in question [21].

The second aspect identifies six different patterns: 1. gated trial—form a team to start, where the focus revolves around the importance of inviting users to work as a team; 2. design conversations, which focuses on designing conversations in order to receive feedback from users; 3. structured social feedback, which focuses on urging users to write comments and express their gamification preferences in order to give the sense of being integrated into the company; 4. reputation, which focuses on establishing how efficient players are by using a gamified software application; 5. sharing achievements, which focuses on sharing their digital achievements with other users; and 6. mischief, which focuses on embracing uncertain circumstances that any community faces [21].

The third aspect identifies three patterns: 1. create scores, which focus on keeping scores that can affect users' behaviors in many ways; 2. throttle actions, which focus on

designing gamified applications that incentivize users to interact with the whole gamified system; and 3. advanced user paths, which focus on having simple tasks that grow more challenging with time [21].

Bearing in mind that all these patterns contribute to the successful introduction of gamification into a company, when the idea for this gamification mechanism was first created, a number of patterns were established as the main focus. These patterns are, in the first aspect, "Prize and Awards", which focuses on awarding prizes and medals to employees in order to motivate them to complete their work. In the second aspect, the "Gated Trial-Form a team to start" pattern was among those highlighted as important since one of the most important focuses is teamwork and the effectiveness of the work completed as a team. Finally, in the third aspect, all three standards were taken into account since they are all important focuses for the project. The "Create scores" pattern, which focuses on user scores, is the most important of these since the engine works with scores, leaderboards, and awards as the basis for gamification. The "Throttle actions" pattern is also important to focus on as it encourages users to use the whole system. The "Advanced User Paths" pattern was also taken into account when creating the engine, especially when creating the rules documented in Section 4.

2.8. Similar Solutions

In order to finish this background, market research was carried out to find similar proposals to those intended with this article, and six projects were found:

- Deloitte Leadership Academy (DLA): Deloitte Consulting created the Deloitte Leadership Academy (DLA) to provide its employees with training programs. DLA has gamified its training programs with game mechanics that include medals (earned when completing a special mission), points, and leaderboards. In addition, there is a team prize indicating that, if all members of a particular team successfully complete a specific mission within a limited time, they will all receive a special medal. As another game mechanic, micro leaderboards are also used, which show the top ten finishers in each group and are updated on a weekly basis. With gamification, DLA has implemented a system that provides immediate feedback on the learning progress and uses referrals to correct learning paths, as well as providing a means for motivation and engagement [22].
- ThinkTopia: ThinkTopia engages at the individual, team, and organizational levels using a series of activities and rewards. These activities are based on business needs and strategic priorities (the institutional milieu), which cascade from the strategic level to the team and individual level to demonstrate how individual effort contributes directly to both the larger organizational goal and individual concerns. Although this is only a prototype, ThinkTopia has been used to provide incentives and rewards to employees for certain activities and has focused on incentivizing a set of behaviors that are beneficial to both the employer and employee [23].
- SAP Community Network (SCN): Gamification has produced some valuable benefits in the SAP Community Network (SCN), where members can earn points and medals, advancing 13 levels by helping other users in need. Internally, SAP uses game elements in its community network to promote participation and collaboration and has also been trying to develop internal applications to encourage specific behaviors [24].
- Virtuoso: GraviTalent created Virtuoso, which is a gamified recruitment application that assesses candidates on various behavioral traits. GraviTalent provides a data-driven assessment method using serious games that identify behavioral strengths to help companies hire the best-fit talent and build high-performing teams. This application identifies three different areas of the individual: cognitive style, which comprehends problem-solving, strategic thinking, and ingenuity; work attitude, which comprehends perseverance, resilience, and the ability to quickly turn demand into action; and work style, which comprehends speed at work, precision, and efficiency [25].

- ConnectCubed: ConnectCubed is an application that can help organizations solve their human resource-related problems and uses gamification elements to access IQ and personality to identify whether an individual fits a job opening. This application is also able to identify problems in a working team or in the interaction among people while working. It uses a typical serious game where a candidate simply answers questions in the form of quizzes or plays logic games. Pressure is provided by the time factor, which requires scoring rapidly while the candidate is playing [25].
- Ace Manager: Ace Manager was created by BNP Paribas, which offers people the opportunity to find out about the real economy, step into a banker's shoes, and throw themselves into a business venture in order to find the best talents for an organization. This online game presents game mechanics and dynamics that turn the game into a competition with different levels, which results in players earning points and being ranked at the end of the competition phases [25].

Despite this, when analyzing the different examples presented, it can be seen that the gamification models used, although having different objectives, are similar overall. All of them present gamification in the same way, using it as a motivation and commitment factor for performing tasks, with the results being presented in classification tables and points/medals being awarded to the user in question.

Comparing these examples to the objective of this article, this article focuses on the creation of a gamification mechanism to motivate employees and then introduces it into a real business context in order to conclude with a comprehensive and complete system. Thus, it can be concluded from this research that the main focus of the developed mechanism is to motivate employees, encouraging them to perform their tasks and to use the mechanism that is built.

3. Materials and Methods

This section explains the methodologies and tools used in the development of this paper and the solution itself in the context of the company's research and development work. First, we mention the design science research methodology, chosen for its common use by the scientific community for the writing of scientific papers and subsequent academic experience, as the researcher is expected to use the theories to design the artifact [26], and its application in the current project. Next, we mention the 6D approach to gamification, chosen for its detailed description of steps—the 6 'D's [27]—for creating a gamification mechanism. Then, to finish, the tools used by the technological company are listed. These methodologies were chosen and introduced together for their ability to facilitate a better article and a clearer and more complete solution. It is important to mention that this work is divided into two parts: the first one refers to the definition of the problem and the presentation of a solution, and the second one refers to the refinement and optimization of the created solution. However, this article only refers to the first part of this work, so there are steps in the methodologies used that will be referenced in the next article.

The use of two different methodologies stems from the complexity of the implementation of the solution and the documentation in question. Design science research is used in the research carried here out in order to introduce and contextualize the readers to the work prior to the creation of the solution. The 6D approach to gamification is used in order not to miss crucial steps in the creation of the solution. This way, it can be seen from the matrix in Table 1 that the simultaneous use of both methodologies is necessary for different purposes, but both are important for the work developed.

Table 1. Matrix table between design science research and the 6D approach to gamification.

Design Science Research \ 6D Gamification Approach	Step 1: Define Business Objectives	Step 2: Delineate Target Behavior	Step 3: Describe your Players	Step 4: Devise Activity Loops	Step 5: Do Not Forget the Fun	Step 6: Deploy Appropriate Tools
Activity 1: Identify the Problem and Motivate	X	X				
Activity 2: Define Objectives of a Solution	X	X	X			
Activity 3: Design and Development				X	X	
Activity 4: Demonstration						X
Activity 5: Evaluation						X
Activity 6: Communication						

The Cross (X) means a match; for example, Activity 1 of DSR matches Step 1 and Step 2 of the 6D framework.

3.1. Design Science Research Methology (DRSM)

The design science research methodology (DSRM), according to Peffers et al. [28], incorporates principles, practices, and procedures necessary to conduct research. This methodology is thus based on 3 objectives:

- To be consistent with the previous literature;
- To provide a nominal process model for performing design science investigations;
- To provide a mental model to present and evaluate design science research in information systems.

With these objectives in mind, Figure 1 shows the 6 stages of this methodology:

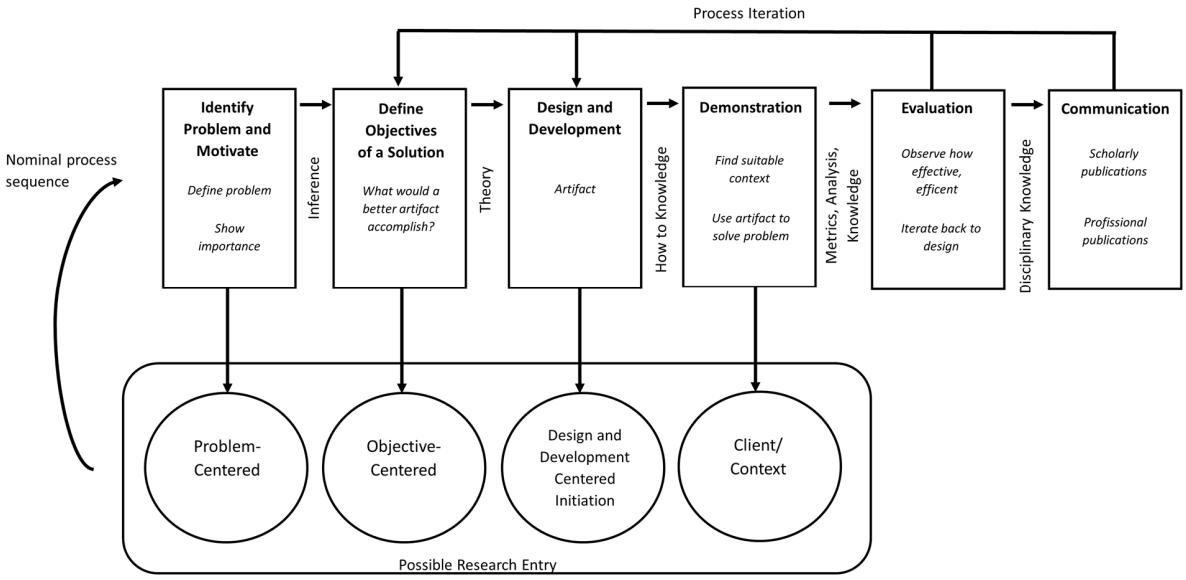

Figure 1. The design science research process (DSRP) model. Adapted from [28].

The stages of design science research that reflect this article are Activities 1, 2, and 3, named, respectively, "Identify Problem and Motivate", "Define Objectives of a Solution" and "Design and Development".

- Activity 1 consisted of identifying the problem in order to disaggregate it and find the motivation that leads to the existence of a new cloud gamification solution in the specific case of this article.
- Activity 2 consisted of creating objectives for the solution, which are described in this article.
- Activity 3 reflected in this article concerned the basis of the artifact created according to the two previous activities, which is based on the rules created and the objectives defined, thus starting the development of the model described below and its subsequent application in the company.

The following steps, Activities 4, 5, and 6, will be explained in the next article with practical results of the implementation of the solution created in the business context.

The 6D Approach to Gamification

The 6D approach (Figure 2) to gamification was used in order to obtain a systematic approach to the 6 steps existing in this framework [29], which are:

- Define business objectives: where the objectives have to be well-defined according to the work team;
- Delineate target behavior: where the tasks that the employees must perform and the metrics that evaluate the tasks themselves are specified;
- Describe your players: where the known characteristics of the players are defined;
- Devise activity loops: where the repeatable tasks are specified in order to improve the skills of the collaborators;
- Do not forget the fun: after all the above steps, the authors should review the application of the steps in order to keep the focus on the objective and still keep the fun in the mechanism;
- Deploy appropriate tools: based on the previous steps, the mechanisms, metrics, and tools are applied, focusing on the players and applications of the organization.

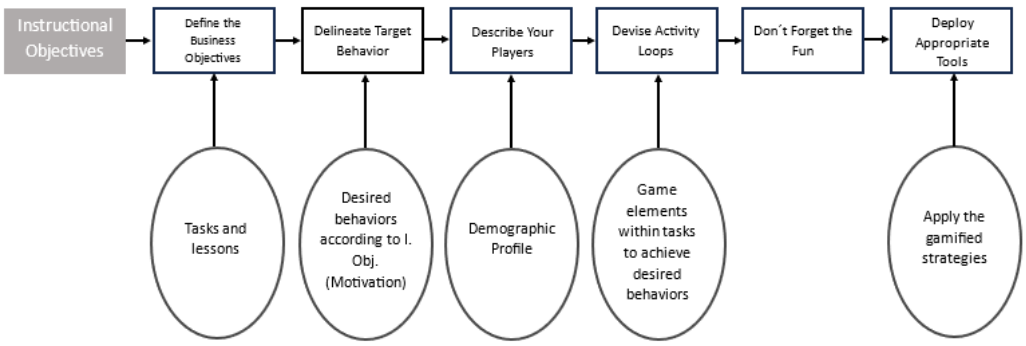

Figure 2. The 6D approach to gamification. Adapted from [29].

The approach taken in developing this article and the gamification mechanism, in general, was based on this methodology, and the steps that were followed were implied in the indicated stages. "Define business objectives" refers to the first meetings with the company's managers to outline the objectives of this project. "Delineate target behavior" refers to the meetings held with employees to arrive at the criteria and metrics. "Describe your players" refers to the company in general, which will serve as an example for companies with similar needs and with a desire to apply gamification in their organization. "Devise activity loops" is reflected in the choices of metrics established so that they facilitate employee learning. "Don't forget the fun" is implied in the approval meetings of the decisions previously made with the organization's managers and employees, in order to keep the focus on the intended goal without losing motivation in the tasks. "Deploy appropriate tools", finally, refers to the creation of the mechanism and its application in the company. The mechanism is presented in the form of an artifact base in this article, which will be

implemented and studied in the form of a solution in the company and documented in the next article.

3.2. Tools

For the development of this article, a research process was conducted within the company in order to find all the tools used in it. These tools are essential for understanding what can be connected in the company and in the system in general. The company in question is a research and development company operating in the field of digital transition and data science, which aims to change the entrepreneurial environment into a healthy competitive environment and to recognize those who contribute the most to the growth of the company. The system created will contemplate several gamification approaches with weights according to the person's tasks. Accordingly, the following tools were found taking into account the tasks and activities performed (Table 2):

Table 2. Tools.

Tools	Description
Google Sheets	This tool is used to complete the task of filling in the timesheets and planning sheets during the work week, thereby ensuring that information on work planning and working hours is entered and saved.
ClickUp	This tool involves the SCRUM management activity, recording activities, plans, and executions carried out by company employees.
Diagramflow	This tool allows employees to access the chatbot previously created in the organization, which in turn allows access to the gamification model. This way, employees will be able to visualize and easily consult the model.
GitHub	This tool implements a distributed version control system that tracks changes on files and allows for the security of the work carried out between teams with the possibility of everyone working simultaneously without losing any information since this tool secures the code and commits performed.
Postman	This tool is used to test running projects and their updates.
Google Docs	This tool is a package of applications used in the company for various documentation tasks, in particular, technical documentations.
Node.Js	This tool is the programming language used for the creation of the REST API and for the implementation of the gamification model rules that were later consumed by the chatbot.

4. Gamification Model

This section concerns the global and scalable gamification model created. It specifies the definition of the narrative where the application of the 6D methodology and the steps taken in defining it are explained, as well as the rules created for the model that was created. The whole context and model are real, and ITEK is a real company whose identity is concealed for confidentiality reasons.

This section presents the work completed in relation to the artifact created and the model previously mentioned that will be implemented and documented in a future article.

4.1. Narrative Definition

According to the 6D methodology, the first phase is to define the narrative of a solution, which, in this case, is based on the need to motivate employees. This narrative is focused on gamification in organizations, which can motivate employees to comply with company standards and perform tasks proposed to the same employees.

Thus, for this approach, an implementation plan of a system that incorporates gamification was developed, where compliance or non-compliance with the set of defined goals results in the attribution or subtraction of points. These points are presented in a table in periods defined by the organization, which may be monthly, quarterly, annually, or even annually. In addition to the points mentioned, the gamification mechanism portrays the

presence of three fundamental elements: points, leaderboards, and badges. As can be seen from the narrative described and the two phases of this work previously mentioned, in the first phase, the idea of badges is not contemplated. However, the idea is to introduce badges by area later, i.e., giving the employee who has the best performance in a given area a badge.

To set the narrative and explain Figure 3, the first step focuses on the survey and study of existing solutions on the market, carried out by the entity that compares rules and norms of similar solutions with the rules and norms created by the organization. The origin of these rules and norms comes from direct discussions between employees and managers and from general ideas managers suggest. This collation of ideas was created over the course of working days and in meetings that focused exclusively on this until the initial set of rules and norms were defined. So, the first and second phase started with, in a first instance, a meeting held with the company's managers with the objective of registering norms and rules according to the needs described by them and with the research completed. Here, an initial set of norms and rules was created which, after being defined, were presented to the employees in the third phase, in order to understand their position relative to them. All of this aims to bring the gamification model closer not only to the company's needs but also to the employees' needs and expectations, thus leading to the inclusion of different entities in a single narrative so that the narrative may incorporate a point of balance between the needs of the organization and its employees. In addition to his adjustment to several entities, this inclusion also foresees guaranteeing a greater impact on the organization at the motivational level on subordinates.

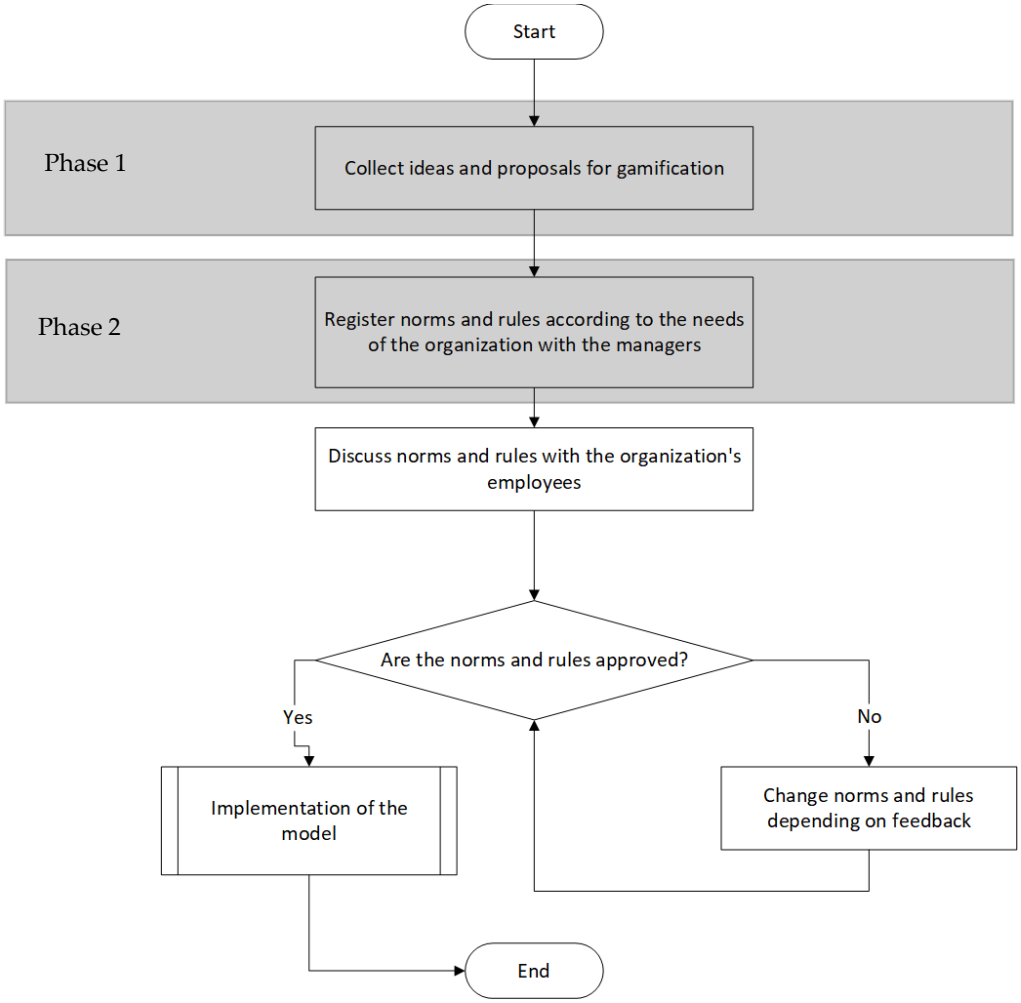

Figure 3. Process flow diagram.

In the fourth phase, we investigated whether the rules and norms were approved. If so, the implementation of the model in the organization was considered, which will be explained in a future article. It is possible, however, to conclude that, considering all the meetings held with the staff, the narrative is based on the fulfillment of the defined norms and goals by employees, as well as the completion of the tasks proposed in the project sprints in which they are involved.

Regarding the score assigned or subtracted, the first case is based on the timely completion of the proposed tasks, with the early fulfillment of these tasks resulting in the assignment of a higher score. The second case results in a penalty, which is significantly lower when compared with the attribution, in order to maintain a higher motivation of the employees involved.

If the rules and norms are not approved, then it goes back to where they will be changed depending on the feedback given and re-evaluated until these are approved.

The created narrative is expected to have an impact on increasing the quality of the services provided and on improving the focus and concentration of employees, as well as the work team in general. Furthermore, the narrative will be presented and available whenever anyone wants to consult and know the process within itself.

Taking into consideration the impacts expected with the proposal, the existing benefits with its implementation can be discussed. These include prizes and technologies, among others, granted in cards, the possibility of holidays, and even salary increases.

4.2. Gamification Rules

With the narrative concluded and defined, an analysis of the existing processes of the company was carried out in order to understand which processes could be included in the gamification model. Following the 6D approach to the gamification framework, the tasks and metrics were delineated in order to clarify what rules should be implemented.

Next, after showing the company and employees a set of rules to be integrated, these rules were redefined, and new ones were added according to suggestions. The following set of goals was defined, which then became a proposal to be integrated into technological companies.

These rules were designed for a typical tech company that follows agile methodologies (e.g., SCRUM) and where human resources must fill in working timesheets, fill in their working scheduled plan, present the work completed, meet milestones, and deliver their artifacts. It also has a rule to highlight who disseminates the company's results and services and tries to attract new customers.

Considering the goals discussed, this proposal consists of the following:

- g0—Comply with the defined schedule;
- g1—Participate in daily SCRUM meetings of the projects in which the collaborator is involved;
- g2—Participate in SCRUM project planning meetings in which the collaborator is involved;
- g3—Participate in SCRUM project review and retrospective meetings in which the collaborator is involved;
- g4—Fill in the timesheet by the end of the working week;
- g5—Fill in the schedule sheet by the end of the previous working week;
- g6—Report project-related issues to the project manager;
- g7—Communicate schedule changes;
- g8—Document work completed;
- g9—Be a seller;
- g10—Present the results obtained at the end of a project or other events to the whole team;
- g11—Share all artifacts produced in the company with its members (project owners or responsible members);
- g12—Do not create projects, repositories, or others without authorization from the CTO.

Based on the goals defined and mentioned above, criteria were created for the attribution or subtraction of points for the fulfillment or non-fulfillment of the mentioned goals. The creative process of these criteria had the same action plan as the established goals and the discussion with managers and employees. Thus, the following criteria, evaluation methods, and respective scoring were defined, as listed in Table 3. The respective points for each goal are justified based on the effort required for each task and the impact that each action has on the company. Also, the scale of points to be assigned was defined previously in conjunction with the head of the company.

Table 3. Gamification criteria.

ID	Goal	Criteria	Points	Evaluation Method
1	g0	Achieving all the tasks proposed	+25	Per sprint SCRUM
2	g0	Not fulfilling one of the sprint tasks	−5	Per sprint SCRUM
3	g1	Missing a daily SCRUM meeting	−1	Per meeting
4	g2, g3	Missing a review/retrospective/planning sprint meeting	−5	Per meeting
5	g10	Distinguished quality of the work presented	+30	Per project
6	g0	Accomplishment of extra tasks not outlined for the sprint	+5	Per sprint
7	g8	Keep project documentation up to date according to the work carried out	+5	Per project
8	g10	Propose improvements to projects and their functionalities	+5	By suggestion accepted
9	g4	Fill in the work timesheet by the end of the week	+2	Per working week
10	g4	Lack or delayed filling in of the work timesheet for more than a week	−1	Per working week
11	g4	Filling in the work timesheet in advance	+1	Per working week
12	g5	Filling in the work planning sheet by the end of the previous week	+2	Per working week
13	g5	Lack or delayed filling in of the work planning sheet	−1	Per working week
14	g5	Filling in the work planning sheet in advance	+1	Per working week
15	g12	Do not show the companies artifacts (code, documentation, ideas, etc.) to external entities/people	−1	Per action
16	g12	Non-compliance with the company rules	−1	Per action
17	g9	Presence in the company facilities	+15	Per action
18	g9	Participation in company events	+5	Per action
19	g9	Integration of a project in the company for the work developed as a seller	+10	Per action
20	g9	Neither attendance at the company nor participation in events when assigned to them	−10	Per action
21	g9	Improvement in proposals in the company	+10	Per action

To clarify the terms described in the evaluation method, a sprint at SCRUM is a period of time determined by the organization in which the team works to complete the tasks outlined. To assess this first version of the model, a case study was implemented using cloud computing tools.

Also, in Table 3, it is possible to interpret that g0 can be implemented in each sprint meeting and can have two approaches: total compliance with what is requested (+25) and non-compliance (−5). Regarding g1, it is implemented if someone misses the daily SCRUM meeting, thus removing 1 point.

This attribution or reduction in points, as mentioned above, reflects the importance and the effort required for each goal, so it is possible to notice that the fulfillment of all the objectives of a SCRUM is superior to participating in meetings. Therefore, the first goal reflects more points than the second goal. Another example of this is the discrepancy in points that exists between the presentation of work of distinct quality and the simple completion of all the proposed tasks, since the first goal, as can be seen, reflects more commitment and work than the second goal.

5. Cloud Gamification Approach

This section describes the cloud gamification approach by specifying the environment, the architecture, and the chatbot. In the environment section, the company ITEK is presented, and the gamification model is explained in Section 4. In the architecture section, as the name indicates, the architecture of the gamification model is described, as well as the table that relates the tools for the rules previously defined, which also mentions the capacity for autonomy of each relationship. Finally, in the chatbot section, the deployment of a chatbot in ITEK and its advantages for the company are mentioned.

5.1. Environment

The company ITEK is a technological company that represents a company with needs related to employee motivation. Thus, using this company as an example, objectives were defined for the creation of a gamified solution with potential adaptation to the cloud.

The definition of the gamification model is a process resulting from the analysis of the narrative, goals, and criteria previously discussed and explained, as well as the need for this process to correspond to them. For this gamification model to be transferrable to any and all organizations, a set of necessary assumptions for its implementation and correct operation was defined:

- Possibility of adding new employees;
- Possibility of adding new evaluation criteria;
- Possibility of assigning the criteria fulfilled by the employee and updating his/her score;
- Possibility of checking the classification.

Figure 4 presents a diagram showing the basis for implementing the gamification model, taking into account the above assumptions:

Looking at the diagram presented in Figure 4, it can be seen how the proposed model would be implemented. An organization would start by adding its employees to the system and defining the criteria to be used. The next step is to implement in its systems a mechanism capable of awarding points to a certain employee for the fulfillment/not-fulfillment of one of the defined criteria, enabling the possibility of creating an internal ranking among company employees.

This dynamic model aims to allow each organization to take greater advantage of the model itself, taking into account the needs of the organization, and to value transparency among all with the availably of its results. Each organization can then define, at the initial moment, the way in which it intends to aggregate the rankings and the regularity of these rankings, as well as define a set of different criteria for each of these periods.

In the prototype presented in this article, ITEK opted for the definition of two temporal periods: monthly and annually. This definition was based on the need to keep employees focused and motivated on the gamification model, thus creating the possibility for them to receive important feedback for the perception of the work developed, which in turn is important for the definition of the goals to be achieved in the following month. This allows employees and the company to have a greater perception of the actions required for constant improvement in the results obtained.

To further explain Figure 4, when adding collaborator 1 (option 1 is true), for example, the first step is entering the input name, i.e., the name of the collaborator, then declaring the collaborator as a string and assigning the collaborator variable to the name entered. The next task is adding the new collaborator (option 2 is true) to the list of existing collaborators and then entering the score equivalent to this new collaborator as 0, thus completing the cycle of adding a collaborator to the system. To add a new objective, in example g0, the process starts by entering the objective in the respective input and then adding the input points. The string array is then declared, introducing the new objective to the list of existing objectives and associating the number of points previously introduced to the objective in question, thus completing the cycle of introducing new objectives. For the attribution of points (option 3 is true), the cycle starts by going through the list of existing objectives until the objective, for example, 0, is found, then the list of collaborators is scrolled until the

collaborator, for example, 1, is found and, to finalize, the points are associated with the collaborator according to the objective fulfilled. If option 3 is false, then the cycle runs to show the list of collaborators and the points associated with each of them.

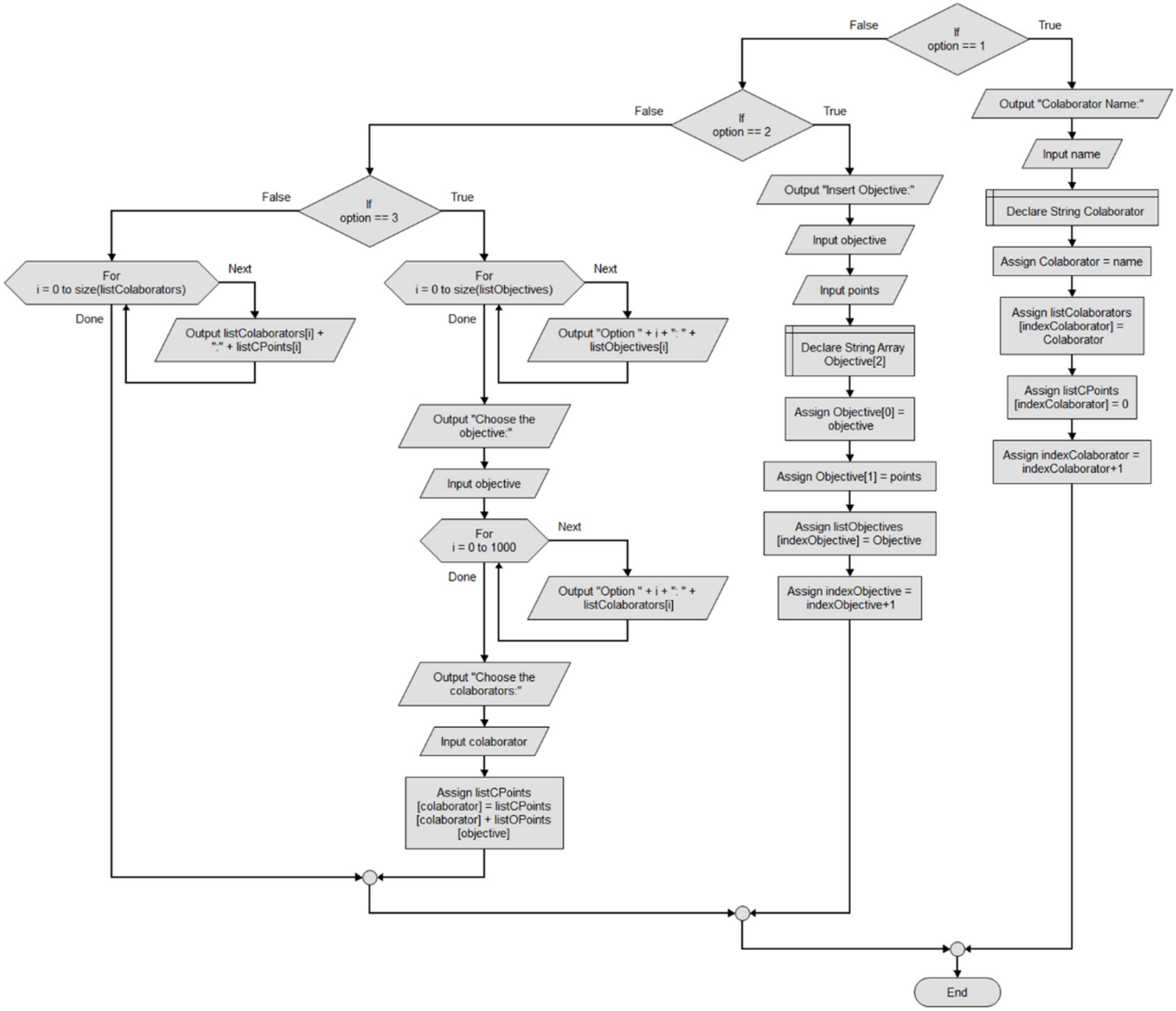

Figure 4. Gamification model implementation diagram.

5.2. Architecture

Concerning the annual model, its main objective is to analyze the goals achieved in a broader way, so as to be able to reward employees whose performance is not so notorious when analyzed over a shorter period of time, but who demonstrate constant performance.

In order to achieve the goals proposed in the definition of the narrative, it was necessary to proceed to the analysis of the tools used in ITEK, which was initially performed as an analysis with the data that they provided for the proposed model, and finally, the role they had in its construction.

With the five tools in use in mind, it is possible to obtain the architecture as the basis of the proposed gamification model, as shown in Figure 5:

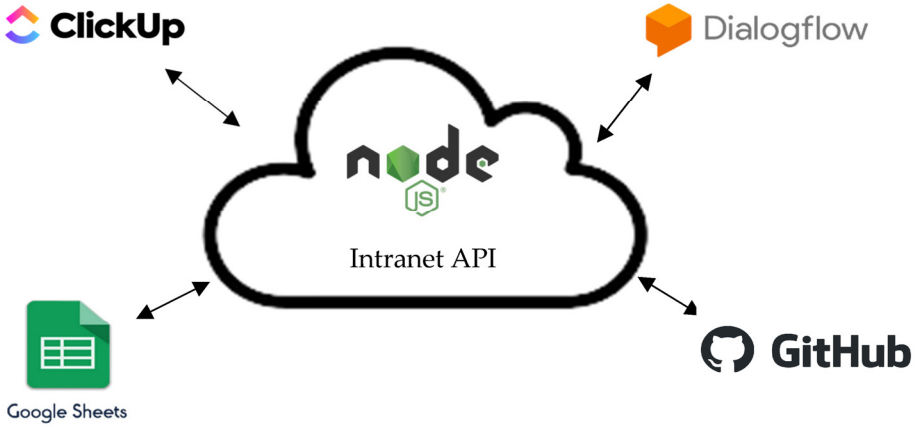

Figure 5. Gamification model architecture.

The architecture proposed above in Figure 5 assumes the integration of the gamification mechanism in ITEK's intranet API developed in Node.Js using the REST paradigm and Google Sheets, ClickUp APIs, and GitHub to obtain data that may interfere with the gamification mechanism. Diagramflow is used as a tool for interaction and consumption of the gamification model. On the other hand, it also requires an adaptation of the chatbot integrated into the platform, which serves as a communication point between managers and the gamification mechanism, thus being a solution for goals that can only be met manually.

The Google Meet, Google Docs, and Postman tools are cloud solutions, which, although used in the company, have not yet been integrated. Because of this, they are not represented in the presented architecture but are mentioned as tools of the organization.

With the architecture described above, a relationship between the established goals, the tools in use, and the automatic variable can be drawn, as listed in Table 4. Automatic, in this case, means that the goal can be easily achieved without human intervention. So, it is understood that the rules can be created and automated by taking advantage of cloud computing benefits (e.g., API development).

Table 4. Relationship between goals, tools, and automatic.

Goal	Tool	Automatic
g0	Google Sheets; ClickUp	X
g1	Google Meet; ClickUp	
g2	Google Meet; ClickUp	
g3	Google Meet; ClickUp	
g4	Google Sheets	X
g5	Google Sheets	X
g6	ClickUp	X
g7	ClickUp	X
g8	GitHub; Postman	X
g9	GoogleSheets	X
g10	Face-2-Face	
g11	GitHub	X
g12	GitHub	X

Based on Table 4 and considering GitHub and the tasks associated with the defined goals, a tendency for the goals to become automated is shown. Another tool that automates the defined goals, as seen above, is Google Sheets. In total, nine goals are automated because, for example, in g0, both Google Sheets and ClickUp are tools that automate tasks. However, three goals are semi-automated for the simple reason that they are associated with tools that automate tasks and tools that do not (for example, g2), where ClickUp automates but Google Meet does not.

This proposal will be validated by all the company's employees, which after discussion and analysis, will result in an optimized model that will be implemented and put into practice. With the optimization of the model, the benefits will also be discussed with the team and the access rules will be defined.

5.3. Chatbot

In addition to the development of the themes mentioned in this article, ITEK developed a chatbot. This chatbot allows the company to register employees and consult their points, compile all the rules, insert the records that are manual and interact with the developed APIs. The way this gadget works is based on the Diagramflow tool, which accesses the API and is then able to access all the information registered in it. Figure 6 shows an example of this chatbot:

Figure 6. Chatbot Chat.

6. Discussion

The present discussion aims to gather information regarding the use of cloud gamification for employee motivation in organizations. Accordingly, the work described involves information on gamification in general, gamification in the business context, gamification design, organizational gamification, motivational information systems, resources on gamification, cloud gamification, and gamification in HR. It is also possible to identify that gamification applications in enterprise information systems generate behavioral changes, increase intrinsic motivation, raise enjoyment and engagement, and improve performance [30].

The literature review constitutes an essential basis for the development of the work in this article, so it is possible to conclude that the contents described helped to understand necessary concepts and prepare the authors for possible limitations. It also shows, since the beginning of this article, the added value of cloud gamification, which can be applied to motivate HR, thereby bringing the proposed solution closer to the objective of the work.

This leaves us with two important results: the first one is the developed model (also described as the artifact) that was built and is currently being implemented, aiming at this stage to show the solution that was developed and that it is possible to have a cloud-based

gamification solution. This shows that the model is not theoretical and that not only has been already implemented, but it is also currently being validated at the ITEK company. As Section 4 shows, especially Section 4.1, the employees and management were part of the initial phase and are currently experimenting with the solution developed in the company. The second result is the feasibility of testing. This global model consists of a list of rules and norms regarding the work that takes place in the organization and a thoughtful and complete architecture that aims to change the motivation of the employees of the ITEK organization. The proof of feasibility, also called the proof of concept, demonstrates that the presented model is feasible and that it is possible to implement it in a real-world context. It is important to note, however, that motivation can only be effectively measured after 6 months of implementation, as the employees' feedback will be fundamental for the optimization and validation of the framework.

As far as limitations between the literature review and the existing results, it is possible to identify technical challenges and resistance to change. In terms of technical challenges, there are possible challenges in the creation of the platform, problems in the inclusion of all the tools of the organization in the intended solution, and difficulty in creating a dynamic platform where users remain independent and flexible. Another limitation is the possible resistance to change by the organization's employees. While it is generally agreed that gamification can positively influence employee behavior and motivation, there is less consensus on indicators and aspects describing gamification, as views differ on which game elements represent a gamified system [31]. This resistance, although unlikely to happen, presents the possibility that employees do not feel comfortable with the new tools, therefore causing them to not use them.

Speaking of impacts, it is possible to identify positive and negative ones. Regarding positive impacts, according to the literature review, gamification can impact satisfaction, autonomy, competence, and relationships among employees [14]. Negative impacts focus on ensuring fairness, ethical concerns, and maintaining employee engagement [32].

In sum, it is possible to mention that in this article, 12 rules were created, 21 criteria were developed that relate to the rules and the evaluation method, and eight technologies were found and explored. In addition, the base model was developed and is ready for future application, and the architecture was developed and studied at ITEK company. It is also important to mention the possibility of adapting the model described and idealized for cloud tools for any and all technology companies.

7. Conclusions

This article aims to bring to the scientific and business community practical examples that can enrich and give light to new applications related to the themes of gamification, the cloud, and human resources that were mentioned throughout this document. In this way, this article provides contributions at the level of possible improvements that can impact companies including improving employee engagement and improving knowledge creation and business orientation. In addition, it is possible to understand the best way to optimize the gamification model to be used.

The specific scientific contribution of this article, as mentioned in the Discussion section of this article, focuses on the model developed, which is in itself a scalable model, and the proof of feasibility. This model and proof of feasibility, as mentioned earlier in this article, can be used as a base model for any company that has the same needs as ITEK and wants to develop solutions. Therefore, this model helps companies and contributes to the scientific community by helping and clarifying problems related to the cloud and more. Moreover, this study demonstrated the feasibility of developing a cloud-based gamification architecture to motivate and monitor the work of human resources in a technology company.

With this in mind, the importance of integration and interoperability can be drawn from this model, with total transparency between systems and collaborators, as well as the ease of integrating this model into any company. This safeguards that the technologies

used are replaceable with the cloud technologies of choice of a company that aims to use this model. Thus, it is possible to conclude that the technological company ITEK serves, in addition to the contributions mentioned, to demonstrate the applicability of the model that was developed and that will be applied in the future. This article can even act as a design and implementation guide for other researchers or practitioners aiming to implement a similar solution in the cloud or other platforms.

Another topic discussed in this article that can help those interested in this subject is the rules and ways in which the 6D approach to gamification can be mapped in the specific case of technological companies that intend to use gamification as a motivational factor for their employees.

As for future work, we aim to focus on the integration of the missing tools mentioned throughout this article and the validation of the model in the company context for future optimization and implementation. If proven successful, this work will be documented in a future article, and the definition of the benefits of safeguarding the documentation of all these steps will also be brought up in a future article.

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