Joguei, e agora? Reflexões acerca do potencial de contribuição dos Jogos Sérios no desenvolvimento de competências individuais nas organizações

I played, now what? Reflections on the potential contribution of Serious Games to personal competences development in organizations

Jugué, ¿ahora qué? Reflexiones sobre el potencial aporte de los Serious Games en el desarrollo de habilidades individuales en las organizaciones

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Resumo: Uma das alternativas recentes para lidar com a complexidade do desenvolvimento profissional em ambientes organizacionais sujeitos a grandes mudanças e instabilidade tem sido a utilização de jogos sérios. Entretanto, apesar da atenção crescente sobre esse tema, ainda são raras as investigações que analisam os resultados efetivos da ação destes jogos sobre o desenvolvimento das competências individuais de seus participantes. Frente a essa lacuna, este estudo tem como objetivo analisar o potencial de contribuição dos jogos sérios no desenvolvimento de competências individuais nas organizações, a partir da coleta das opiniões de diferentes atores envolvidos nas etapas de ideação, desenvolvimento e execução. Para atingir esse objetivo, foi realizado um estudo de casos múltiplos, em três organizações de grande porte, uma do segmento automotivo e duas do financeiro, as quais aplicaram jogos sérios em ações de treinamento e desenvolvimento. Os dados foram coletados através de entrevistas semiestruturadas, de pesquisas nos sites das empresas, de análise de vídeos, de materiais promocionais e de outras matérias divulgadas na imprensa. Os resultados da

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pesquisa apontam, guardadas as especificidades dos casos analisados, que os jogos sérios têm o potencial de explorar e desenvolver determinados tipos de competências e comportamentos entre os participantes. A análise dos dados ainda revelou outras contribuições importantes: primeiro, a necessidade de métricas qualitativas e quantitativas mais específicas para avaliar a efetividade dos jogos sérios no desenvolvimento de competências individuais e, segundo, evidências de mobilização, durante o jogo, de competências individuais não previstas no planejamento inicial destas atividades.

KEYWORDS
Skills Development. Serious Games. Skills Metrics.

Summary: One option for addressing the complexity of professional development in organizations has recently led to major disruptions: the use of serious games. Despite the increased attention given to them, analyses of their effective results on the development of participants' skills are still rare. Faced with this, the present study examines the potential contribution of serious games to this need. To this end, the opinions of various actors involved in the conception, development, and execution of serious games were collected. A multiple case study was conducted with three large organizations, one in the automotive sector and two in the financial sector, and all using these games for training and development. Data were collected from semi-structured interviews, from research into company websites, from promotional materials and other material published in the media, and from video analyses. Taking into account the specificities of each case, results indicate that serious games have the potential to elaborate and develop certain types of skills and behaviors among participants. Data analysis also revealed other important contributions: first, the need for more specific qualitative and quantitative metrics to evaluate the effectiveness of serious games in developing personal skills and, second, evidence of the mobilization of unanticipated personal skills.

PALABRAS CLAVE
Desarrollo de habilidades. Juegos serios. Métricas de habilidades.

Resumen: Una de las alternativas recientes para afrontar la complejidad del desarrollo profesional en entornos organizacionales sujetos a grandes cambios e inestabilidad ha sido el uso de juegos serios. Sin embargo, a pesar de la creciente atención sobre este tema, aún son escasas las investigaciones que analicen los resultados efectivos de estos juegos en el desarrollo de las habilidades individuales de sus participantes. Frente a esta brecha, este estudio pretende analizar la contribución potencial de los serious games al desarrollo de habilidades individuales en las organizaciones, a partir de recoger las opiniones de diferentes actores involucrados en las etapas de ideación, desarrollo y ejecución. Para lograr este objetivo se realizó un estudio de caso múltiple en tres grandes organizaciones, una del segmento automotriz y dos del sector financiero, que aplicaron serious games en acciones de capacitación y desarrollo. Los datos fueron recolectados a través de entrevistas semiestructuradas, investigación en sitios web de empresas, análisis de videos, materiales promocionales y otros materiales publicados en la prensa. Los resultados de la investigación indican, teniendo en cuenta las especificidades de los casos analizados, que los juegos serios tienen el potencial de explorar y desarrollar ciertos tipos de habilidades y comportamientos entre los participantes. El análisis de los datos también reveló otras contribuciones importantes: en primer lugar, la necesidad de métricas cualitativas y cuantitativas más específicas para evaluar la eficacia de los juegos serios en el desarrollo de habilidades individuales y, en segundo lugar, evidencia de la movilización, durante el juego, de habilidades individuales imprevistas en el inicio. planificación de estas actividades.

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Introduction

The diffusion of digital technologies has required new skills and performance profiles from workers (Cimini, Boffelli, Lagorio, Kalchschmidt & Pinto, 2020), and this calls for significant investment in training and development. However, studies indicate that the return on investment has not been as was expected, both in postering emerging skills and in work performance (Blume, Ford, Baldwin & Huang, 2010; Deloitte Development LCC, 2018; Dutra, 2004; Mehale, Govender & Mabaso, 2021). A recurring criticism of organizational training and development environments that arises in various contexts is that most of these programs fail to accurately reconstruct the work environment and the real conditions and problems faced by professionals (Vazquez & Ruas, 2012).

One option employed to confront this difficulty is the use of gamification tools and serious games in organizational training and development. These have been found to contribute to professional development, and particularly to the development of knowledge, skills, and attitudes, or rather, mobilized elements of personal competences (Allal-Chérif, Bidan & Makhlouf, 2016; El Idrissi, Chemsi, El Kababi & Radi, 2022; Gurbuz & Celik, 2022; Jaunay et al., 2019; Le Boterf, 1995; Mason & Loader, 2019; Michael & Chen, 2006; Miguel, Lage & Galindez, 2020; Ypsilanti, Vivas, Räisänen, Viitala, Ijäs & Ropes, 2014).

According to Ellstron and Kock (2008), the term competence can be used to address a person's ability following certain formal or informal criteria to deal with certain situations or to carry out certain tasks or activities. The competence depends on certain attributes including multiple knowledge systems with formal, experiential, or emotional bases. Such attributes can be physical, cognitive, or affective in which factors such as attitudes,

values, and motivations play a role. These may include personality traits such as self-confidence and social skills like communication and cooperation (Ellstron & Kock, 2008).

For this reason, gamification and serious game have been regarded as relevant tools for training and development programs, especially in sensitive areas such as human-computer interaction (Armstrong, Landers & Collmus, 2016; Armstrong & Landers, 2018; Deterding, 2018; Landers, 2018; van Bree, 2014).

But what is meant by gamification and serious games? Is there a relationship between these ways of using games? The literature on these tools has found it difficult to define the limits of their efficacy, which is understandable given their similarities in this regard. We still therefore lack consensus and insight into their main characteristics (Neidenbach, Cepello & Pereira, 2020; Seaborn & Fels, 2015). The following study seek to elucidate the natures and characteristics of these tools and contribute to their understanding.

For Searborn and Fels (2015), gamification is the process that gives rise to serious games and is defined as the transformation of educational content into a game. Gamification is thus a broad concept that comprises a portfolio of alternatives using elements of design and game language which are not themselves considered "complete games" by users (Menezes & Bortoli, 2018). Gamification can regard games as a challenge, but also as play and having fun, and may incorporate fantasy, imagination, and leisure (Neidenbach et al., 2020). In this article, gamification is a generic field that incorporates virtual environments and video game technology for recreational purposes, for instruction, and for personal training, while also interfacing with other objectives (Menezes & Bortoli, 2018). The term "serious" in serious games implies that they are practical and not purely meant for entertainment. These usually

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contain pedagogical objectives and focus on teaching a chosen subject such that personal competences can be cultivated (Oliveira & Rocha, 2020).

What distinguishes serious games from gamification is their goal of modifying the learner's behavior and attitude and, when possible, influencing their professional and/or personal performance (Landers, 2014). Serious games thus take a more utilitarian approach, although the literature suggests that the fun, engagement, and entertainment of gamification is necessarily a part of this (Deterding, Dixon, Khaled & Nacke, 2011).

For these reasons, serious games have been recognized as tools contributing to the development of the knowledge, skills, and attitudes of working professionals (Allal-Chérif, Bidan & Makhlouf, 2016; Jaunay et al.2019; Mason & Loader, 2019; Michael & Chen, 2006; Ypsilanti et al., 2014). Together with certain activities associated with gamification, serious games are regarded as tools suitable for training and development programs (Armstrong & Landers, 2018; Deterding, 2018; Landers, 2018).

To date, literature evaluating the efficacy of serious games has mostly focused on the operation of games, for example, analyses of game duration, the number of sign-ons, the types of errors and successes, the level of interactivity, in addition to the performance of the algorithm in the players' experience (Kazar & Comu, 2021; Raupach, de Temple, Middeke, Anders, Morton & Schuelper, 2021). Other studies have investigated designers' perceptions of the relationship between the purpose of games and their implementation, and between their potential and users' experiences (Adams, Hart, Jennefer, Beavers, Olivera & Margoudi, 2019; Jaunay et al., 2019; Massoud, Berta, Poslad, De Gloria & Bellotti, 2021). However, there have been fewer studies on the effectiveness of serious games and their contributions to the training and development

of working professionals (Adams et al., 2019; Allal-Chérif et al., 2016; Harvey, Selmanovic, O'Connor & Chahin, 2019). For this reason, although reports examining serious games reveal their great potential in professional development, they do not consistently use analytical instruments capable of providing reliable study results. This has led to a gap in empirical evidence regarding the effectiveness of serious games (Allal-Chérif et al., 2016; Harvey et al., 2019; Jaunay et al., 2019; Kazar & Comu, 2021; Mason & Loader, 2019; Mayer, 2018; Ypsilanti et al., 2014).

With such gaps in the literature, this study seeks to answer the following question: how can serious games contribute to the development of personal competences? In response, this study has as its objective analyzing the potential contribution of serious games to the development of personal competences in organizations based on survey data collected from players post-game together with that of various actors involved in game conception, development, and execution. To achieve this end, an exploratory approach was adopted using the multiple case study method with two financial sector companies and a third in the automotive sector.

Theoretical elements of this study

Potential contribution of serious games to training and development

Specifically, regarding serious games used in professional development in the corporate environment (Michael & Chen, 2006), it was observed that part of the literature on this subject focused on identifying the personal competences most commonly addressed, including interactivity, initiative, negotiation and activity planning (Almeida & Simões, 2019).

Another line of research on the impact of serious games has been dedicated to the field

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of attitudes and postures related to corporate engagement, entrepreneurship, workplace safety, cybersecurity, and awareness leading to action where digital transformation is underway (Adams & Makramalla, 2015; Angafor, Yevseyeva & He, 2020; Brauner & Ziefle, 2022; Calvo & Reio, 2018; Martinez, Montero, Arias & Salcedo, 2019; van Bree, 2014).

Denami (2018) understands that serious games provide a learning environment focused on practices such as interactivity and engagement. In fact, there are several studies that find serious games tend to generate significant player involvement. This promotes deep immersion and concentration (Malone, 1981) in which connections with real-life situations can be established, and it suggests that serious games hold educational potential that is multidimensional in nature (Ypsilanti et al., 2014). Serious games can thus awaken sensations such as excitement, curiosity, anticipation, surprise, or satisfaction, increasing the chances that they will be played for long durations (Denami, 2018; Schoenau-Fog, 2011). These sensations are perceived by players, which gives them another motivational factor (Calvo & Reio, 2018). Furthermore, the potential for personal learning can exceed what is expected since primary interactions can lead to secondary learning and promote unforeseen improvements in the professionals' future performance (Denami, 2018; Derwik & Hellström, 2023).

If these games' virtual environments are capable of offering pedagogical content, players can be encouraged to seek information, which is one mobilizing factor for them (Cerinšek, Petersen & Heikura, 2013). The most intriguing thing is that the results observed from the use of serious games come from different studies conducted in various contexts, such as in companies, universities, hospitals, military organizations and consultancies, and despite being based on relatively generic conclusions, this shows that games have significant potential for practical contribution due to their scope and adaptability (Oliveira & Rocha, 2020).

According to the most recent literature, serious games have the potential to contribute to several aspects related to training: expanding players' knowledge, encouraging the adoption of safe practices, promoting involvement in the quest for knowledge, supporting the will to change, fostering engagement, and, especially, enhancing performance at work (Calvo & Reio, 2018; Feng, González, Amor, Spearpoint, Thomas, Sacos, Lovreglio & Cabrera-Guerrero, 2020; Maheu-Cadotte, Cossette, Dube, Fontaine, Lavallee, Lavoie, Mailhot & Deschenes, 2021; Miljanovic & Bradbury, 2020; Suppan, Abbas, Catho, Stuby, Regard, Achab, Harbarth & Suppan, 2021).

On the other hand, analysis of the publications above as well as similar material reveals the difficulties in consolidating a concept around various competences development methods as well as other associated factors, and determining which of these are most susceptible to development.
One principle found in most studies on serious games so far reviewed is that of preservation of certain features built into the broad spectrum of gamification, specifically, interactivity and entertainment. As a result of this brief review, the present study finds that serious games can be classified as such if they can be used in training and development, and that employing the original appeal of gamification enables professionals' development of knowledge, skills, and attitudes in order to improve their performance at work (Armstrong et al., 2016; Armstrong & Landers, 2018; Deterding, 2018; Landers, 2018; van Bree, 2014).

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The impacts of serious games on personal competences

The spreading use of serious games has notably increased of late and has been aided by growing Industry 4.0 relationships and modes of production (Almeida & Simões, 2019; Ambigaipagam, Wan Fauziah & Sivan; 2019), though studies on their impacts, and especially their impacts competences, are still rare. Expanding our knowledge on serious games would increase the capacity for their use and adaptation as tools for developing professional performance.

According to Grabska-Gradzinska and Argasins-ki (2021), a challenge to this advancement is that many evaluations of serious games are limited to collecting opinions from players regarding their satisfaction with the experience immediately afterwards in what is called a reaction assessment (Kirkpatrick & Kirkpatrick, 2005). Another approach is to observe the results of a very short period of engagement right after a game is completed, which is known as a learning assessment and which is also quite time limited (Raupach et al., 2021). These limited evaluations are only initial contributions to understanding the impact of serious games on the development of professional performance.

An improvement to evaluating the results of such training can be found in the model of Kirkpatrick and Kirkpatrick (2005) which analyzes the results of serious games among 3 Cases. This model consists of 4 criteria: reaction, specifically trainees' satisfaction with the program proposal; the extent of learning in terms of concepts, techniques, skills, and attitudes, both before and after training; what changed in trainees' work behavior because of the program; and results measured by trainees' productivity, work quality and/or innovativeness. The difficulty in identifying more clearly the impacts of serious games on personal competences development is further increased by the diversity of activities in the cases studied in the available literature (healthcare, education, IT, and administration, for example) which hinders systematization and analysis of the results obtained (Kapp, Spangenberger, Kruse & Narciss, 2019).

In fact, the absence of theoretical-empirical references relating to both the results of serious games used in professional development as well as to the proposed goals of these games has made it difficult to conduct analyses on their effective results and made almost every attempt to measure them unfeasible (Urquidi-Martin & Aznar, 2021). This impenetrability is deepened by the lack of empirical studies on the use of personal learning principles and implements for monitoring and evaluating serious games (Buzady, Wimmer, Csesznak & Szentesi, 2022; Sol Calabor, Mora & Moya, 2018).

Considering these challenges to evaluating the potential of serious games for professional development, it was decided that this study should employ an approach anchored in personal competences development. What can be called the competence-based approach encompasses a diversity of theoretical currents and empirical studies that comprise a model with three distinct dimensions: the personal, the collective, and the organizational (Moreira & Munck, 2010). As noted, this proposal is focused on the personal dimension.

More recently, certain forms of emotional intelligence have been identified among the affective factors which are potential attributes of competence. According to several studies, these constitute a predictive factor of great impact on work performance (Joseph, Jin, Newman & O'Boyle, 2015; Fernández-Sánchez, Sierra-Daza & Valverde-Berrocoso, 2020). Emotional intelligence broadly addresses the competences that enable

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awareness of one´s emotional states and those of others, coupled with the ability to regulate or use emotions to positively affect one's performance in different roles (Mattingly & Kraiger, 2019). Examples of emotional intelligence used as competence or competence attributes within organizations include: intrinsic motivation, empathy, active listening, and managing relationships.

From the perspective of systematizing so many elements, we recovered Le Boterf's (1995) classification, organizing what can be called capacities or attributes the elements that will compose and mobilize competence in the action itself, in knowledge (knowledge), knowing do (skills) and know how to be (attitudes and positions), whose acronym is KSAs.

This model enables an operational dynamic of personal competence specifically within the context of organizational management as presented in Figure 1. It shows that improving professional performance and the ability to act in new and complex situations is directly related to the incorporation of content and experience in a professional's competence attributes (Le Boterf, 1995). This personal competences approach can provide a valuable perspective on the process of appropriating and evaluating the impacts of serious games, and especially due to its ability to adapt to different specialties and fields of activity (Chen & Chang, 2010; Ellström & Kock , 2008).
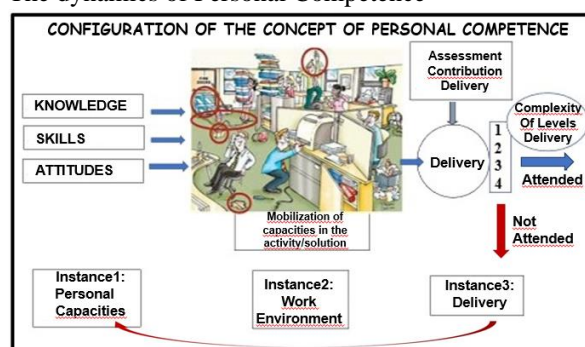
This configuration of personal competence dynamics in the context of organizations, as presented in Figure 1, identifies three interrelated elements (Ruas, 2005). Instance 1 refers to the potential capacities (knowledge, skill, and attitudes) that a person has and mobilizes when they act as a working professional (Le Boterf, 1995). Instance 2 refers to the interaction between a person and their work, and the competence that they use to carry out their assignments

(Ellstron & Kock, 2008). This deals, therefore, with competence in action (Le Boterf, 1995; Zarifian, 2001). Instance 3 refers to the expected performance or the intended solution in-context, which is known as "delivery" and which is evaluated using a metric previously developed in the competence mapping called "complexity of delivery levels " (Dutra, 2004).

Instance 3 is affected by unmet expectations, and this approach provides for the abilities that make up KSAs to be amended with additional training or longer training periods. This approach is represented by the arrow relating delivery to skills which implies continuous adjustment between a person´s capabilities and the demands of the job. This last process can follow a rationale of site-specific personalized learning using either common or selected training programs (Ruas, 2005).

The use of personal competence is intended to include, in the debate on the effectiveness of serious games in professional development, theoretical-empirical parameters already recognized and consolidated in the literature and in managerial experience (Le Boterf, 1995; Zarifian, 2001 ; Dutra, 2004; Ellstron & Kock, 2008).

Figure 1
The dynamics of Personal Competence

Source: Adapted from Ruas (2005)

Methodology

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The present study addresses the impact of serious games on the development of personal competences, highlighting, above all, the yet unknown elements that contribute to demonstrating the effectiveness of games in a real context (Allal-Chérif et al., 2016; Harvey et al., 2019). The multiple case study method was used here to analyze three different instances of the use of serious games. While this perspective can provide new evidence for a theoretical basis that has not yet been developed, this research assumed an exploratory character (Hartley, 1994). The conceptual basis for the case study was Stake's (1998) proposal which comprehends the unique and specific context of each of the three situations that were examined.

Data Collection

In this study, data were collected from multiple sources, both primary and secondary. Primary data were collected through interviews using a semi-structured script. Secondary data was collected through the organizations' website, videos, promotional material and articles published in the press.

Three Cases were selected, two companies in the financial sector and one in the automotive sector. These companies used serious games for training and development activities, each with more than 5,000 participants (players). In the last five years, all the companies studied were given awards and won international titles for their training activities. To be considered in these Cases, only completed training activities qualified. If an activity was still in progress, participants had to have completed a cycle, that is, completely finished a round of the game since, in some Cases, the games took place over the course of a year. All games analyzed here were continuous, and activities that used serious games as an instructional training tool in just a single session were disregarded.

A total of 17 interviews were conducted from November 2018, to April, 2019. The interviews took place remotely, totaling 980 minutes in all, and used a variety of means of communication such as Skype, Appear.in, and telephone. This was due to respondents' being located in several Brazilian states as well as abroad. For each game iteration, an interview script was developed which accounted for each player's role and level of participation. The scripts were created to gather information on the interviewee's relationship with the game, description of the game, the game´s instructional objective, description of concepts (competence, serious games, gamification), instructional use of game elements (rules, mechanics, features, feedback, gameplay) motivation for choosing the game as an instructional tool, game situations/activities meant to develop competence, data source (personal competences to be developed, mapping and survey of personal competences), identification of personal competencies developed in the game, evaluation of personal competencies developed, interactions perceived within the game and post-game, principal difficulties, measurement of personal competences at work, and rating criteria. Players were also asked about their participation in the game (name of the game, interaction time, rounds they participated in, classification, description of rules and perceived mechanics, objective of the game, meaning of the game), how their interaction with the game occurred, why they decided to start and remain playing, what they learned from the game, and the game's relationship with daily activities.

The interviews were audio-recorded and transcribed, totaling 317 pages, and entered into a database. The anonymity of each respondent was ensured, as well as their organization. The software Atlas.TI was used as a database to store all the collected data which was later coded and analyzed. This was

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stored in an electronic folder and backed up on the cloud as well as on an external hard drive.

In the documented information, the rules of the game were taken into account, along with performance demonstrations of the game, press/promotional publications containing public information, videos, and organizations' websites. These documents provided information such as performance indicators, performance data, and game rules, among other things, and these were highlighted among the records and corroborated with other sources and evidence (Stake, 1998).

Two-way data triangulation was conducted on data consisting of two forms. The first in relation to the various types of interviewees with views/hierarchical levels of each game/Case, i.e., game and employee, manager, player, and designer. The second was related to the different types of data obtained: interviews, videos, promotional materials, press articles, and game documents.

Each game had a structure, design, mechanics, and different elements, but all had as their central objective the development of personal competences. This study presents the various perspectives on these, taking into account the detail and depth obtained though the collected data. The authors propose that the readers of this article play an active role, expanding the analysis and comparison in the process of transferability and plausibility (Stake, 1998).

Data analysis

Data analysis was conducted systematically on each Case studied in accordance with the content analysis strategies proposed by Miles, Hinberman, and Saldamages (2014). This analysis deals with different data sources and different perspectives on the same phenomenon. The interpretation of these data adopted the conceptual basis of Stake (1998) in which analytical generalization is sought drawing upon collected data and the literature.

Each of the Cases was analyzed in-depth using inductive analysis to look for patterns and themes emerging from the data. The particular analysis of these Cases aimed to understand phenomena within the context in which they occurred to avoid decontextualization.

Contextualization of the Cases

The objective of this study was to analyze the impact of the use of serious games on professional training and development from the post-game perspective of various actors involved in the conceptualization, development, and execution stages. To describe the context of the selected cases, the corporate environment was examined together with the circumstances of these serious games and the profiles of the interviewees.

Case 1 was a company that manages car dealerships, a leader in this competitive field which seeks to standardize its internal processes. Dealers responsible for sales, after-sales, and maintenance services are independent but must also align their franchise's culture, processes, and quality standards with the parent company. To this end, a corporate university (CU) deals with challenges such as promoting the brand image and ensuring process and procedure standardization in compliance with established values. Training the CU provides covers all phases of the franchises' operational process and aligns their efforts to secure the reputation of the brand.

In this Case, the serious game strategy that was used inaugurated a new digital portal to be used across the whole company. The game software was configured to map personal competences which were applied effectively during activities, with a particular emphasis on those related to customer service. The game

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sought to encourage employees to access the new educational portal and to work on their self-development. This initiative was part of an employee recognition program. With these measures, the company aimed to improve the company's relationship with its employees and reduce turnover.

Case 2 was a company in the banking industry with a broad service network in every Brazilian state and with more than 100,000 employees, including interns and consultants. It also has a CU, the purpose of which is to align its employees with corporate strategy and develop their personal competences through training and development activities, both face-to-face and via e-learning.

Participating in training through voluntary access to the game is a fundamental condition for employees to be included in the company's professional career. In 2018, each employee received, on average, 80 hours of training per year, of which 8.0 hours were in-person and 2.0 hours were in-service training. Training activities are most often developed internally, but sometimes the company's corporate university (CU) turns to the market to hire training providers. Note that the vast majority of training is voluntary and involvement with UC is optional.

The serious game examined in this study is for customer service employees and encourages self-development, career advancement, and supports the company's digital transformation. About 56,000 employees participated in 2017 and 2018, and this game stands out for its support of coursework and encouragement of employee interaction.

The game's strategy is linked to CU′s digital platform and courses, and its runtime ranges from 1 to 6 hours. The game is meant to develop certain skills, train future leaders, foster a sense of belonging within the company, and encourage discussion among employees.

Case 3 was a nationwide finance company with more than 100,000 employees. To encourage employee development and strengthen the brand, this company also operates a CU that has received three excellence awards over the last three years. The UC offers several online and in-person courses, also open to the external community, including courses focused on social voluntarism. Training and development activities are varied and can take place internally or in partnership with other institutions.

The company's human resources department has an area dedicated to internal communication which is responsible for creating events, visual identity, ambiance, and hiring consultancies as necessary. The CU aims to align development activities with organizational strategies while always addressing the fundamental trio of: people, technology, and sustainability.

The course platform has a scoring system that encourages employee participation, and it includes mandatory courses. Over time, three games were developed for internal use and one of these games, the focus of the present study, has had 17,000 players, 80,000 rounds, and 2,000,000 responses to questions. This game focuses on customer service employees to promote professional and personal development, and to expand access to activities for everyone in the organization.

This game stands out for presenting a quiz that encourages the exchange of information and thirst for learning. Access to the game's content was open to all interested employees, and training achieved through gameplay made it possible for participants to gain certification.

The central objective of the game was to encourage proactivity within the CU educational portal, promote self-development, expand access to available content, and accelerate the company's digital transformation. While developing its

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employees, the company also seeks to spread knowledge and reinforce its prominent position in the national financial market.

These three companies use games as instructional tools for a variety of ends. Figure 2 categorizes the various factors behind the use of serious games in these three Cases. These factors prioritized the development of motivational elements such as corporate engagement, interpersonal relationships and organizational culture, effectiveness of training and development activities, increased self-development, and cost reduction. In all Cases, games also encouraged access to the company's online personal education platforms.

Table 1
Mobilizing factors for the use of games

Case 1	Case 2	Case 3
Crises and reduction in sales	Developing proactivity when offering products to customers	Institutional development
Improve customer service and increase sales	Develop understanding of products and the ways customers choose them	Increase engagement with the company
Evaluate relationships with employees	Develop leaders and foster commitment	Increase engagement in the program
Reduce employee turnover	Increase CU engagement	Strengthen organizational culture
Reduce training costs compared to in-person training	Alignment training and development with company strategy	Promote self-development
Launch the new online course platform	Digital transformation	

Source: Research data (2023).

Characterization of Interviewees

Initial contact and interviews were conducted with game managers to determine if the games met the research criteria. Subsequently, others involved in the games

were interviewed as indicated by these managers. Table 2 presents information on the employees' time at the company and the roles played by each interviewee.

Table 2
Identification of Participants

ID	Role in the game	Time at the company	Case
E1	Creator	5 years	1
E2	Designer	-	1
E3	Player	4 years	1
E4	Player	3 years	1
E5	Player	2 years	1
E6	Player	5 years	1
E7	Function Mgr.	2 years	1
E8	Creator	7 years	2
E9	Designer	6 years	2
E10	Player	5 years	2
E11	Player	-	2
E12	Player	15 years	2
E13	Function Mgr.	30 years	2
E14	Creator	-	3
E15	Designer	3 years	3
E16	Player	1 year	3
E17	Player	-	3

Source: Research data (2023).

The following people were interviewed in Case 1: the manager responsible for developing and training the branch network (E1), the consultant specializing in corporate education and who was responsible for developing the game (E2); the technician specializing in vehicle diagnostics, mainly in electronic and engine components (E3); the quality manager responsible for internal processes, performance indicators, and training (E4); the person responsible for after-sales customer service (E5); the service consultant for customer service in repairs (E6); and the after-sales manager working in parts, accessories, and services who is also responsible for employee performance (E7). These players ranged in age from 25 to 38 years old.

In Case 2, the respondents were: the person responsible for developing training solutions (E8); the educational designer working to develop solutions internally (E9); and the manager of E12 who evaluated the

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respondent's post-game performance (E13). E10 works in customer service at the relationship center, E11 is also involved in customer service, and E12 works in cashier service. The players' ages ranged from 29 to 40 years old.

In Case 3, the respondents were employees at administrative headquarters working in the information security and research departments. The game examined here has a national reach, but only players from the administrative headquarters were able to participate. The age of the players ranged from 21 to 24 years old. E14 is responsible for managing the game and communicating with employees. The designer (E15) owns a startup and provides game maintenance, expansion, and customization services. E16 prepares reports in the research and development department, while E17 works in information protection.

Results

The results here are in two parts, the first includes the design and the elements used in each game, and the second is dedicated to analyzing the personal competences developed.

Knowledge Structures, Design, and Evaluation Criteria for Serious Games

Regarding knowledge structures used to design serious games, in Case 1 observations of the work environment and consultations of the employee and office manuals were undertaken; in Case 2, a briefing on organizational strategy, the expressed need for training, and definitions of the personal competences to be developed were all examined; In Case 3, users' experience, observations of the work environment, and knowledge of the defined strategies were evaluated. Clearly these are quite different knowledge structures because while Case 1

focuses on the demands and directives of the internal environment, Case 2 seeks to relate the external and internal environment through strategy and focuses on the resulting need for competences, while Case 3 is more focused on the external environment, specifically customers and defining strategies.

Differences are also evident in the criteria for evaluating games. For Case 1, the game would be considered effective if, during its development, there was an increase in the number of participants, which is a criterion tracked by specific performance indicators. In Case 2, the effectiveness of the serious game depends on the evaluation of participants' reaction to the game, the number of user accesses, and a post-game multiple-choice quiz. For Case 3, effectiveness results from reaching a certain number of participant accesses. Therefore, the criterion for evaluating the effectiveness of serious games that was common to all 3 Cases was the number of accesses and frequency of participation in the game. Using the classic structure of learning assessment criteria based on the Kirkpatrick and Kirkpatrick (2005) model, the reaction assessment criterion is used in 2 of the 3 Cases and, possibly, the quiz in Case 2 as this may fulfill part of the learning criterion, albeit in a limited way. It should be noted that the evaluation criteria are fragile and do not allow, a priori, identification of effective results from training on serious games.

Incentives were created to promote participation in the games. In Case 1, personal awards and recognition were given, as well as cooperation activities between teams, and players were encouraged to interact with players from other areas as well as engage in post-game reflection. Case 2 also used personal awards and recognition together with fostering team cooperation and interaction with colleagues from other departments. Finally, in Case 3, personal awards and

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recognition were also used, and, in this instance, cooperation with staff as well as interaction with colleagues from other departments was encouraged.

Analysis of the use of serious games for personal competence development

Examining the positive aspects of employing serious games for personal development, certain processes stand out in the three Cases studied here. As directed by the managers of all three organizations, the game designers made content available for online access to encourage e-learning. According to the rules, players were to study the content related to each stage of their game prior to playing. This practice fostered self-development among participants which had the potential to influence their future behavior as long as this was undertaken within their organizations.

> Because you can talk to new people who are playing too and, as you don't have a teacher there to tell you what's wrong, you can ask them and see if they got it right, and, if they didn't get it right, you can study together. (E16).

Regarding self-development, the literature points out that one of the merits of e-learning`s development strategy is the close relationship between theoretical learning and practical development, and how this helps participants make sense of theoretical elements when putting them to practical use (Dall'alba & Sandberg, 1996; Sandberg, 2000).

Focusing on decision-making in the didactic use of serious games was another positive result. This was both a goal of these organization and was often appreciated by players in all three Cases.

> Sometimes, your mistake can be something that you can't fix later. I think that's the biggest

learning experience. You realize that your decisions have consequences later" (E12).

> In that case, I think it's about making a decision. Being able to have more confidence in giving an answer... well, this question of the decision itself, of sometimes not having too much doubt or flexibility. In the flexibility of the response, I challenge myself more and I think this competence has improved a lot (E11).

In fact, decision-making is one of the most highlighted aspects in the literature dealing with the results of serious games as this type of game mobilizes player autonomy and impacts their professional goals, personality, creativity, and personal competences (Allal -Chérif et al., 2016). Competence in interacting with employees from other departments was also frequently recognized:

> And because the awards involve trips for those from outside São Paulo, they end up creating it just for the sake of, "ah, the hotel, the van, it's going to leave...," and since it's three days together, they include us too, so as not to lose contact and to help each other. So, the tool we use on WhatsApp, currently I have two or three groups that I participate in, but there are two that talk the most, that really engage (E17).

Addressing competence in interpersonal relationships also rendered a positive result:

> You have to interact only with the people who are there, often you have never seen the person, and you have to have this sympathetic interaction of talking, being clear in what you are saying, being patient, sometimes the person doesn't follow your line of reasoning and you have to be clear, change your responses, shape the situation (E3).

> I became more confident in making decisions, even on a personal level. Interacting more with people made me want to participate in another training, it's really encouraging. In fact, we didn't know the other managers that we would have to deal with, and even if you understand the way the person acts, you have to interact with them, it's your team at that moment, your best has to come out there (E5).

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Employees' actions in carrying out their professional duties is a resource for creating simulations in serious games. These simulations have the potential to arouse emotions such as excitement, curiosity, anticipation, surprise, or satisfaction, thus increasing the chances that a game will be played and will continue for long periods of time. (Denami, 2018; Schoenau-Fog, 2011). This feature was also a positive result of the use of serious games in all three Cases.

Another personal competence highlighted in the research results, particularly in Case 1, was communication, especially with regard to improving and reducing barriers to this capacity. Some of the interviewees reported that gaming activities enabled the development of confidence and the appropriation of knowledge of techniques for their work and their relationships with colleagues and customers. In fact, the relationship with customers was one of the most important issues for game designers and for managers at all three organizations.

Finally, the personal competences principally recognized by players in their serious games and in each of the Cases were: (i) in Case 1, self-development, interpersonal relationships, personal interaction, customer relationships, teamwork, and communication; (ii) in Case 2, self-development, interpersonal relationships, teamwork, customer relationships, and decision making; (iii) in Case 3, self-development, interpersonal relationships, personal interaction, trust and empathy, and teamwork.

In examining serious games as tools for developing personal competences, certain difficulties arise which are intrinsic to the strategies adopted for the games, according to evidence presented by some of the players. First, understanding in greater depth each of the personal competences addressed in the games was difficult given the large and diverse portfolio of personal competences that the games were designed to mobilize.

The prospect of addressing all these personal competences in an effective and sustainable way requires a continuous and long-term program. It is also necessary to consider that, among the difficulties in planning these activities, there were restrictions on the adequate preparation of players, a lack of player monitoring instruments in use during gameplay, and high expectations for improving personal competences Therefore, the planning process did not encounter the conditions needed to implement the ambitious proposal of placing serious games at the center of the strategy for developing personal competences. These conditions led to difficulties for the three organizations in evaluating effective outcomes and identifying which personal competences the games most engaged with.

It is therefore necessary to advocate for sufficient and comprehensive planning to better promote the positive benefits of serious games as tools for professionals' personal development. Among the measures necessary to achieve this objective, we recognize (i) the selection and rigorous definition of the personal competences to be targeted with serious games, including metrics indicative of each competence´s development; (ii) preparing players for the process, without, however, revealing game content in order to protect the potential for surprise and innovation during gameplay; (iii) careful selection of instruments for monitoring and evaluating players' behavior both in-game and post-game, as well as instruments for evaluating the effect on the targeted personal competences in at least the medium term (Adams et al ., 2019; Allal-Chérif et al., 2016; Grabska-Gradzinska & Argasinski, 2021; Harvey et al., 2019; Kapp et al., 2019; Raupach et al., 2021; Urquidi-Martin & Aznar, 2021) .

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Discussion

Based on the mobilizing factors and objectives for using the serious games examined here, interviewees from the three organizations listed the personal competences that they believed were addressed during the games. The following analysis includes: (i) personal competences that the game organizers intended to target during the games; (ii) personal competences which were not targeted by the game creators, but which participants noted had been addressed by gameplay; and (iii) future competences and training needs.

Personal competences targeted and exploited in serious games

Chart 1 presents the individual skills expected and explored by serious games in the 3 Cases, according to the interviewees.

Chart 1
Personal competences both targeted and perceived to be exploited in the 3 Cases of serious games

Personal competences targeted and exploited		
Case 1	**Case 2**	**Case 3**
Self-development		Self-development
Assertive communication		Communication
	Integration	
Empathy		Empathy
	Initiative and proactivity	Entrepreneurship
Problem resolution	Decision making	Leadership
		Engagement and flexibility
Ability to diagnose	Association of personal competences with strategy	Systematic vision
Understanding customer needs	Relationship with customers	Strategic planning
		Creativity

Source: Research Data (2023).

By systematizing these competences according to their natures, the Cases were presented as follows, considering the following categories: (PIC) development of individual competences; (TC) technical competences; (CDSR) competences for developing social relationships; and (CCD) competences for corporate development.

Chart 2
Classification of competences targeted and exploited in serious games

	PIC	TC	CDSR	CCD
1	Self-development, analytical skill	Troubleshooting	Empathy	Assertive communication, Customer needs
2	Initiative and proactivity Analytical skill	Decision making	Integration	Customer Relationships
3	Self-development, Entrepreneurship, Flexibility, Systematic Vision	Strategic planning	Communication, Empathy	Leadership, Engagement

Source: Research Data (2023).

Some synergies can be observed among the 3 Cases regarding targeted competences, such as self-development together with entrepreneurship and initiative, analytical capacity among PICs, empathy between CDSRs, and customer focus among CCDs. On the other hand, the goal of addressing 17 competences in one program depending mainly on a serious game suggests excessive ambition, and even more so if we consider the relative fragility of the monitoring and evaluation instruments presented above.

Of the 17 competences examined in these three Cases, only two of them, interactivity and initiative, were among the competences most frequently addressed in the serious games environment (Almeida & Simões, 2019).

The documents consulted to identify which personal competences would be addressed in these serious games turned out to

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be relatively restrictive. This made examining the three Cases a little more difficult in terms of monitoring and evaluating the development of players and, by extension, evaluating what types of personal competences were most often addressed in the games. For personal competences to be effectively addressed by organizations, it is necessary that each competence type in question be defined clearly as to their nature and qualitative and/or quantitative metrics, and then related to the complexity of delivery (Dutra, 2004).

The contributions of the personal competence-based approach, as exemplified in Figure 1, contain two pre-conditions for planning the development of competences in training programs: (a) a definition of the nature of the personal competence, the KSAs, which is central to mobilizing the competence in question, together with noting which attributes should constitute the focus of the development process (Le Boterf, 1995; Mendes & Tosta, 2019); and (b) a definition of a quality-quantity metric capable of setting delivery levels related to professional performance, as exemplified in Figure 1.

Development of unexpected competences

One of the personal competences encountered by players unforeseen by the designers and managers was teamwork. The game designers were mostly focused on personal action. However, in all Cases studied, players found the importance of forming teams and building interpersonal relationships in these teams to be fundamental to participating in the games. The combination of interpersonal and social competences in serious games is highlighted by Gomez, Ruipérez-Valiente, and Clemente (2023).

Mapping of Personal Competences / Survey of Training Needs

The use of these games went beyond the sought-after development of personal competences as they were also used as alternatives for mapping future personal competences and surveying needs training because the configuration of the game in Case 1 employed a role-playing game in which managers/observers took notes.

> The game maps all the personal competences that this professional needs. From the first moment that I don't develop, I map, and then as a result of the games, I update contents. So we sometimes start to notice things in the games... In general terms, schools monitor success, "from 0 to 10, you have to get 8 right, cool, but you got two wrong, so you got 20% wrong." And how do I feed back into the development process, how do I feed back into my training, so these errors must also be considered (E1).

Final considerations

This article sought to answer the research question, "How can serious games contribute to the development of personal competences?" in professional development training from the perspective of the actors involved in the conception, development, and execution stages.

Throughout the exploration of applicable theories and considering the three Cases analyzed, a set of contributions was reached:
I) Confirmation that serious games have potential for professional development in organizations. A review of the results of the Cases analyzed reveals that the use of serious games as a tool for training and developing professionals constitutes an important alternative for organizations. This is especially noticeable with competences related to Human Resource management, such as self-development, interpersonal relationships, interaction, teamwork, communication, but also for professional performance, such as

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customer relationships, decision making, and proactivity.

II) However, the more intensive use of serious games will require qualitative and quantitative metrics to assess their effectiveness in developing competences from games. The analysis of the research results is not sufficiently conclusive about the effectiveness of serious games in developing professional competences. This position is confirmed in publications by Jaunay et al. (2019) and Kazar & Comu (2021). This is one of the richest areas for potential advancement in future research.

III) In the same sense, the analysis of the results of serious games revealed the almost absence, in the companies studied, of a concern with personal competences that may be demanded in the near future. Some of them were even identified during the game, as relevant to the company's activities. However, they did not appear as relevant competences to be explored during the game. The lack of concern about future competences, in the midst of the dissemination of the so-called industry 4.0, seemed to researchers to be an important flaw in the management of the serious games investigated.

IV) During the serious games, competences were mobilized that were not intended to be addressed. Thus, another possibility relevant to the future management of serious games is that most competences exploited by games, whether intentionally or not, can be used in order to maximize overall efficacy. In this instance, it is necessary that the players' actions are monitored in real time, or at least post-game, to identify these opportunities.

V) It was observed that the systems for evaluating the impact of serious games on the competences explored in these 3 Cases were very fragile. Of the possibilities highlighted in classic training evaluation methods, only the reaction evaluation criterion was used, and then only a very superficial evaluation of types and forms of learning was obtained. At least two relevant criteria, changes in trainee behavior and impacts of training on results, were not addressed in the interview results.

VI) Game participation can extend employees' working hours. The interviews indicated that several participants played at home after the end of their workdays or during free time at the company. It is important to remember that participation in the games is voluntary, however, if employees are motivated to participate during their free time, at home or at work, this should be recognized as specific motivation regarding the game.

Finally, research limitations include the difficulty of observing the activities carried out during the games, especially the environments created in-game and players' reactions to them, thus leaving researchers limited to interviewees' narratives about these. A second limitation comes from the cross-sectional design of the study, while a longitudinal investigation that collects antecedents and phenomenon in real time could render more consistent results and could expand the capacity to generalize.

As suggestions for future research, first, investigate the competence contents and delivery metrics could be addressed by companies more effectively in order to achieve a more systematic treatment of players' impressions about their own learning; second, relationships could be sought between the competences explored, the stages of serious games, and the 3 instances of the operational dynamics of competences, with the aim of identifying more clearly how learning occurs.

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