

Gamification Framework for Management Practice

RICARDO PATEIRO MARCÃO¹, GABRIEL PESTANA²
AND MARIA JOSÉ SOUSA³

¹FCES, UNIDCOM/ Data Mining Lab, Business Research Unit

²IADE, Faculdade de Design

Universidade Europeia / Altran Portugal, S.A.

³Instituto Universitário de Lisboa

Tecnologia e Comunicação da Universidade Europeia

Lisbon, 1500-210 Portugal

E-mail: ricardo.pateiro.marcao@gmail.com; gabriel.pestana@universidadeeuropeia.pt;
maria.jose.sousa@iscte-iul.pt

Nowadays, performance profitability and turnover reduction are the main challenges of big companies in the professional services' sector. While it's not always possible to achieve all the goals of a large multinational in each country, it's necessary to assess its development to do so. Thus, the steps identified are going to a new version of business architectures, where they can be used innovative frameworks to collect interesting results. However, for the sake of management, to ensure cohesion between teams, it's also necessary to obtain high income to support enterprise architecture and the intended business model, which highlights the use of the concept of gamification to allow it. In this context, it's necessary to understand how the commitment of stakeholders evolves and if the application of gamification techniques and/ or frameworks enhances this variable, taking performance evolution as another variable that could be evaluated. After all, not only invested capital profitability matters, where we usually call Key Performance Indicators (KPI).

Keywords: control, engagement, gamification, management, motivation, performance

1. INTRODUCTION

The quick evolution of technology, as well as the adaptation of the digital universe, has infiltrated overtime into many aspects of everyday life. Advances and progress in this field have brought simplicity and automation in different industries, from industry to professional services to education. According to [1], activities that in the past would take days or even months to be completed, now they can be finished in hours, or even minutes. The advancement of technological know-how and its application have resulted in a greater efficiency in the delivery of the product and its placing on the market.

More and more organizations create dynamic environments, where internal and external changes are constant, and the creation and use of innovative management and operation models is urgent. These models must be composed of business and industrial processes capable of dealing with this type of change and with the necessary constant innovation, so that the organizations become more competitive, assuming by [2]. According to [3], the current industrial models of management, practiced on a large scale in many

Received June 18, 2020; accepted June 26, 2020.
Communicated by Alvaro Rocha.

large companies, are based on military methodologies and practices, though sometimes discarded by many economists. However, in the conclusion of his study, while following a military analogy, he finds that a team consisting of very weak employees with salaries below the national average of the country concerned is not a threat on the market, as opposed to a team consisting of efficient collaborators and with above average salaries. In the perspective of [2], this is a strategic approach that allows defining a value-added business architecture, although its study focuses on the alignment between processes, technology and risk management.

The role of a company in the context of value creation is to support customer processes by providing them with resources, as considered by [4]. At the same time, and in a perspective of maximizing results, it is necessary to gauge the business model in practice, in order to build a complete assessment. According to a study carried out by [5], focused on the implementation of quality improvement activities in the processes used in public health, it is possible to achieve positive changes in different departments, in which the related tasks are performed in a more effective and efficient way. In this context, after the implementation of such activities, we have been able to use the information flowing between different departments that share the same processes to infer decision making at a higher level. Although each department has a unique nature, which is one of the limitations identified in the research in question, the data gathered showed that there is a greater amount of changes in management with a stronger quality improvement culture among the different health departments.

Given the different management cultures present in many organizations, management control systems became strategically useful, responding to the creation of organizational silos. Although this depends on the business model adopted in the context of change management, [6, 7] consider these types of systems as an impetus for operational management focused on implementation. Different studies indicate that, as a general rule, incremental innovation mechanisms should be managed differently from radical innovation mechanisms. However, [8] suggest the opposite, focusing on the research and development activities of pharmaceutical industry. Here, technological innovation has functioned as a driving force for competitive advantage, not only because of globalization, but also because of accelerating product lifecycles, increasing competition, technological fusion or marketing products across platforms. Although it's an industrial sector with a very strong market, it's not immune to competition.

The cornerstone of competitive advantage in the pharmaceutical industry is the successful innovation, hence the fact that your investment in research is far greater than any other electronic or aeronautical technology industry. For this reason, organizational control is one of the key points to consider. This can be defined as any process by which managers direct their attention, motivating and encouraging members of the organization to act as intended so that the goals of the organization are best achieved. At the same time, structural control, also known as bureaucratic or behavioral control, is another pillar to be taken into account as it allows the regulation of activities and behaviors and is often implemented in the form of processes, activities, tasks and rules.

In this context, different forms of input, behavior, and output control enable scientists to effectively conduct their work and align it with different collaborative and professional goals. Although organizational control influences innovation, it depends on the nature of the product development activity. When companies have professionals that have per-

formance indicators which doesn't fit to the goals already defined, questions like "Is he a bad resource?" just emerge. For this reason, it's necessary to analyze how different support frameworks use the market, in topics related to business monitoring and human resources management, to identify methodologies most commonly used in performance management.

In order to monitor the most diverse analysis indicators (*e.g.* key control indicators, performance indicators, key risk indicators, *etc.*), [9] believes that the practice of dashboards become increasingly useful in themes surrounding business activity monitoring. According to [10], nowadays a dashboard is not only a tool which uses business intelligence technology to manage business processes management), but a powerful interactive and diagnostic tool that produces a passable overview of the company concerned so that its time objectives can be met more effectively.

In general, the perfection of the projection and development of alarmistic conceptual models and control and performance monitoring involves business modeling based on valuation points analytical tools, which include use case diagrams, activities, and business processes described Unified Modeling Language (UML), along with the creation of artefacts using methodologies such as Design Science Research (DSR).

In recent years, the concept of gamification, related to the conversion of tasks into games of a game, has gained considerable attention, not only in the design of services, but also in the operationalization of these, being such an example of the typology of resources mentioned above. Here, it is possible to use games as service systems composed of operative and operational resources, but there is no exact definition for such. According to [4], the definition given to the concept of gamification highlights four important aspects: (i) affordances; (ii) psychological mediators; (iii) goals and (iv) context. Although we can identify different types of actors in play, the author considers the concept as a communicative scenario in a given environment or service, with a perspective of testing different theories of marketing, assigning to the consumer the role of provider of a certain service, where a win-win model is created.

The concept of gamification has been defined by different authors over the last two decades under different perspectives. Although all relate motivation to organizational performance, some describe it as the "Holy Grail" for acquiring good results, as is the case with [11]. According to [12], the gamification concept is no more than the use of game elements in a non-game context, allowing the player's engagement and, consequently, better results in a given activity, appealing to innovation.

This research intends to fill different gaps into the theoretical fields of study, making a literature review on project management, gamification as the engine of motivation and performance monitoring; and into the empirical field, since, based in field analysis, there is a lack of a consistent and effective process management. Based on, it was defined a gamification framework for management practice, targeting the best practices of different methodologies and gathering a better engagement level from the employees themselves.

In this paper, it can be found a research based on a detailed framework, but without concrete results, widespread in different chapters, as follows: (i) Introduction, where it's explained the motivation for this research; (ii) Background, where it's presented a literature review surrounding the scope; (iii) Developed gamification framework, where it's detailed the framework resulting from the research; (iv) Conclusion Remarks, where it's made our final statements; and (v) References, the bibliography.

2. BACKGROUND

With the economic crisis in which we live, it is becoming urgent to capture the high development of a company. In a professional context, the analysis of organizational performance through dashboards implemented with monitoring frameworks provides gains in knowledge about events, as well as available data about the progress of employee performance. The profitability of such performance and the reduction of turnover are the main challenges of big companies operating in the professional services sector. While it is not always possible to achieve all the goals of a large multinational in each country, it is necessary to assess its development in order to do so. In this manner, the steps identified are going to a new version of new business models, under an organizational perspective that can be accompanied by interesting results with a different structure. However, for the sake of management, in order to ensure cohesion between teams, it is necessary to create mechanisms for obtaining high income to support enterprise architecture and the intended business model, which highlights the use of the concept of gamification as one of these mechanisms.

The area of monitoring and project management presents a collection of methodologies, some more sequential and others more iterative, each one with benefits in different aspects. Hence, a set of good project management practices could be used to identify the most beneficial characteristics of different methodologies. Since one of the dimensions of project management is human resources management, it is urgent to value employee's motivation. Many of the studies surrounding employee's performance give us the perception that this is a variable dependent on motivation, so it's necessary to identify concepts that address it. By monitoring the evolution of employee's performance, we were able to evaluate the success of the model. Although there are several methodologies in the market, none of them results from a symbiosis between traditional and iterative methodologies, and there is no reference to any model that can dynamically address employee motivation.

In this context, considering project activities, it is necessary to understand how the commitment of stakeholders evolves and if the application of gamification techniques enhances this variable, taking performance evolution as another variable that could be evaluated. Although the measurement of organizational performance is the focus of top management across different organizations, it does not always fix control of established goals. It is necessary to create mechanisms to keep people motivated, living with their active activity of adding value to the organization. However, in the annual results statement, only the effectiveness of sales' performance is mirrored, incoming with the business generated by this organizational silo.

2.1 Gamification

This section focuses the use of the concept of gamification in some projects and researches. Although the studies surrounding performance management involve the public health and professional services' sectors, [13] consider it as a topic that easily covers the other sectors. In order to design, implement and manage new health information systems, through the development of an enterprise architecture capable of capturing the effectiveness of IT and business resources, [13] define two types of input: (i) financial motivations

and various types of inter-organizational relationships, and (ii) pressure from patients who want health professionals to meet patients' needs, which supports technology in the perspective of providing a greater amount of resources electronically. Based on these inputs, it concludes that the relationship between the maturity stage of the business architecture and the organizational impact of the use of IT is directly proportional, in a positive perspective, since its implementation allows organizations to obtain a greater competitive advantage. In this sense, as we evolve in the maturity stage of the enterprise architecture, we are able to address the different types of motivation defined previously. According to [14], despite the observable evidence that humans are liberally endowed with intrinsic motivational tendencies, this wall propensity is expressed only under specifiable conditions, which contrasts with extrinsic motivation.

In the perspective of studying the evolution of performance management, [15] develop a method to discriminate failures, through a predictive control model. This method monitors the sequence of innovations of the Kalman filter, which can be obtained in closed industrial circuit, from where we can make an analogy to the use of the concept of gamification. According to the benchmarking study carried out by the author, the final result of the application of the method is an indication of the estimation of the sub-optimal state, which revealed the method contributes to the capture of the high yield.

With the objective of producing a process of continuous improvement of a given economic activity, [3] analyze the performance of its management activities and states that the use of a BAM system can be used to monitor performance management in real time. Since a system of this kind monitors several enterprise systems simultaneously and shows exceptional situations in a dashboard, in case the symptoms of the problem are identified by predefined rules, [3] consider it as a solution that feeds the globalization of the economic activity of the organization. However, since the good financial performance of an organization should accompany the motivation of its employees, according to [16], an enterprise architecture must contain a management control system capable of dealing with change, not only at the macroeconomic level, but including human resources and strategic and organizational planning, according to [6]. For this reason, in conclusion of a study conducted by [8], control at the level of a business process can be defined as any process by which managers direct attention, motivate and encourage the members of the organization to act in a desired way to achieve the company's goal.

According to [17], business performance management allows organizations to monitor and respond to changes in the business environment, in order to optimize their performance, relating it to the employee's goals. Business performance is measured through indicators to reflect the return of activities under the technology layer. For the best performance in the business, the essential is the set of effective measurement and performance analysis of the management activities of the business, which is only possible through the definition of indicators, metrics used to plan, execute and monitor business. Among these, performance indicators are highlighted, which determine the monitoring of the objectives to be fulfilled and allow the monitoring of the relative levels of control with a certain tolerance, used in the organizational context.

According to the guidelines defined by [11], to acquire added value through the use of business architectures: (i) avoiding the traditional approach in strategic planning; (ii) outlining a future strategy that maximizes the current performance; and (iii) evaluating the intermediate effects of the use of IT to generate added value; an enterprise architecture

must be designed to capture maximum flexibility and agility. [3] further emphasize that this point should be valued in order to improve the alignment between business and IT, from where IT projects has an architecture based on a gamification framework, using different events (see Fig. 1). In the architecture presented, game rules are created and managed through a Business Rule Management System (BRMS) and the engine evaluates each event according to its predefined game rules. This offset event is, in turn, processed by the game repository and stored in its database. Finally, an analytical component is used to analyze player behavior in order to improve the rules of the game and optimize long-term employee engagement.

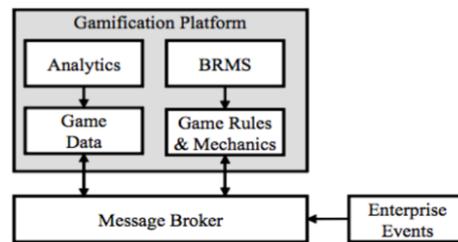


Fig. 1. Gamification platform, according to [18].

The choice of the methodology for monitoring and project management is not the only point that we can use to deduce its efficiency, especially in what concerns the area of knowledge related to human resources management according to [19], where management is focused on the motivation and expectations of the project team. Because of this, we will consider the concept of gamification as the motor of motivation. According to [20], the main objective of the concept of gamification is to enhance the motivation of the human being and to improve his performance in a given activity. A study developed by him also reveals that it is through the configuration of the different variables that may be involved in the game design that is possible to fulfill the basic biological needs of the employee, and it has been verified that this approach positively affects satisfaction and performance. [11] also consider that the motivation is leveraged by the systematic addition of benefits to the employee, dependent on the results obtained in the projection and development of products or services, transforming the professional activity into a game. However, [21] propose a new definition of the concept of gamification, emphasizing the experimental nature of gaming and gamification themselves rather than their systematic understanding. The concept of gamification refers to a process that allows the improvement of a service through the creation of value triggered by the employee himself, which constitutes a starting point for the research work in the above. In Table 1, we can analyze the definitions presented for the concept of gamification, according to the levels of abstraction considered. For this empirical work, we will consider the definition of [21], based on the experiences of the collaborator, on the second level of abstraction.

In order to understand how social factors predict attitude towards gamification and intention to continue using gamification services, as well as the intention to recommend such services, [22] conducted a study through the application of a survey of systems, whose conceptual map of research work can be seen in Fig. 2.

Table 1. Levels of abstraction that can be applied in the two definitions of gamification presented by [21].

Levels of Abstraction	Condition Systematic	Condition Experiential
I	Games are the system	Games require the voluntary involvement of employees
II	Rules, conflicting objectives and variable and uncertain return	Generates hedonic pleasure

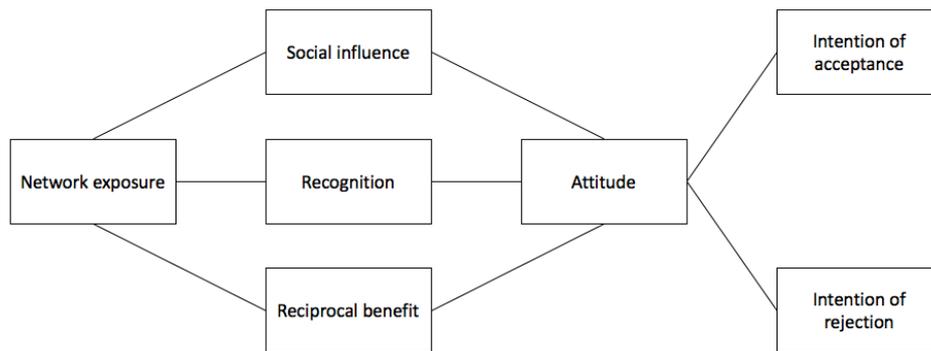


Fig. 2. Influence of motivational indicators of the gamification concept (adapted from [22]).

The results of the application of this study indicate that, although the relationships were positively influenced by the degree of employee exposure, the "amount of recognition" they receive does not directly affect their attitudes towards the use of gamification services. Therefore, the researchers conclude that the attitude towards the use of a gamified service is determinant in the intention to use and, consequently, in its recommendation, which confirms the role of the different attitudes shown in the justification of behavioral intentions, says [23]. According to [21], social elements are essential for the creation of services or products gamified.

According to [24], the use of the gamification concept in the development of products and services reflects a very useful trend in the opinion of Chief Information Officers (CIOs) and other IT managers in the near future. A successful example is what was done by Sweden's National Society for Road Safety and Volkswagen. They implemented the Speed Camera Lottery, a lottery in which drivers who respected the speed limit automatically participated, the premium being paid through the excess fines speed, exemplify [25].

According to [25], the potential of the gamification concept is based on motivational support, distinguished in two types, as it was already said before: (i) intrinsic and (ii) extrinsic. In the context of the research of [14], the motivation is the intrinsic, aiming at (i) increasing employee satisfaction; (ii) transmitting optimism to colleagues; (iii) social interaction; and (iv) interpretation of the concept of gamification applied to their work.

[25] also make an analogy between the definition elements of the game to be simulated and the reasons associated with each type of element, according to the mechanical and dynamic perspectives, as we can see in Table 2.

Table 2. Elements of game definition and their motivations, according to [25].

Motivation	Game Mechanics	Game Dynamics
Intellectual curiosity	Documentation about behavior	Exploration
Achievement	Scoring systems and awards	Collection
Social recognition	Rankings	Competition
Final goal	Levels and reputation	Status acquisition
Social exchange	Group tasks	Collaboration
Cognitive stimulation	Pressure and challenges	Challenge
Self-determination	Characters and world/ virtual trading	Development/ organization

In the context of performance management of a collaborator, its performance always appears as a variable dependent on motivation, where we can study the benefits of using the concept of gamification, according to [26]. The main objective of this concept is to improve human motivation and performance in a given activity, and motivation can be leveraged by the systematic addition of benefits. Depending on the results obtained in the projection and development of products or services, it is possible to transform the professional activity of a collaborator in a game, which is possible through the definition of indicators. According to [17], indicators are metrics used to plan, execute and monitor business strategies, from which the KPIs, key risk indicators (KRIs) and key control indicators (KCIs) are highlighted. These determine the monitoring of the objectives to be fulfilled and allow the monitoring of the relative levels of control with certain tolerance, used in the organizations. In the perspective of [18], gamification is considered as the new trend of capturing high performance in organizations, being a concept also used to improve employee engagement. This approach is especially promising in the business domain as business information systems focus on efficiency issues, rather than focusing on points such as motivation and satisfaction. In order to use this concept in the organizational context, business information systems responsible for business management and business effectiveness can act as mediators for introducing gaming techniques such as scorecards or rapid feedback on real business processes. From a psychological perspective, [18] concludes that it produces significant improvements in collaborators.

In the perspective of studying the evolution of performance management, [15] develops a method to discriminate failures, through a predictive control model. This method monitors the sequence of innovations of the Kalman filter, which can be obtained in closed

industrial circuit, from where we can make an analogy to the use of the concept of gamification. According to the benchmarking study carried out by the author, the final result of the application of the method is an indication of the estimation of the sub-optimal state, which revealed the method contributes to the capture of the high yield. With the objective of producing a process of continuous improvement of a given economic activity, [3] analyzes the performance of its management activities and states that the use of a BAM system can be used to monitor performance management in real time. Since a system of this kind monitors several enterprise systems simultaneously and shows exceptional situations in a dashboard, in case the symptoms of the problem are identified by predefined rules, [3] considers it as a solution that feeds the globalization of the economic activity of the organization. However, since the good financial performance of an organization should accompany the motivation of its employees, according to [16], an enterprise architect must contain a management control system capable of dealing with change, not only at the macroeconomic level, but also at the level of human resources and strategic and organizational planning, considers [6]. For this reason, in conclusion of a study conducted by [15], control at the level of a business process can be defined as any process by which managers direct attention, motivate and encourage the members of the organization to act in a desired way to achieve the company's goal.

The concept of gamification has evolved in such a way that, although it refers to the conversion of different situations of daily life into a game, nowadays, it is seen as an engine of motivation. Although its application is discussed differently by different authors, [27] consider that the concept of gamification refers to a process of continuous improvement of services, with the aim of providing behavioral changes, through the use of game characteristics. Its short-term goal is to transform the professionals, traditionally called *Homo Economicus*, into *Homo Ludens*.

In recent years, such as [1, 28] agrees that gamification has attracted a significant interest in industry and the academic world, not only because of the discussion that surrounds the field of game studies, but also through human-machine interaction, in a more ethical and moral issues. [29] states that, while gaming is increasingly offered to the consumer from a service perspective, the existing literature is very limited, also in particular and surrounding areas, as marketing and motivation.

According to [30], the concept of gamification can also be applied in areas such as logistics, in a perspective of profitability of the business activities, not only of the employees, in agreement with [31, 32]. However, despite its versatility, there is still a large gap regarding the definition and understanding of the concept of gamification in concrete, which makes it difficult to be applied directly, say [1, 33]. Nevertheless, in order to define the concept of gamification, it is necessary to understand the concept of game. In the context of game studies, [11] defines the concept of gaming with a set of conditions necessary to achieve a particular goal, and, from a singular perspective, no single condition is sufficient to define such a concept. [34] considers that the combination of this type of conditions is essential for the effective creation of a game, although it has been verified that there are other authors, such as [35, 36], who defend that there may be unique conditions capable of composing a game, a phenomenon known as *gamefulness*. For this reason, [11] defines the concept of gamified service as a service that can lead the user to live experiences of a game, and distinguishes between this and the concept of game, making possible the application of the *gamefulness* phenomenon as a condition

that is not exclusive of games.

From the gap identified by [1], between the inexistence of the relationship between the concept of gaming and the experiences they provide, there is the so-called concept of service marketing, characterized by a type of service aimed at providing other services or system of services to people. Following the identification of characteristics of game experiences, in the context of the psychological forum, such as (i) mastery, (ii) flow and (iii) suspense, we can then create an interactive process with a value proposition that allows the use of design elements of games as services and service systems.

Depending on the results obtained in the projection and development of products or services, it is possible to transform the professional activity of a collaborator in a game, which is possible through the definition of indicators. According to [37, 38], indicators are metrics used to plan, execute and monitor business strategies, highlighting KPIs, KRIs and KCIs. These determine the monitoring of the objectives to be fulfilled and allow the monitoring of the relative levels of control with certain tolerance, used in the organizations. Since the concept of gamification refers to a process that allows the improvement of a service, according to the research conducted by [39], through the creation of value triggered by the collaborator himself, his potential is based on motivational support.

Gamification is one of today's most powerful technology trends, but the cost and effort of its implementation does not always justify its results. For this reason, companies are actively investigating different ways of overcoming difficulties in projecting successful gamification solutions, say [27]. Even so, in the public education sector, in many cases, this cost-benefit analysis is not taken into account, since the curricular development of the student prevails. It is based on this premise that [1] develop an interactive application based on gamification, aiming to improve knowledge about the English language and use Malaysian higher education as a case study. The same authors also state that the acquisition of new vocabulary in a second language requires repeated expositions. With the use of emerging digital platforms and games, this exhibition is made easier. Given the access to mobile technology, students showed greater engagement and better results when learning English through an app when compared to the traditional teaching approach.

Unlike traditional teaching, technology provides an environment that contributes to greater motivation in learning a particular subject, according to [40]. Since the younger generation spends a greater amount of time using digital tools, including games, it is important that teachers and educators understand the value of including these elements in teaching. However, [41, 42] consider that although the use of gamification has a major impact on education, technology itself cannot serve as a means to ensure that pedagogical meaning and learning objectives are achieved. For this reason, in recent years, many researchers have proposed the integration of the concept of gamification into education as a means to specifically boost learning experience and motivation, such as [43, 44, 45, 46]. According to them, although it is a new concept, its use has played such a role in the sectors mentioned above, where its non-use to enhance motivation and learning is equivalent to the growth of a child without knowing what a game.

Although the concept of gamification first emerged in 2008, by Brett Terrill, with the goal of enhancing engagement of a collaborator to a particular task, it only began to be widespread in the industrial and professional services sectors in 2010. Since there are different definitions for this, [1] redefine the concept as a process of improvement of a certain service, using game experiences, with the objective of supporting the creation of

value to the activities of the employee (player in this case), neglecting possible methodologies and models used. Since there is no analysis of the typology of game elements in the literature used, it is dubious whether rewarding models involved in loyalty programs, decision support systems, and other services that consider the assignment of points, levels and progress metrics could be included. However, if we consider the concept of affordance as part of the concept of gamification, it is necessary to define models that allow the calculation of the evolution of the collaborator throughout the game.

The term of affordance refers to elements that allow the execution of certain activities in the field of human-machine interactions, opening the possibility of experiencing experiences through recognition. According to [47], in the case of stimuli projected with the purpose of providing certain behavior to the user, affecting the psychological state of the user, then it is motivational affordances, a statement with which agree [48, 49].

Since the definition of business architectures presupposes the alignment between the business and IT, regardless of the business model and methodologies used, it should be possible for the collaborator to be able to compare himself with other colleagues of the same profile, through collaborative tools that allow the sharing of results in real time. However, when using a gamification system, the profitability of the economic activity of the organization is addressed more efficiently and better results are presented. In order to improve such monetization, such systems should be embedded in the business model in practice, a theme that will be addressed throughout the next section.

According to [2], organizations are increasingly living in dynamic environments, where internal and external changes are constant, not to increase the motivation of their employees, but because they feel the need to become increasingly competitive in the market where operate. For this reason, according to Chenhall and Euske (2007), the role of management control systems has become a concern for professionals and researchers in the area of management.

Although employee motivation is not the focus of corporate development, according to [50], the social comparison between employees, whether individual or through rankings, acts as an engine for implementing changes in habits and wants. Social comparison allows the employee to evaluate their opinions and abilities. In the absence of a goal, the focus is on assessing their own abilities, although the need for comparison shrinks as the gap between skills increases, say [7, 43]. Specifically, and according to [50], normative comparison is a type of social comparison in which one individual (or group) is compared statistically against another group. For this reason, feedback is an essential tool in this forum, allowing employees to better evaluate their performance by monitoring and comparing their behavior. By using direct communication channels, it is possible to collect data, not only for benchmarking, but also to provide behavioral change in collaborators, as with agree Iyer *et al.* (2018) in a different perspective.

Considering the different management cultures present in many of the organizations of the day, management control systems become useful in the strategic response to the creation of organizational silos. Although this depends on the business model adopted, in the context of change management, Chenhall and Euske (2007) and [51] consider these types of systems to be an impetus to operational management focused on implementation. Different studies indicate that, as a general rule, incremental innovation mechanisms should be managed differently from radical innovation mechanisms. However, [8] suggests the opposite and focuses on the research and development activities of pharmaceutical com-

panies. Here, technological innovation has acted as an engine for achieving competitive advantage, not only because of globalization, but also because of the acceleration of product lifecycles, increased competition, technological fusion or the commercialization of products in different media. Although it is an industrial sector with a very strong market, particularly and constantly profitable, it is not immune to business competition. The basis of competitive advantage in the pharmaceutical industry lies in successful innovation, hence the fact that its investment in research and development is far superior to that of any other high-tech, electronic or aeronautical industry. For this reason, organizational control is one of the key points to be considered. This can be defined as any process by which managers direct their attention, motivate and encourage the members of the organization to act in the desired way, so that the organization's goals are achieved in the best possible way. At the same time, structural control, also known as bureaucratic or behavioral control, is another pillar to be taken into account, since it allows the regulation of activities and behaviors and is often implemented in the form of rules and procedures. In this configuration, different forms of input, behavior, and output control allow scientists to effectively conduct their work and align it with different collaborative and professional goals. Although organizational control influences innovation, this depends on the nature of product development activity.

As already mentioned previously, the concept of gamification is a trend under which all the activities, defined by the constituent processes of a given business model, can be measurable in order to maximize organizational efficiency and employee engagement, according to [18, 52].

Since a business architecture with a high level of maturity provides for the qualification of the use of technology in business management and information systems, according to [53], we can adopt Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) or Supply Chain Management (SCM). They will serve as mediators for introducing gaming techniques such as scorecards, real-time performance monitoring, and rapid feedback on business processes performed in real-time, with which they agree [18]. According to the assumptions of [53], the centralization of decision making is one of the capabilities that can be used, although this may affect the use of business architecture standards. Because centralization increases the ease of communication between technology and management areas, management has a greater amount of opportunity to voice its concerns in the process of setting standards. At the same time, this centralization facilitates compliance assurance, causing all identified exception cases to receive due process. Since this is not an emerging theme enough, there are already related projects exemplifying the performance of projects of performance profitability, using different business models.

Business performance management enables organizations to monitor and respond to changes in the business environment in order to optimize business performance and relate it to business objectives. Business performance is measured through KPIs to reflect the return of business activities under the technology layer. Here, an indicator is defined according to a high-level perspective with respect to the business, and is calculated and extracted from the source under the technological layer. Any transactional activity, in the technological layer, potentially affects the result of the KPIs, which have to be adapted

and propagated to the business performance management system for a possible analysis, as with agree [54, 55].

Remembering the research about TE process, already mentioned, it can be introduced the concept of gamification. While it is sometimes necessary to redefine a root enterprise architecture, [2] state that, although its implementation is costly, traditional approaches to restructuring strategic planning should be avoided. Among the different identified risks, we highlight the technical and the social, where the instability of the organizational environment and the reduction of engagement to the success of projects is highlighted.

It is not new that the concepts addressed in corporate and leadership areas were developed within the military. Although economists have recently begun to understand the importance of the democratic role in professional development, according to [56], the stronger an army, the more benefits we get. For this reason, it is important to create organizational silos capable of evolving with synergetic objectives.

According to [3], motivational theories confirm that different collaborators have various needs and desires. The concept of gamification allows us to use such factors, based on those needs and desires, to obtain the completion of a given task. Its application aims not only to increase productivity, but also to improve its enthusiasm. The specific case of the application of related models in departmental silos composed of human resource specialists is one of the successful ones in the market. At the same time, by applying the concept of gamification to recruitment and training for evaluating employee performance and welfare activities, it is possible to improve their engagement. With the increase of competition and labor supply in economic activities of the tertiary sector, [3] reinforces that it is urgent the gradual improvement of the satisfaction of the different collaborators.

Although most of the activities measured by these models are not virtual, the use of technology to make such measurements is very useful. According to [2], there are two types of methods for this: (i) autonomous and (ii) social. The autonomous ones offer tasks, that are verified or monitored according to the algorithms configured in the system like tests and questionnaires; while social ones allow direct or indirect interaction with real personnel, including communication and verification tasks.

According to [57], these models become useful because they offer certain motivational support to employees, be it intrinsic or extrinsic. Intrinsic motivational support is rooted directly in the task, while the extrinsic motivational support is related to the fulfilment of external objectives, and is often related to an extraordinary remuneration. Although the concept of gamification first emerged in 2008, by Brett Terrill, with the goal of enhancing engagement of a collaborator to a particular task, it only began to be widespread in the industrial and professional services sectors in 2010. Since there are different definitions for this, [4] redefines the concept as a process of improvement of a certain service, using game experiences, with the objective of supporting the creation of value to the activities of the employee (player in this case), neglecting possible methodologies and models used. Since there is no analysis of the typology of game elements in the literature used, it is dubious whether rewarding models involved in loyalty programs, decision support systems and other services that consider the assignment of points, levels and progress metrics could be included. However, if we consider the concept of affordance as part of the concept of gamification, it is necessary to define models and frameworks that allow the calculation of the evolution of the collaborator throughout the game.

3. DEVELOPED GAMIFICATION FRAMEWORK

As a result of the need to boost the results of consulting companies operating in IT, pharma and professional services' sectors, a gamification framework was developed. It acts not only on the results of the company and the employees themselves, but also on their commitment.

Gamification in a standard context can be translated as a competition that is created where a number of people perform activities to score points and to win their league, in the case that has different profiles playing in more than one league, with which [37]. The activities are related to their normal activities with some stretch targets to enhance performance and to distinguish between players. Fig. 3 shows a diagram that elucidates the background where gamification, as a way to enhance people performance and solve the lack of their adherence, may work.

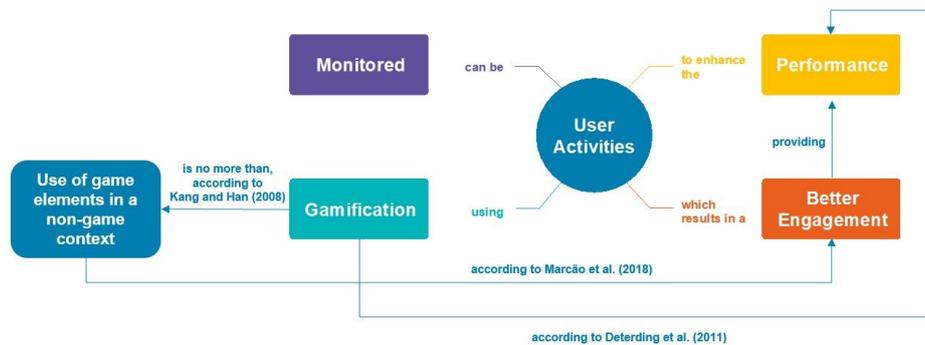


Fig. 3. Gamification background.

It's a framework that provides a continuous improvement cycle of 20% overall for each iteration, as we can see in Fig. 4. This framework is based on four stages, numbered from 0 to 3, which are described in Table 3.

Starting with Stage 0 (Assess), interviews should be conducted with the various interlocutors of the management of the company concerned, to understand which areas most need intervention. In addition to the results, it is also necessary to measure the behavioral component so that the indicators are aligned with the different profiles.

In Stage 1 (Define), the communication groups, called leagues, are defined according to the alignment between the professional and behavioral profile of each employee; as well the size of the teams that will be part of each league and the number of teams that should be playing. In addition, they are defined different analysis indicators of three typologies: KPIs, KRIs and KCIs; and they should have a weight of 50%, 30% and 20%, respectively. Using biomimicry, calculation rules should be defined to allow them to be measured using the first ten levels of the Fibonacci sequence as a standard. At this stage, it is still necessary to define the timeline in which the program will run, control model and used technology for data collection and results sharing, whose example apps are shown in Figs. 5 and 6.

In Stage 2 (Launch), the gamification program is presented, with all leagues, their teams and indicators, expected timeline and the prize (or prize typology) that the winning

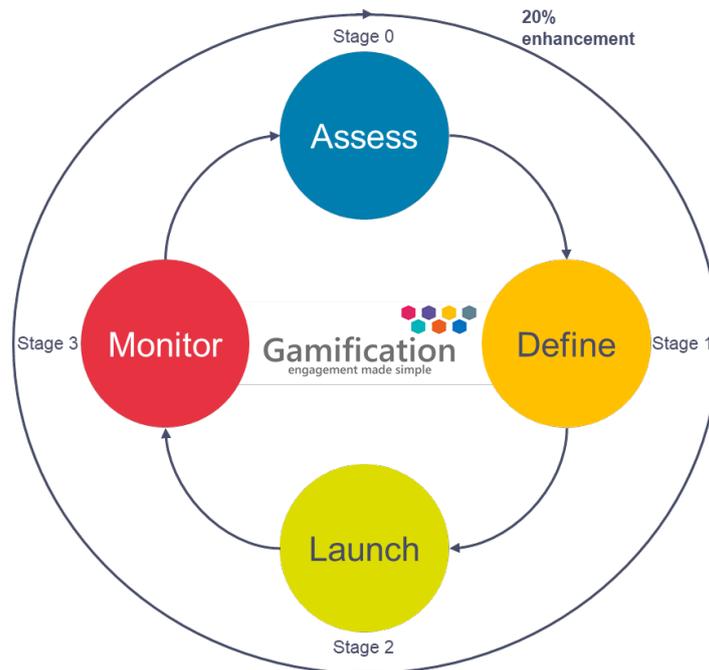


Fig. 4. Gamification framework.

Table 3. Stages of the gamification framework.

Stages	Description
0: Define	Areas to be improved
1: Define	i) Indicators that should be measured ii) Leagues according to the profiles in each area to be improved iii) Dimension of the teams iv) Number of leagues v) Game dynamics vi) Used technology vii) Timeline of the program viii) Number of teams
2: Launch	Gamification program
3: Monitor	i) Teams ii) Indicators iii) Engagement of the people iv) Results v) Score evolution

teams will award. As we can see in the conceptual map of Fig. 7, this type of program allows to improve performance by measuring indicators, addressing both intrinsic and extrinsic motivation.

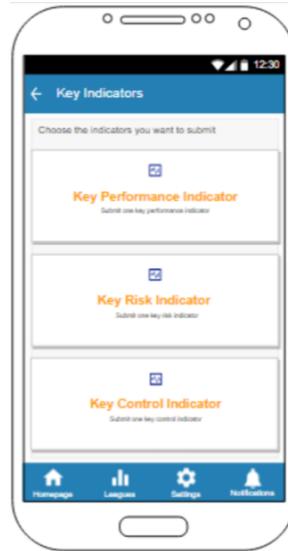


Fig. 5. Mockup of the mobile app to support the framework.

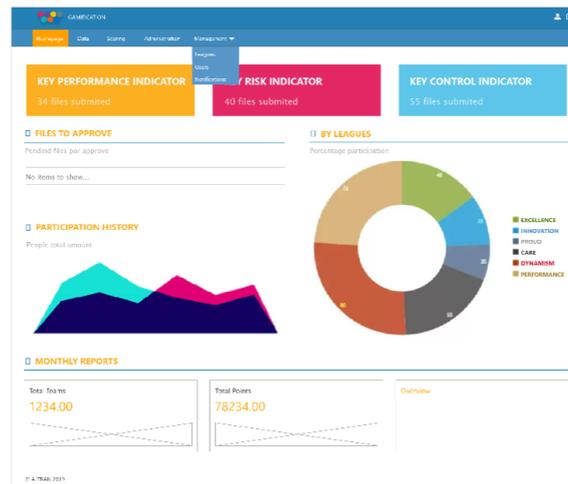


Fig. 6. Mockup of the web app to support the framework.

In Stage 3 (Monitor), the entire previously defined control model is applied, and the results achieved by indicator, percentage of completion against the predefined goal (20% of enhancement), evolution of team score and level of engagement, with a weighted average against team and league. Whenever the overall engagement level (arithmetic mean between leagues) decreases, a boost should be applied to boost the players participation.

The application of this framework is foreseen in two approaches: (i) Top management and (ii) Project management. In the first approach, it is applied the framework end to end as described above. In the second, there is the particularity that only two types

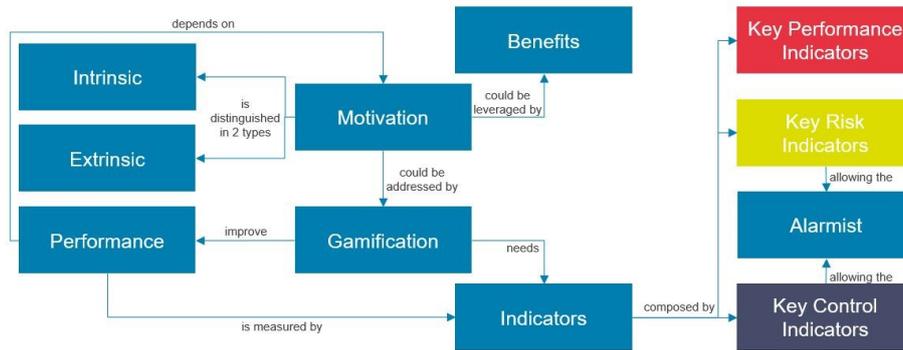


Fig. 7. Conceptual map correlating motivation and indicators.

of indicators are considered: KPIs and KCIs, with a weighting of 50% each, since risk management is one of the pillars of project management practice, according to [19].

In Figs. 8 and 9, we can see the differentiation between indicator typologies, depending on the approach.

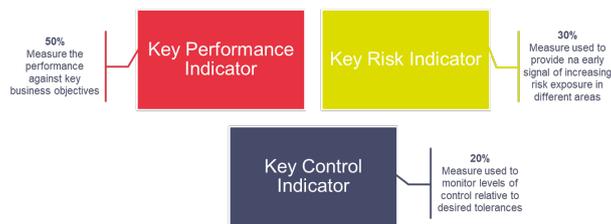


Fig. 8. Top management approach.

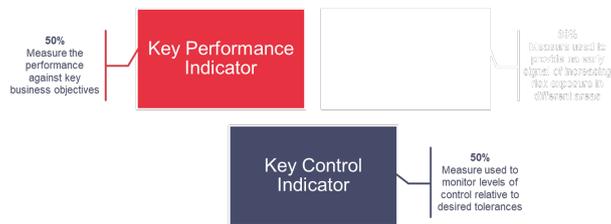


Fig. 9. Project management approach.

4. CONCLUSION REMARKS

The different approaches to the above theme denote the existence of a fine line between the choice of methodology for the realization of the intended conceptual model, the choice of the appropriate modeling language, the choice of the business framework that best fits the objective case study and the definition of the necessary indicators.

Using the Zachman Framework to define the intended conceptual model, it is possible to design and define the use cases, activities and business processes of the future enterprise architecture, define the indicators and implement the work evaluation method, following the DSR methodology guidelines.

Indicators are metrics used to plan, execute and monitor business strategies. These include performance and control, which determine the monitoring of objectives to be achieved and allow the monitoring of relative control levels with a certain tolerance, used in organizations, say [58].

Using the same specification for n conceptual models, changing only the indicators and the emphasis of the identified use cases, makes it easier to create value through business insight. In this way, according to [59], the alignment between existing and required processes can be achieved more quickly and consequently with a higher success rate, while ensuring one of the high performance principles of IT, say [60].

Today, companies, especially those active in information technology, face increasing difficulty in retaining their talents. For professionals in this area, working in large technology companies such as Microsoft or Amazon is certainly attractive, however, even these show a great turnover of their employees. Despite the observable evidence that humans are liberally endowed with intrinsic motivational tendencies, according to [14], this propensity is something expressed only under specific conditions. Although, in the field of commercial efficacy, the most salient motivation is of the extrinsic type, by the underlying economic activity, according to [61], feedback continues to be a very useful personal and hierarchical control mechanism for the development of the employee and his/ her company. This allows you to not only monitor and compare your behavior, but also evaluate its performance.

According to [6], the role of Management Control Systems (MCS) has become an important concern for professionals and researchers in the fields of economics and management, regarding different organizational changes. With its use of the area under focus in this document, it is possible to carry out a statistical analysis with different parameters, defined by the indicators presented in the gamification model used, with which it agrees [2].

Although the definition of the gamification concept proposed by [11] culminate around the set of game design elements, which implies that a service system is considered gamified when it is based on the existence of game characteristic elements in that system; the definition of gamification proposed by [4] focuses on the motivation and the different psychological states of the player. These states focus on motivational affordances and allow the focus of this definition of gamification to be related to psychological outcomes, rather than being related to design specificities. Besides acting as mediators of behavioral results, they allow the creation of value to the concept of gamification. Specifically, adopting this definition, according to [62], such a service system invokes psychological states and emotions, which allows to mediate behavioral results, providing value creation.

The concept of gamification allows the addressing of themes such as engagement and player performance. However, its use need not necessarily correspond to an inherently successful process. Gamification only guarantees player support in the development of gaming experiences in order to promote value creation. However, depending on the indicators associated with the model in practice, we can enhance its development and that of its activities, according to [11], which provides the profitability of the results and their

performance. In the case that the concept of gamification is applied in order to improve certain behaviors, instead of focusing on the emerging experiences of players, designers run the risk of falling into a trap, which leads to the conflict between the intended goal of behavior change development of value-added experiences.

Because the application of performance management models, based on the concept of gamification, depends on the standard of business architecture adopted, which is related to the management of IT services per business unit, according to [53], it is necessary to take into account different organizational control variables: (i) years of architecture experience; (ii) architecture objective; (iii) support for top management; (iv) problems with legacy systems; and (v) organizational and industrial dimensions.

The use of business architecture standards for business applications allows to describe and understand the applications required to successfully execute business processes, along with an assessment of their strategic value and impact on running the business. In this way, the use of this type of standards is directly associated with the management of the IT infrastructure and the execution of processes to control and monitor the configuration and the conformity of the standards. On the other hand, the business architecture standards for integrating business applications have a more complex management, requiring a greater involvement of all the pillars of the company. Thus, it is important to clearly define the main roles at the architecture level in order to ensure the involvement of business units and architects with the necessary knowledge to establish and implement a viable set of business architecture standards. In conclusion, [53, 63] reaffirm that the use of enterprise architecture standards for data integration may not have positive effects because of its high complexity, and, therefore, only significantly positive in the development of IT application planning.

In order to ensure greater efficiency, organizations should be more demanding in making decisions, regarding the adoption of IT governance mechanisms because it is necessary to define which resources will be managed using business architecture standards and what their typology.

According to [61], it is one of the most important tools in all organizations, because it allows employees to evaluate their performance, contrasting their results in a temporal perspective. Since the definition of business architectures presupposes the alignment between business and technology, [6] it also considers that employee performance should be shared in different dashboards, as a perspective of real-time results sharing, which, together to an accompanying model based on a gamification system, according to [64], is very useful for the profitability of the employees' performance and the economic activity of the organization.

However, despite the clear and necessary use of technology to detriment of human morale and citizens' rights in many cases studied, monitoring is a seemingly essential term for organizations. If one assesses the simplest case of third party monitoring not explicitly authorized by the employees concerned – mailbox monitoring – we have a gap created between top managers and low-level employees who feel some invasion of privacy. Top managers indicate that it is extremely important that this remains in practice, unlike low-level employees, because they use e-mail as a communication tool among co-workers and not just for work-related topics.

In 1997, according to the American Management Association 14.9% of the managers included in the survey reported that they reviewed the e-mail messages sent by the em-

ployees they managed. In 2001, the study was applied again and the figure rose to 46.5%, from which it is possible to describe a positively rising trend curve. Since US labor law is unclear in this regard, there has been a way around the situation, and employees, though dissatisfied, eventually accept these working conditions, say [65].

For this reason, it is concluded that the acceptance of technology as a means of monitoring is often characterized by the detriment of the feeling of invasion of privacy. For this reason, it is urgent to review the research methods applicable to the intended universe, adapted to contemporary reality, using duly justified *in situ* observations, so as not to disregard possible conflicts between ethics, privacy and the acceptance of technology in our daily life. Despite the success of the different projects, only then can the reaction products be satisfied not only with the project results, but also with their performance results.

According to the guidelines presented by [66], to acquire added value through the implementation of business architectures with gamification models: (i) avoid the traditional approach in strategic planning; (ii) outline a future strategy that maximizes the current performance; and (iii) evaluate the intermediate effects of IT use for the generation of added value; an enterprise architecture must be designed to capture maximum flexibility and agility so that drivers of effective motivation can be used, such as the concept of gamification under study.

Applying this framework in particular can be very useful to drive not just the commitment of the employees, and the results of the company, but also to help the company driving the annual appraisal for employees.

REFERENCES

1. I. R. Mchucha, Z. I. Ismail, and R. P. Tibok, "Developing a gamification-based thesaurus app to improve english language vocabulary: a case study of undergraduate students in Malaysia," *Carnival on E-Learning*, 2017, p. 43.
2. R. V. Bradley, R. M. E. Pratt, T. A. Byrd, and L. L. Simmons, "The role of enterprise architecture in the quest for value," *MIS Quarterly Executive*, Vol. 10, 2011.
3. J. G. Kang and K. H. Han, "A business activity monitoring system supporting real-time business performance management," in *Proceedings of IEEE 3rd International Conference on Convergence and Hybrid Information Technology*, Vol. 1, 2008, pp. 473-478.
4. K. Huotari and J. Hamari, "A definition for gamification: anchoring gamification in the service marketing literature," *Electronic Markets*, Vol. 27, 2017, pp. 21-31.
5. A. Siegfried, M. Heffernan, M. Kennedy, and M. Meit, "Quality improvement and performance management benefits of public health accreditation: national evaluation findings," *Journal of Public Health Management and Practice*, Vol. 24, 2018, pp. S3-S9.
6. R. H. Chenhall and K. J. Euske, "The role of management control systems in planned organizational change: An analysis of two organizations," *Accounting, Organizations and Society*, Vol. 32, 2007, pp. 601-637.
7. L. Piras, P. Giorgini, and J. Mylopoulos, "Acceptance requirements and their gamification solutions," in *Proceedings of IEEE 24th International Requirements Engineering Conference*, 2016, pp. 365-370.

8. B. Laura, "Cardinal, technological innovation in the pharmaceutical industry: The use of organizational control in managing research and development," *Organization Science*, Vol. 12, 2001, pp. 19-36.
9. K. Vidačković, I. Kellner, and J. Donald, "Business-oriented development methodology for complex event processing: demonstration of an integrated approach for process monitoring," in *Proceedings of the 4th ACM International Conference on Distributed Event-Based Systems*, 2010, pp. 111-112.
10. O. Velcu-Laitinen and O. M. Yigitbasioglu, "The use of dashboards in performance management: Evidence from sales managers," *International Journal of Digital Accounting Research*, Vol. 12, 2012, pp. 39-58.
11. S. Deterding, D. Dixon, R. Khaled, and L. Nacke, "From game design elements to gamefulness: defining gamification," in *Proceedings of the 15th ACM International Academic MindTrek Conference: Envisioning Future Media Environments*, 2011, pp. 9-15.
12. K. H. Han, S. H. Choi, J. G. Kang, and G. Lee, "Business activity monitoring system design framework integrated with process-based performance measurement model," *WSEAS Transactions on Information Science and Applications*, Vol. 7, 2010, pp. 443-452.
13. R. V. Bradley, R. M. Pratt, T. A. Byrd, C. N. Outlay, and D. E. Wynn, "Enterprise architecture, its effectiveness and the mediating role of its alignment in US hospitals," *Information Systems Journal*, Vol. 22, 2012, pp. 97-127.
14. R. Ryan and E. Deci, "Intrinsic and extrinsic motivations: classic definitions and new directions," *Contemporary Educational Psychology*, Vol. 25, 2000, pp. 54-67.
15. C. A. Harrison and S. J. Qin, "Discriminating between disturbance and process model mismatch in model predictive control," *Journal of Process Control*, Vol. 19, 2009, pp. 1610-1616.
16. T. Besley and J. A. Robinson, "Quis custodiet ipsos custodes? civilian control over the military," *Journal of the European Economic Association*, Vol. 8, 2010, pp. 655-663.
17. R. P. Marcão, G. Pestana, and M. J. Sousa, "Corporate frameworks and technological products focusing alarmistic and monitoring indicators of control and performance," in *Proceedings of IEEE 11th Iberian Conference on Information Systems and Technologies*, 2016, pp. 1-6.
18. P. Herzig, M. Ameling, and A. Schill, "A generic platform for enterprise gamification," in *Proceedings of Joint Working IEEE/IFIP Conference on Software Architecture and European Conference on Software Architecture*, 2012, pp. 219-223.
19. PMI, *Project Management Body of Knowledge*, Project Management Institute, 2007.
20. M. Sailer, J. U. Hense, S. K. Mayr, and H. Mandl, "How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction," *Computers in Human Behavior*, Vol. 69, 2017, pp. 371-380.
21. K. Huotari and J. Hamari, "Defining gamification: a service marketing perspective," in *Proceeding of the 16th ACM International Academic MindTrek Conference*, 2012, pp. 17-22.
22. J. Hamari and J. Koivisto, "Social motivations to use gamification: An empirical study of gamifying exercise," in *Proceedings of the 21st European Conference on Information Systems*, Vol. 105, 2013.

23. I. Ajzen, "The theory of planned behavior," *Organizational Behavior and Human Decision Processes*, Vol. 50, 1991, pp. 179-211.
24. N. Chandler, B. Hostmann, N. Rayner, and G. Herschel, "Gartner's business analytics framework," *Gartner Report G*, Vol. 219420, 2011, p. 2011.
25. I. Blohm and J. Leimeister, "Design of it-based enhancing services for motivational support and behavioral change," *Business & Information Systems Engineering*, Vol. 5, 2013, pp. 275-278.
26. R. P. Marcão, G. Pestana, and M. J. Sousa, "Gamification in project management," in *Proceedings of the 2nd International Conference on Economic and Business Management*, 2017, pp. 852-861.
27. J. Hamari and P. Parvinen, "Introduction to gamification minitrack," in *Proceedings of the 50th Hawaii International Conference on System Sciences*, 2017, p. 1277.
28. B. Huang, K. F. Hew, and C. K. Lo, "Investigating the effects of gamification-enhanced flipped learning on undergraduate students' behavioral and cognitive engagement," *Interactive Learning Environments*, 2018, pp. 1-21.
29. A. J. Kim, "Putting the fun in functional: applying game mechanics to functional software," *Google TechTalks*, Vol. 29, 2009.
30. J. Hense, M. Klevers, M. Sailer, T. Horenburg, H. Mandl, and W. Günthner, "Using gamification to enhance staff motivation in logistics," in *Proceedings of International Simulation and Gaming Association Conference*, 2013, pp. 206-213.
31. C. Di Chio, J. Merelo, S. Cagnoni, F. Neri, C. Cotta, M. Preuss, M. Ebner, H. Richter, A. Ekárt, J. Togelius, A. Esparcia-Alcázar, and G. Yannakakis, "Lecture notes in computer science (including subseries lecture notes in artificial intelligence and lecture notes in bioinformatics): Preface," *Lecture Notes in Computer Science*, LNCS Vol. 6624, No. Part 1, 2011.
32. H.-J. Park and J.-H. Bae, "Analysis and survey of gamification," in *Proceedings of International Workshop on Game and Graphics*, 2013.
33. A. Lieberoth, N. H. Jensen, and T. Bredahl, "Selective psychological effects of nudging, gamification and rational information in converting commuters from cars to buses: A controlled field experiment," *Transportation Research Part F: Traffic Psychology and Behaviour*, Vol. 55, 2018, pp. 246-261.
34. J. Juul, "The game, the player, the world: Looking for a heart of gameness," *PLURAIIS-Revista Multidisciplinar*, Vol. 1, 2018.
35. D. Takahashi, *Game Guru Jane Mcgonigal Says "Gamification" Should Make Tasks Hrd, Not Easy*, Academic Press, 2011.
36. O. Pedreira, F. García, N. Brisaboa, and M. Piattini, "Gamification in software engineering—a systematic mapping," *Information and Software Technology*, Vol. 57, 2015, pp. 157-168.
37. R. N. Landers, E. M. Auer, A. B. Collmus, and M. B. Armstrong, "Gamification science, its history and future: Definitions and a research agenda," *Simulation & Gaming*, Vol. 49, 2018, pp. 315-337.
38. F. Dalpiaz, R. Ali, S. Brinkkemper *et al.*, "Special section on gamification and software engineering," *Information and Software Technology*, Vol. 95, 2018, p. 177.
39. B. Morschheuser, L. Hassan, K. Werder, and J. Hamari, "How to design gamification? a method for engineering gamified software," *Information and Software Technology*, Vol. 95, 2018, pp. 219-237.

40. K. Bovermann and T. Bastiaens, "Using gamification to foster intrinsic motivation and collaborative learning: A comparative testing," in *EdMedia+ Innovate Learning*, Association for the Advancement of Computing in Education, 2018, pp. 1128-1137.
41. M. M. Yunus, L. Kwan, N. Said, K. Karim, R. Jani, and M. Shamsul, "Educational gaming: the influence of video games on esl students' writing skills," in *WSEAS International Conference on Recent Advances in Computer Engineering Series*, 2012, pp. 355-360.
42. M. R. Wells, K. Demirjian, B. Hammel-Cobb, L. Kelly, and C. Riegner, "Gamification of the science classroom: an investigation of the use of an online gaming platform to improve student performance," *Interdisciplinary STEM*, Vol. 39, 2018.
43. D. E. Osheim, "This could be a game: defining gamification for the classroom," *San Jose State University Scholar Works*, 2013.
44. C. M. Garland, "Gamification and implications for second language education: a meta analysis," *the Repository at St. Cloud State University*, 2015.
45. M. N. Nourdin and M. G. B. Quintana, "Word-y: Structure and content design of educational videogame to learn english as a 12," *Nuevas Ideas en Informática Educativa*, 2015, pp. 678-683.
46. G. A. Gunter, L. O. Campbell, J. Braga, M. Racilan, and V. V. S. Souza, "Language learning apps or games: an investigation utilizing the retain model," *Revista Brasileira de Linguística Aplicada*, Vol. 16, 2016, pp. 209-235.
47. F. Blin, "The theory of affordances," *Language-Learner Computer Interactions: Theory, Methodology and CALL Applications*, 2016, pp. 41-64.
48. P. Zhang, "Technical opinion motivational affordances: reasons for ict design and use," *Communications of the ACM*, Vol. 51, 2008, pp. 145-147.
49. M. Sherriff, M. Floryan, and D. Wert, "Achievement unlocked: Investigating which gamification elements motivate students," in *Proceedings of ASEE Annual Conference & Exposition*, Vol. 10, 2016, p. 26500.
50. W. Roos and R. van Eeden, "The relationship between employee motivation, job satisfaction and corporate culture," *SA Journal of Industrial Psychology*, Vol. 34, 2008, pp. 54-63.
51. L. Piras, E. Paja, P. Giorgini, J. Mylopoulos, R. Cuel, and D. Ponte, "Gamification solutions for software acceptance: a comparative study of requirements engineering and organizational behavior techniques," in *Proceedings of IEEE 11th International Conference on Research Challenges in Information Science*, 2017, pp. 255-265.
52. E. A. Cudney, S. L. Murray, C. M. Sprague, L. M. Byrd, F. M. Morris, N. Merwin, and D. L. Warner, "Engaging healthcare users through gamification in knowledge sharing of continuous improvement in healthcare," *Procedia Manufacturing*, Vol. 3, 2015, pp. 3416-3423.
53. W. F. Boh and D. Yellin, "Using enterprise architecture standards in managing information technology," *Journal of Management Information Systems*, Vol. 23, 2006, pp. 163-207.
54. M. Khalil, J. Wong, B. de Koning, M. Ebner, and F. Paas, "Gamification in moocs: A review of the state of the art," in *Proceedings of IEEE Global Engineering Education Conference*, 2018, pp. 1629-1638.

55. J. Hamari, L. Hassan, and A. Dias, "Gamification, quantified-self or social networking? matching users' goals with motivational technology." *User Modeling & User-Adapted Interaction*, Vol. 28, 2018, pp. 35-74.
56. S. Singh, "Gamification: A strategic tool for organizational effectiveness," *International Journal of Management*, Vol. 1, 2012, pp. 108-113.
57. I. V. Osipov, E. Nikulchev, A. A. Volinsky, and A. Y. Prasikova, "Study of gamification effectiveness in online e-learning systems," *International Journal of Advanced Computer Science and Applications*, Vol. 6, 2015, pp. 71-77.
58. O. Yigitbasioglu and O. Velcu, "A review of dashboards in performance management: implications for design and research," *International Journal of Accounting Information Systems*, Vol. 13, 2012, pp. 41-59.
59. N. Ayachitula, M. Bucu, Y. Diao, S. Maheswaran, R. Pavuluri, L. Shwartz, and C. Ward, "It service management automation-a hybrid methodology to integrate and orchestrate collaborative human centric and automation centric workflows," in *Proceedings of IEEE International Conference on Services Computing*, 2007, pp. 574-581.
60. R. E. Dvorak, E. Holen, D. Mark, W. F. Meehan *et al.*, "Six principles of high-performance it," *McKinsey Quarterly*, 1997, pp. 164-179.
61. P. Petkov, F. Köbler, M. Foth, R. Medland, and H. Krcmar, "Engaging energy saving through motivation-specific social comparison," in *ACM Extended Abstracts on Human Factors in Computing Systems*, 2011, pp. 1945-1950.
62. J. Hamari, "Transforming homo economicus into homo ludens: A field experiment on gamification in a utilitarian peer-to-peer trading service," *Electronic Commerce Research and Applications*, Vol. 12, 2013, pp. 236-245.
63. M.-E. Iacob and H. Jonkers, "Quantitative analysis of enterprise architectures," in *Interoperability of Enterprise Software and Applications*, Springer, 2006, pp. 239-252.
64. E. Vail, "Causal architecture: Bringing the zachman framework to life," White Paper, Ptech, Inc., 2002.
65. E. P. Robinson, "Big brother of modern management: E-mail monitoring in the private workplace," *Labor Lawyer*, Vol. 17, 2001, p. 311.
66. R. P. Marcão, G. Pestana, and M. J. Sousa, "Performing enterprise architectures through gamified business models," in *Handbook of Research on Business Models in Modern Competitive Scenarios*, IGI Global, 2019, pp. 232-246.



Ricardo Pateiro Marcão is the responsible for the projection of Gamification Initiatives and also a Project Manager for Strategy, IT and Pharma projects at Altran Portugal, S. A.. Even a Computer Engineer (BSc/ MSc), he did an Executive Master in Management (PT), two another executive educations in Finance (UCP, PT) and Innovation/Strategy (Harvard, USA) and he's finishing his PhD in Management (PT). He is author of some scientific articles and white papers, and has also spoken in some events/ conferences all over the world.



Gabriel Pestana is a promoter of applied research methodologies in the fields of Knowledge Management and Collaborative Decision-Making platforms. His research addresses the study of Business Intelligence solutions with requirements for real-time monitoring of events within critical info-structure. Consolidated experience at implementing solutions settled over the importance of data semantic, context awareness and data analytics with alerts triggered based on the user role/profile. Experienced in conceptualizing and implementing innovative solutions using visual analytic models and techniques to support intelligent business processes.



Maria José Sousa (Ph.D. in Management) is an University Professor and a Research Fellow at ISCTE/Instituto Universitário de Lisboa. Her research interests currently are public policies, information science, innovation and management issues. She is a best seller author in Research Methods, ICT and People Management and has co-authored over 80 articles and book chapters and published in several scientific journals (*e.g.* Journal of Business Research, Journal of Medical Systems, Information Systems Frontiers, European Planning Studies, Systems Research and Behavioral Science, Computational and Mathematical Organization Theory, Future Generation Computer Systems, and others), she has also organized and peer-reviewed international conferences, and is the guest-editor of three Special Issues. She has participated in several European projects of innovation transfer and is also External Expert of COST Association - European Cooperation in Science and Technology and President of the ISO/TC 260 – Human Resources Management, representing Portugal in the International Organization for Standardization.