



Serious games for managers: Creating cognitive, financial, technological, social, and emotional value in in-service training

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ABSTRACT

This article analyzes the value creation of serious games along five dimensions: (1) product design, (2) cost optimization, (3) impact on cognition, (4) experienced emotions, and (5) the socialization process. This research adopts an exploratory approach, mixes qualitative and quantitative methods, and is based on the case study of AXA, the number 1 global insurance brand. The authors interviewed learners, trainers, and managers from the company. The originality lies in the comparison of five different training methods: face-to-face, videoconference, non-tutored e-learning, tutored e-learning, and serious games. The qualitative study reveals that serious games create value according to five dimensions: conception, optimization, cognition, emotion, and socialization. The four recommendations are: (1) to integrate serious games into a wide-ranging training protocol; (2) to balance face-to-face and distance-learning phases; (3) to assess knowledge transfer and to check that learners can use what they learned in the real world; and (4) to ensure learner self-awareness and enhance cognitive engagement. The quantitative study suggests that value created by serious games is significantly different from value created by other learning methods. Additionally, managers recognize significantly higher value creation than trainers and learners.

1. Introduction

Over the last fifteen years, human resources managers from all sectors have become highly enthusiastic about serious games. Serious games are entertaining applications that are used to achieve a serious goal (Allal-Chérif & Makhoulouf, 2016). These digital technological devices are used to select, recruit, train, and evaluate employees. They can also spread the company's values and culture, internally and externally (Mohammad, Capuano, & Guetl, 2018). Serious training games appeared in the military and aviation fields a few decades ago. Today they are used in all sectors to make training, often perceived as boring and useless, more entertaining and effective (Alvarez & Djaouti, 2011). Edutainment can help managers practice: selling products to virtual customers; having different types of interviews with employees; following procedures; understanding cybersecurity issues; or developing more ethical and responsible practices (Allal-Chérif & Bidan, 2017).

Many multinationals have experimented with serious games,

including almost all Fortune Global 500 companies. Some have even adopted several serious games because their performance is deemed superior to other learning technologies (Larson, 2020). According to Business Wire, the serious games market is expanding, with a global turnover of 6.29 billion dollars in 2020 and an expected 26% annual growth that is set to reach 25 billion in 2026. The Covid-19 pandemic has further accelerated the growth of the video game sector and increased the share of remote work and training in companies (López-Cabarcos, Ribeiro-Soriano, & Piñeiro-Chousa, 2020). Numerous publishers of serious games highlight the ability of these games to enhance employee commitment and motivation through training (Allal-Chérif & Bidan, 2017). Like entertainment games, motivation is increased by the desire to win, move up levels, and attract attention with remarkable virtual performances (Koivisto & Hamari, 2019). SMEs also invest considerably in standard off-the-shelf serious games (Rashkova & Petrova, 2014).

Serious games simulate a situation occurring in the real world. They

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enable managers to identify and capture talented students in schools and universities and attract them to a company to which they would not have applied spontaneously. The most widespread use of serious games is in the transmission of knowledge, practice, behaviors, and values, to integrate employees, improve their performance, and create a sense of belonging and a willingness to progress (Alklind Taylor, Backlund, & Niklasson, 2012). Although company managers are convinced of the financial, economic, and tangible value of serious games, researchers sometimes question this value. Observers disagree over whether the results of serious games can be successfully applied to the real world (Mohammad, Capuano, & Guetl, 2018). The positive impact of serious games on learning remains to be proven. Users can appear completely hermetic to the ‘fun’ side of serious games, or, on the contrary, be so entertained by these games that they ignore the serious objective (Allal-Chérif & Makhlouf, 2016).

Therefore, it seems important to investigate whether serious games really create value for the company and the learner-player, in a context of training. The literature discusses the advantages and weaknesses of serious games, emphasizing the savings they allow and their impact in terms of memorization, but without going into the issue of value creation (Checa & Bustillo, 2020). The research question is: what form does the value created by serious games take and how does it differ from that created by other modes of learning? This article therefore assesses and characterizes the value created. The research will focus on the perceptions of different stakeholders, such as learners, trainers, training managers, and learners’ managers, with regard to the value created by serious games.

While several papers have been published about serious games created from scratch for research purposes, few articles have studied real cases of serious games developed by large multinationals. The literature review will explain why most multinational firms use serious games and the limits that have been identified. The methodology is based on an in-depth comparative case study of the AXA group’s training methods. The serious game “M for Managers” is compared to face-to-face, videoconferencing, non-tutored e-learning, and tutored e-learning.

Framework: ambivalent perceptions of the value created by serious games.

Serious games aim to make training exciting and immersive. All major companies have adopted serious games, with many of them using several games and are developing new ones. Although some employees remain reluctant to play games in general and serious games in particular, most prefer this training method to more conventional techniques.

1.1. The use of serious games for in-service training

The concept of serious games, although quite old (Abt, 1970), still has numerous definitions and forms, making it difficult to characterize. Indeed, serious games cover a wide range of objects and uses. According to Michel Zyda (2005, p. 26), serious games are “a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives.” Today’s serious games are mainly IT applications that combine a serious goal with ‘fun’. Whether intended for training, promotion, awareness or recruitment, these video games are designed to entertain the player (Alvarez & Djaouti, 2011). They are used in companies of all sizes and sectors, in public services, the army, schools and universities, and in non-profit organizations.

One of the main uses of serious games is training and spreading knowledge (Allal-Chérif & Bidan, 2017), and, in a professional context, they are used to make the learning process more enjoyable. Training, which employees often consider boring, becomes amusement and relaxation (Larson, 2020). Employees enjoy it and even look forward to it. Thus, serious games transform long, intimidating training programs into fun activities that enthuse and motivate participants and encourage socialization and the expression of serious concerns (Tews, Michel, &

Allen, 2014). Serious games are valued for their immersive properties and their ability to provide diverse and complex situations in which learners push back their limits and learn from their mistakes.

Since July 2008, Renault Academy, a training division of Renault-Nissan, partnered with Dæsign, a serious game publisher, to create an interactive training tool for the sales force based on virtual simulations. “Renault Challenge,” which won the 2009 best serious game award, offers car-selling contests to improve the performance of salespeople. Unlike the e-learning platform, which 70% of learners rejected, the game was very well received by concession managers, who organized tournaments and gave bonuses to the best players. In the game, customer advisors develop their sales skills as they play. They are constantly encouraged to improve their score and compete with other players in a virtual concession. They assess themselves and measure their ability to implement the lessons learned during their orthodox training, devoting more time if necessary to areas they find difficult (Larson, 2020).

During the competition, the salesperson analyzes the needs of virtual customers in order to offer them the most suitable vehicle. They seek to improve their performance, moving up through the levels and outperforming their colleagues. In addition, they observe other salespeople’s pitches and identify mistakes. Sales staff go beyond their limits, because they dare to take risks and test bold solutions, which they would not do in the real world. “Renault Challenge,” used by more than 18,000 customer advisors in 37 countries and available in four languages, has had a lasting impact on the performance of sales staff, especially those from Generation Y. According to a user survey by Dæsign, this new way of learning is universally appreciated, with a satisfaction rate of more than 90%. Following this successful experiment, Renault-Nissan has invested heavily in serious games and recently launched its fifth project in partnership with Dæsign.

1.2. A high cost for a high return on investment

Serious games are used in numerous fields – military, aeronautics, pharmaceutical, medical, banking, and the media – and can be adapted to commercial, marketing, production, logistics, purchasing, and finance departments. Serious games are already used to train financial advisors at AXA and Barclays, sales representatives at Danone and L’Oréal, railroad station managers, tourist guides and machines operators, gas station attendants and hairdressing salon employees, surgeons and helicopter pilots. It seems that the applications of serious games are limited only by the developers’ imagination (Alvarez & Djaouti, 2011).

Large companies spend a lot of money developing serious games, such as “Misivias,” developed for Randstad to assess managerial candidates’ analytical and decision-making skills, which cost over €200,000. This is well below the cost of the Bus Training Game, a genuine bus-driving simulator, which cost €1.5 million. Investing so much money in games may seem surprising, especially for pioneering companies that did not need to wait for serious games to prove their worth. A serious game can replace half a dozen e-learning modules and is more effective in terms of involvement, memorization, acquisition of knowledge and skills, benchmarking, and learning transferability (Mohammad, Capuano, & Guetl, 2018). Several authors have found that the return on investment is high and rapid, and the benefits for the company are numerous. However, the value created by these games and their profitability is still difficult to measure accurately.

Although standard off-the-shelf products are beginning to appear for companies of different sectors and sizes, accessible for a few thousand euros, serious games are often tailor-made projects designed to suit each customer’s needs, corporate culture, and strategy. The budget is less than 50,000 euros for the simplest projects and from 100,000 to more than one million euros for very elaborate applications. Some serious games are even more expensive, such as “Pulse,” by BreakAway, which reproduces an entire hospital in three dimensions: it cost more than seven million euros to develop.

Companies are willing to pay so much for games because they expect high performance and a high return on their investment. Serious games are based on the principle of learning by doing: learning by virtual practice (Aldrich, 2005). Certainly, some authors have raised the question of whether acquisitions are transposable to real life (Mohammad, Capuano, & Guetl, 2018). However, others find that the immersive nature of serious games, using the latest technological innovations, such as 3D or augmented reality, contributes to improve employee performance rapidly and substantially, and accelerates the acquisition of knowledge, together with technical and social skills in the training process (Alvarez & Djaouti, 2011). Although decision makers may have too much confidence in the training power of simulations and games (Alklind Taylor, Backlund, & Niklasson, 2012), serious games have proven a reliable and effective way to acquire critical knowledge and good practice. Thanks to the incorporation of pedagogical principles in their design and structure (Azadegan, Riedel, & Baalsrud Hauge, 2012), they contribute to developing the skills required at work. Players learn how to combine these skills to achieve more sophisticated tasks and specific goals.

Simulation-based pedagogy promotes motivation, memorization, and engagement in the learning process of diverse audiences (Garris, Ahlers, & Driskell, 2002; Whittaker, Mulcahy, & Russell-Bennett, 2021). The brain activity stimulated when players practice using these simulations is identical to what they use in their work. The brain does not distinguish between real and artificial stimuli. The motivation and commitment provoked by the immersion and realism of serious games improve the learners' performance and contribute to overall company performance (Ivanaj, Nganmini, & Antoine, 2019).

1.3. The value creation of serious games for people

Serious games are presented as digital technologies for training that enable companies to train a limitless number of people, at a very low cost, more efficiently, and with a higher satisfaction rate (Azadegan, Riedel, & Baalsrud Hauge, 2012). They enable users to acquire knowledge and skills and pass them on from one generation to another or from experts to beginners. When an employee leaves the company, or simply moves to a different job, their knowledge and skills are not lost but formalized in the game for newcomers to acquire (Allal-Chérif, Bidan, & Makhoulouf, 2016). In a serious game, learners confront diverse problems they will encounter in their professional lives and must solve them virtually through exploration and experimentation.

Serious games help the company to manage knowledge and help employees to acquire and implement it. Serious games promote a company's ability to memorize past events or situations and enable new employees to experience them virtually, interactively, and playfully, and to acquire the most appropriate knowledge, practice, and behavior (Allal-Chérif & Bidan, 2017). Through in-depth interviews with employees who have witnessed or been involved in these events, important factors can be collected and incorporated in a digital learning process. Serious games often connect a newly recruited employee with a more experienced one who will serve as a guide and coach (Alklind Taylor, Backlund, & Niklasson, 2012). Newcomers discover the culture, strategy, values, objectives, methods, products, services, and tools of their company, while benefiting from the advice of an experienced referent who helps them integrate.

Serious games promote teamwork, remote collaboration, flexibility, multiculturalism, mutual support, integrity, and reliability. They develop a sense of cohesion and sharing. They have a profound impact on the behavior and culture of the company's employees (Shahri, Hosseini, Phalp, Taylor, & Ali, 2019). They immerse users in a universe not only associated with products, practices, processes, and tools, but also with values and ideas. Serious games measure and correct participants' reactions to certain situations, point out mistakes and misconduct in a fun and encouraging manner, and provide opportunities for improvement that lead employees to adopt best practices and overcome their limits (Köse, Morschheuser, & Hamari, 2019). Humor embedded in

serious games makes learners feel more comfortable and helps them reveal their feelings more easily and sincerely (Grugulis, 2002).

The value perceived by users – players, trainers, and managers – is generally very positive, based on feedback from publishers and professionals, which explains why companies that have tried serious games have intensified their investment efforts. However, although it is relatively easy to assess the acquisition of theoretical knowledge, it remains difficult to assess whether a good virtual advisor, salesperson, driver, or technician is as good in the real world (Mohammad, Capuano, & Guetl, 2018). No academic study has compared the performance of professionals after different types of training, including serious games, especially because some games do not really fulfill their promise of being fun games with a serious purpose and do not conform to the idealized vision that some observers have of them (Köse, Morschheuser, & Hamari, 2019; Larson, 2020). Indeed, the virtual universe is sometimes only a cover for conventional courses, videos, and online quizzes that are neither interactive nor fun. The player is passive and does not intervene in the environment. The game can be too simple, with too little challenge and no risk of really losing or being eliminated. It can be too predictable, too mechanical, too complex, and too serious, generating frustration.

2. Methodology

This research takes an exploratory mixed-method approach. The aim is to study how serious games are used by asking users directly about their opinions, feelings, satisfaction levels, and other observations about this new digital type of training.

2.1. The case study method

We conducted a series of 11 semi-structured, qualitative interviews with stakeholders from AXA. We analyzed these interviews to assess five dimensions of perceived value: conception, optimization, cognition, emotion, and socialization. The case study method is particularly appropriate for investigating modern and polymorphic research topics such as serious games (Yin, 1993). Serious games have developed mainly during the last ten years. They are emerging digital technologies and are still evolving rapidly. The next wave of games should involve artificial intelligence and will constitute truly sophisticated, extended virtual worlds. This recent and rapid evolution makes it particularly difficult to understand their impact on managerial practice.

With regard to the relationships, teaching techniques, and practices implemented through serious games, many parameters influence participant behavior, and many training strategies are possible (Sung & Choi, 2014). Observing these mechanisms in their context by adopting a global vision of each participant's motivations helps identify and understand how to improve the performance of these training methods. Serious games are mainly used in large international groups, and service companies and banks have been pioneers in the field (Allal-Chérif & Makhoulouf, 2016). The AXA group is typical of a serious games enthusiast. The AXA training department agreed to allow us to collect data formally, with the involvement of different stakeholders: learners, trainers, training manager, and the learners' managers. The AXA group is experienced in the use of digital technologies for training, which facilitated the data collection and analysis protocol.

The same person was responsible for all discussions, interviews, transcripts, data coding, and content analysis, which guarantees homogeneity of treatment and limits differences of interpretation.

Data collection and study took place in several phases: (1) open, semi-structured interviews designed to identify and characterize themes; (2) content coding according to the different themes identified (Miles & Huberman, 1986); (3) sequential thematic analysis of each interview; (4) transverse thematic analysis of all interviews by stakeholder type; and (5) overall thematic analysis of all the interviews using Sweeney and Soutar's (2001) classification. The thematic analysis by

interview aims to reconstruct the discourse about the themes and so to determine all the nuances of each person's vision, whereas the thematic cross-sectional analysis of all the interviews provides overall coherence between discourses and identifies major concerns and trends (Boyatzis, 1998).

The research evaluates the perceived value created by a serious game for the different stakeholders: learners, trainers, training managers, and learners' managers. To obtain a scale of value, the research compares serious games with other training methods: (1) entirely face-to-face training, (2) distance training via telephone and videoconferencing, (3) non-tutored e-learning training, and (4) tutored e-learning training. The respondents therefore undergo five different types of training and must assess each one.

2.2. Qualitative and quantitative content analysis

Content analysis involves coding and classifying the interview material in line with the dominant themes (Miles & Huberman, 1986). The identified themes correspond to dimensions of the research object, value creation, identified during the literature review. These themes are product value, financial value, cognitive value, emotional value, and social value (Sweeney & Soutar, 2001). The product value (PV) is the design quality, ergonomics, playability, interactivity, and overall performance of the serious game. The financial value (FV) represents the direct or indirect economic benefits associated with the game in relation to its cost. Cognitive value (CV) refers to learning, memorization, and transfer and acquisition of knowledge and skills. Emotional value (EV) represents satisfaction, wellbeing, self-confidence, and motivation and adherence to the corporate mission, values, and culture. Social value (SV) refers to the extent to which learners connect with colleagues, subordinates, managers, other corporate functions, clients, and partners, as well as their image of them and their reputation.

After a first reading of the interviews, we categorized some of the respondents' perceptions and opinions in line with these different types of value. This characterization requires a precise coding of factors. In some cases, serious games have positive value, that is, a quality or advantage of serious games compared to other modes of training. We therefore coded it using the sign "+" (PV+, FV+, CV+, EV+, SV+). In others, the value creation is perceived as negative, meaning a defect, a disadvantage, or a limit of the serious game compared to other modes of training. We therefore coded it using the sign "-" (PV-, FV-, CV-, EV-, SV-). We brought together similar phrases or sequences in different interviews, highlighted relationships between concepts and variables, and identified patterns of thought and reasoning. This manner of organizing the data is not only useful for content analysis but also for statistical analysis. Regarding the latter, we proceeded to count the occurrences of these different modalities and summarized them in two contingency tables. The first captures the occurrences of the different perceived value categories per type of learning modalities (Table 1), the second presents the number of occurrences of the perceived values per respondent

Table 1
Perceived Values (rows) vs Learning Modalities (Column).

	Serious Games	Untutored e-learning	Tutored e-learning	Distance Training	Face-to-Face	Total
VP+	1	2	3	1	1	8
VP-	3	8	8	5	3	27
VE+	3	3	0	0	0	6
VE-	0	1	1	0	0	2
VS+	2	0	2	2	5	11
VS-	1	2	2	2	0	7
VC+	0	1	4	2	2	9
VC-	7	3	6	1	1	18
VF+	1	2	1	1	0	5
VF-	1	0	0	0	2	3
Total	19	22	27	14	14	96

(Table 2). These tables are then used as data to explore possible relationships between the perceived values and the type of trainings on the one hand, and the type of perceived values and the user's profile on the other hand. Given a small sample size, the tests for statistical significance are implemented with an α level equal to 0.10.

3. Case study of the AXA group and the serious game "M for Managers"

The AXA group is particularly innovative and has integrated digital technologies into all its activities. Human resources management is no exception, first with e-learning courses and then serious games, although it also maintains other more traditional training methods.

3.1. The specificities of AXA group's businesses and organization

The AXA group, the world's second largest insurance company, is a leader in asset management and insurance in the following areas: damage, life, health, retirement, and savings. The AXA group resulted from a merger of several insurance companies, but can be traced back to 1817. Axa is present in 64 countries and employs 166,000 people serving more than 100 million customers, with the aim of helping them to live more peacefully. The group's turnover stood at €98.5 billion in 2015, with an operating profit of €5.6 billion, up 10% from the previous year. With more than 20,000 hires in 2015, training needs are high, especially in this rapidly evolving sector, which is highly country-specific. In addition, AXA is a particularly innovative group, whose ambition is to design the insurance industry of tomorrow and win over digital users. The group has a very strong corporate culture centered on using capital to generate not only financial, but also human, social and societal wealth for the benefit of the community.

The AXA group is organized into five segments: (1) life, savings, and retirement; (2) damage; (3) international insurance; (4) asset management; and (5) banking. The group is very strong in Europe, North America, and Asia Pacific, and is developing in the Middle East, Latin America, and Africa. The intensity of the competition varies by activity and geographical area, which requires a sustained effort to maintain differentiation and quality improvement. The main competitive advantages of AXA are its wide range of top-quality, innovative products; its extensive network of distributors and partners; particularly competitive rates; and an excellent, widespread reputation. The clientele of AXA comes from all social classes and businesses of all sizes and sectors.

AXA is targeting niche markets that its competitors have abandoned or are not interested in and is working on the concept of a package of contract portfolios designed to make its products more competitive and to retain its increasingly demanding, opportunistic customers. To achieve its development objectives, it is essential for the AXA group to have a workforce that is trained in all the subtleties of the company's products and the characteristics of its targeted markets. Another important issue is internal promotion and talent management. The AXA group wishes not only to invest in its employees' knowledge and skills, but also to provide them with career prospects that encourage them to continue working towards the group's success rather than offering their services to competitors.

3.2. The policy and organization of AXA training

AXA's training department provides employees with the necessary tools for: (1) personal and professional development; (2) the development of updated skills in the light of organizational and environmental transformations, (3) adhesion and contribution to culture and corporate values, and (4) continuous performance improvement and wellbeing within the company. The mission of the training department is to analyze individual needs, anticipate and accompany changes in the professions, design and implement training plans and individualized programs, check the acquisition of knowledge and skills, and ensure

Table 2

Perceived Values (columns) per respondent (rows).

	VP+	VP-	VE+	VE-	VS+	VS-	VC +	VC-	VF+	VF-	TOTAL
Trainer 1	1	3	1	0	1	2	2	3	1	1	15
Trainer 2	1	4	0	0	1	1	1	2	0	0	10
Trainer 3	0	5	1	0	0	1	0	2	0	0	9
Trainer 4	1	2	0	0	2	1	1	1	1	1	10
Learner 1	1	2	0	1	1	0	0	2	1	1	9
Learner 2	1	1	1	0	0	1	1	3	0	0	8
Learner 3	0	4	0	0	2	0	0	2	0	0	8
Learner 4	1	0	1	0	0	1	1	0	0	0	4
Learner 5	0	5	0	0	1	0	0	1	0	0	7
Manager 1	1	0	1	1	2	0	2	1	1	0	9
Manager 2	1	1	1	0	1	0	1	1	1	0	7
TOTAL	8	27	6	2	11	7	9	18	5	3	96

learner and manager satisfaction. Training quality implies the improvement of business performance, the quality of the customer experience, the provision of innovative and attractive services, and the ability to attract and retain the best talent.

The courses offered are diverse in content and form. Every topic in the insurance and banking sectors is explored using a variety of training methods: face-to-face, conference call, videoconference, virtual classroom, e-learning modules, role-playing games, and tutoring. Online courses about the company's activities and careers, diversity, social and environmental responsibility, management, computing, and self-development also exist on a self-service basis in a virtual AXA university that is permanently available to all employees. Thus, the group proposes face-to-face, distant, and blended-learning courses, and is therefore appropriate for an analysis of the value creation of serious games compared to that of other training methods.

3.3. Focus on the serious game “M for Managers”

The AXA group has adopted the serious game “M for Managers,” edited by Dæsign and mainly intended to train managers to conduct appraisal interviews. The game teaches player managers to take advantage of this privileged moment, which is an obligatory annual meeting. Rather than limiting themselves to the administrative and legal aspects of the meeting, they are encouraged to detect the potential, to value talent, to manage careers, to assess employability and training levels, and to match each employee's motivations and skills to the company's needs. The game offers several learning modules and gradually introduces new topics: conducting an appraisal interview, conducting a wage negotiation, conducting a difficult interview, motivating an employee, managing a team, giving feedback, learning remote management, and time management.

“M for Managers” was jointly funded with major groups such as PricewaterhouseCoopers, Natixis, and Orange. Their experts proposed educational scenarios with a genuine, credible environment and real professional interactions. The game is designed on the model of “the Sims” in 3D, which allows the characters' facial expressions and body language to be observed. Learners can choose their avatar's appearance and play alone or with others; on a computer, tablet, or smartphone; in sessions of up to 30 min; with or without coaching. The level of difficulty is adjusted to each player. Managers can choose from a huge range of strategies, adjusting them in line with dialog boxes that guide them. Several other serious large groups also use “M for Managers,” such as Renault, BNP Paribas, Michelin, Bouygues Construction, BPCE, Airbus, and Schneider Electric.

With “M for Managers,” AXA's aim is to make these appraisal interviews a strategic managerial tool. The simulated situations are as realistic as possible, and can be complex and tense. Players must strive to manage them as best they can by refusing to yield, negotiating, appealing, or listening. They seek to create a calm and supportive climate for the interview, formulate problems, propose solutions, defuse conflict, reassure the team, and improve satisfaction. The learners can

train with several virtual subordinates, analyze their own behavior, and adapt accordingly. These interviews provide opportunities for negotiation, during which each choice obtains an immediate reaction, positive or negative, with the possibility of correcting oneself and repairing mistakes. The virtual team members have very diverse personalities, skills, ambitions, and reactions, which lead players to adapt their speech to their analysis of the situation and the expectations of the subordinate.

Results analysis.

This section is divided in two parts: the first (5.1 & 5.2) is descriptive and highlights the salient features of our content analysis. The second (5.3 & 5.4) is inferential, where we explore the extent to which some of our results have statistical significance.

3.4. General thematic analysis

Overall, the most frequently mentioned value of all the training methods we compared is product value (PV), associated with design, which was mentioned 35 times, 27 of which were negative (PV-). Users complain that the training tool is poorly designed, particularly with regard to e-learning, whether tutored or not. Interviewees attach great importance to the ergonomics, accessibility, and performance of the training method, considering that the technical qualities and design of the training courses need improvement.

The second most common topic is cognitive value (CV), which appears 27 times, 18 of which were negative (CV-). This theme relates to the purpose of training, which is to learn new knowledge and skills. Users criticize digital technologies in all their forms, because they were most frequently mentioned with regard to cognitive value. Thus, face-to-face training and the combination of phone and videoconferencing are considered more effective for this kind of learning. One reason these methods are less criticized is because they do not involve digital technologies, which are sometimes considered as gadgets. However, tutored e-learning training receives the most positive mentions, showing that its effectiveness is nonetheless recognized.

The social value (SV) was mentioned 18 times, of which 11 were positive (SV +). This value is also important but is not a concern that users consider at the time of the training. The face-to-face mode is considered the best way to communicate with others, share experience, exchange feelings, create relationships, check skills, obtain personal feedback, and organize follow-up. Un-tutored e-learning is poorly perceived with regard to socialization, because learners feel left to themselves and disconnected from others.

Emotional value (EV) and financial value (FV) are the two least frequent themes, mentioned eight times each. Positive emotional value is associated with non-tutored e-learning and serious games, which generate more self-confidence, motivation, fun, and wellbeing, among other things, because learners do not feel observed or judged, and they can make mistakes without fear of being laughed at. However, no training method seems to cause unease or other negative emotions. Financial value (FV) is relatively balanced between positive (FV +) and negative (FV-) comments (5 and 3 respectively), and spread evenly

between the training methods studied, with one or two mentions for each. The face-to-face approach appears to be the most expensive mode, and non-tutored e-learning the least expensive (see Table 1 for the number of mentions for each type of training).

Although the sample includes four trainers, most of the comments are negative, which can be interpreted as a frustration felt by all the respondents with all the different training methods. They all have defects and each have different uses, which makes them non-substitutable. The training methods that generate the most comments and debate are tutored and non-tutored e-learning. The only form of training for which the perceived value is more positive than negative is face-to-face training.

3.5. Detailed analysis of the value creation of the serious game

Our results show a predominance of the cognitive value (CV), which is most often mentioned in interviews, especially negative cognitive value (CV-), with seven factors listed. This form of training is therefore considered by the interviewees as less effective for learning, memorizing, and transferring knowledge and skills than other modes of learning. Users perceive serious games as requiring them to change their way of learning. They do not perceive autonomy as an advantage, but rather as “having to fend for themselves,” even if they appreciate the opportunity to move at their own pace. Because learners do not make the effort they usually associate with learning, they wonder what remains of the training once their game session is over.

Negative product value creation (PV-) comes in second, equal to positive emotional value (EV +). Serious game training is considered confusing and requires a period of adaptation and appropriation. However, the game exerts a form of fascination and captivates its users. While it destabilizes learners, its playful side breaks with routine and provides learners with satisfaction and pleasure, which is confirmed by the absence of negative mentions of emotional value (EV-). Other forms of training are considered more conventional and predictable.

Perceptions of social value are mixed, with two positive mentions (SV +) and one negative (SV-). Users appreciate the interactivity of the serious game, and recognize a form of socialization, although in some cases the serious game can isolate players and create a form of solitude. Because the choices and actions have no consequences, players sometimes gamble carelessly, and have fun testing the scenarios rather than looking to discover the best way to make progress in the game.

The financial aspect seems less of a concern to users. While they think that serious games are very expensive for their company, they consider that the return on investment is swift, given the cost savings. The absence of travel and the ability to play anywhere and on any device is recognized as saving time and money. All in all, the interviewees proposed no significant advantage of serious games as a form of training. Rather, they stress its limits and even question its usefulness.

3.6. Exploring relationships between perceived value and learning modalities

Given an inflated number of cells for a relatively modest count of occurrences (Table 1), we regrouped some modalities of comparable nature. Thus, distance and face-to-face trainings were regrouped in a modality called synchronous learning; tutored and untutored learnings were regrouped into asynchronous learning. The serious game is kept as a modality on its own, considering that it represents our modality of reference. Thus, we analyzed a new contingency table (Table 1.1).

Results show (Table 1.2, Fig. 1) that there is a significant link between the categories of perceived values and the learning modalities (p -value = 0.059, α = 0.10). (1) Serious games learning displays a significantly higher positive emotional perceived value, and significantly higher negative cognitive perceived value than expected (cut point is ± 1.645). (2) Asynchronous learning is characterized by a significantly lower positive social perceived value and a significantly lower negative

Table 1.1

Perceived Values (rows) vs regrouped learning modalities (columns).

	Serious Games	Asynchronous	Synchronous	Total
VP+	1	5	2	8
VP-	3	16	8	27
VE+	3	3	0	6
VE-	0	2	0	2
VS+	2	2	7	11
VS-	1	4	2	7
VC+	0	5	4	9
VC-	7	9	2	18
VF+	1	3	1	5
VF-	1	0	2	3
Total	19	49	28	96

Table 1.2

Adjusted residuals of Perceived Values vs Learning Modalities.

	Serious Game	Asynchronous	Synchronous
VP+	-0.541	0.677	-0.271
VP-	-1.335	1.008	0.062
VE+	1.918	-0.053	-1.623
VE-	-0.710	1.400	-0.917
VS+	-0.142	-2.317	2.673
VS-	-0.380	0.335	-0.036
VC+	-1.565	0.285	1.059
VC-	2.256	-0.098	-1.870
VF+	0.012	0.412	-0.463
VF-	0.598	-1.797	1.452

financial perceived value. (3) Synchronous learning shows a significantly higher positive social perceived value along with a significantly lower negative cognitive perceived value.

3.7. Exploring relationships between the user's profile and perceived value

Following on from our exploratory study (Table 2), we regrouped all trainers in a single category, and did likewise with the learners and the managers. We call this variable User's Profile. We also regrouped the Product, Financial and Social perceived values into a modality called Organizational Perceived Value (VO), whereas the Emotional and Cognitive perceived values were regrouped into a new category called Individual Perceived Value (VI).

Analysis of the new contingency table (Table 2) yields a significant link between the user's profile and the organizational perceived values (p -value = 0.074, α = 0.10). (1) The Trainers are characterized by a significantly higher level of negative organizational perceived value than expected. (2) The Learners do not perceive any significant difference in perceived value than expected. (3) The Managers are those who perceived the most significant difference in perceived value: a higher-than-expected level of positive organizational perceived value, and a much lower-than-expected level of negative organizational perceived value, along with a higher-than-expected level of positive individual perceived value (Table 2.1, Fig. 2).

It is worth mentioning that if we regroup overall positive perceived value and overall negative perceived value, there is a significant link between the user's profile and the perceived values (p -value = 0.009). The contributions for this relationship come exclusively from the Managers who display a significantly higher-than-expected level of positive overall perceived value and a significantly lower-than-expected level of negative overall perceived value (Table 2.2). Neither the Trainers nor the Learners perceive any significant level of perceived value, one way or another.

4. Discussion and implications

The limits of serious games lead to a reconsideration of how they are

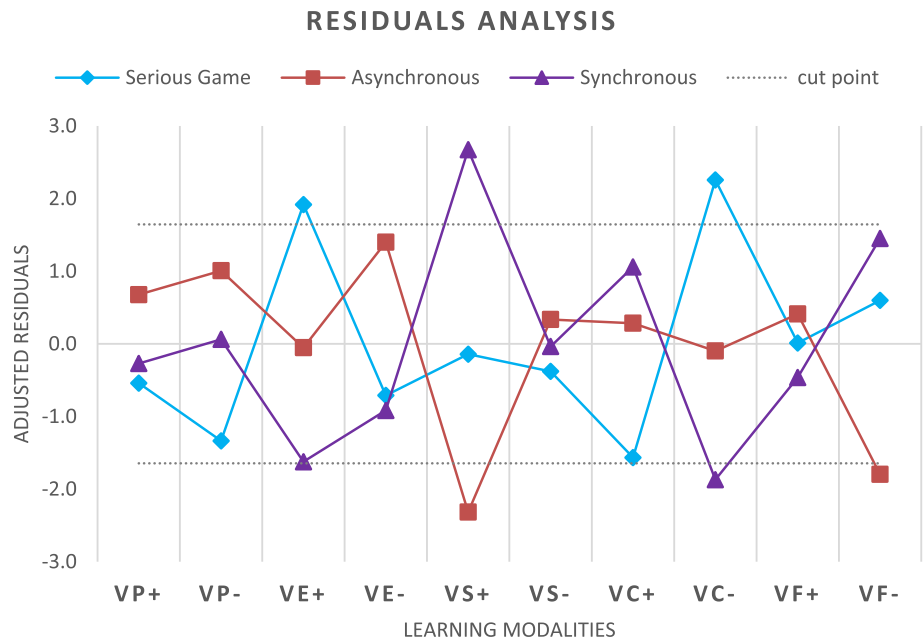


Fig. 1. Residuals Analysis of Perceived Values vs Learning Modalities (with 90% confidence interval cut points).

Table 2.1
Perceived values per User's Profile.

	VO+	VO-	VI+	VI-	TOTAL
Trainers	9	21	6	8	44
Learners	8	15	4	9	36
Managers	7	1	5	3	16
TOTAL	24	37	15	20	96

designed and used for training (Spil, Romijnders, Sundaram, Wickramasinghe, & Kijl, 2021). Their integration within a comprehensive system, with preparation and follow-up, and face-to-face and team-based phases, could significantly improve the value perceived by users in the different dimensions studied.

4.1. Using serious games more effectively to improve learning

One aim of serious games is to train users without them realizing it, but if the perception is that they learn nothing, or less than with other methods, then it has defeated its purpose. This raises the question of

Table 2.2
. Adjusted residuals.

	VO+	VO-	VI+	VI-
Trainers	−0.946	1.701	−0.494	−0.588
Learners	−0.487	0.487	−0.944	0.779
Managers	1.897	−2.907	1.886	−0.225

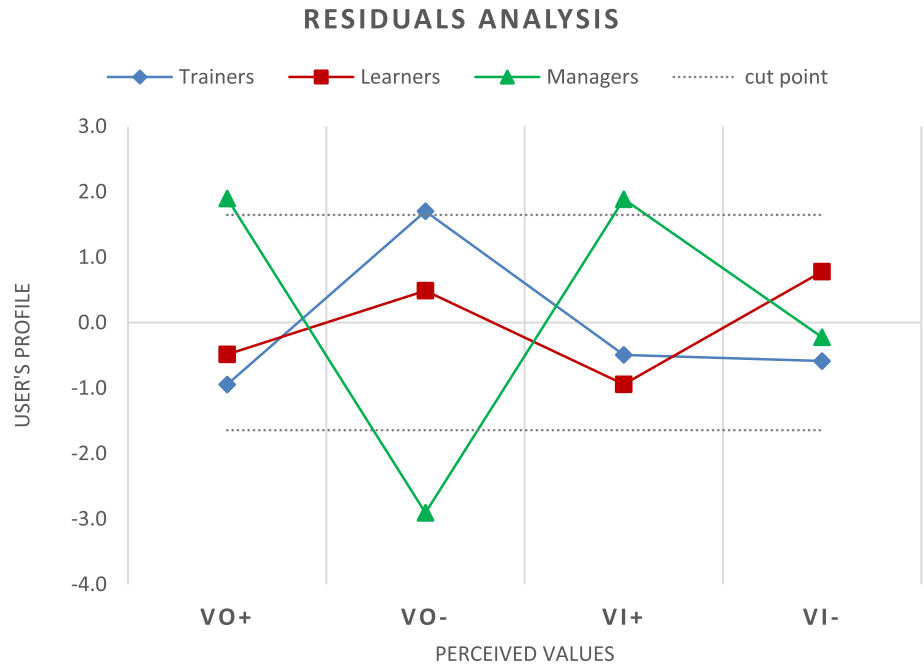


Fig. 2. Residuals Analysis of User's Profile vs Perceived Values (with 90% confidence interval cut points).

learner self-awareness and self-reflection (Hacker, 2016). Learners' cognitive engagement and ability to use the serious game and accept the embedded technology are important levers to improve product and cognitive value creation (Whittaker, Mulcahy, & Russell-Bennett, 2021). Such awareness is essential for learners to evaluate their learning objectives, adapt their strategies and heuristics to the context, and to become the agents of their own thoughts and decisions (Hacker, 2016). Therefore, playability should not completely remove learners from the professional context. It should be based on the performance and progress they must achieve in their work (Sung & Choi, 2014).

Although the literature recognizes the many pedagogical qualities of serious games, it is essential to develop an interactive playing mode suitable for training and to define precise and measurable learning objectives (Boughzala, 2014). In order to improve the transferability of acquired knowledge and skills, the game must be designed by senior professionals to include regular assessment and feedback phases, and analysis of successful performance (Goodman, Wood, & Chen, 2011). Learners must understand and discuss their objectives with experts before playing, to improve cognitive value. However, most serious games are very open and give players excessive freedom. It is therefore difficult to measure whether the game's training objectives have been understood and achieved, and consequently this aspect is often neglected. The game only assesses players' involvement and performance (Heyes & Stuart, 1996), without measuring whether they have really acquired knowledge, modified their behavior, or learned to master tools, processes, or situations to improve their efficiency and effectiveness at work (Boughzala, 2014; Phillips, Chang, & Su, 2019).

Training methods that do not involve discussion, practice, and follow-up appear incomplete to learners who cannot speak to a coach or share experience with colleagues (Lam, De Rue, Karam, & Hollenbeck, 2011). The effect of gaming-based training depends on whether learners are supervised (Pando-García, Periañez-Cañadillas, & Charterina, 2016). The importance of a social link leads learners and trainers to favor serious games in face-to-face mode when possible. Interactivity and the possibility of teamwork are two major positive factors. This view is supported by our data: only the synchronous mode of learning benefits from a significantly higher-than-expected level of positive social perceived value, and a significantly lower-than-expected level of negative cognitive perceived value (Table 1.2, Fig. 1). In short "in a synchronous learning format, not only do we appreciate a better relatedness with our coworkers, but we are much less skeptical about the value of our learning".

Many trainees refuse the very idea of a game, however "serious" it may be. The way companies communicate about serious games can sometimes devalue them, preventing users from perceiving their added value. Choosing not to use the word game to designate a serious game may be a good way to improve this perception. It might be preferable to talk of 'self-training tools', 'knowledge transfer software' or 'virtual simulations.' In addition, if the game's universe is too distant from the real working environment and players make no association between real and virtual practice, the game's efficiency may be in doubt (Mohammad, Capuano, & Guetl, 2018). Moreover, learners cannot transfer the knowledge and skills acquired through a serious game before they have mastered all the concept's aspects and subtleties.

4.2. Integrating the serious game into a multi-channel training protocol

Serious games are above all extremely diverse training tools. They are not an exclusive solution but should be part of a comprehensive multi-channel training and support program. Serious games are just one of many training methods and should be part of an overall approach, a medium for conveying practice and knowledge in a specific but not unique way. Whether for recruitment, training, or the promotion of corporate values, serious games should always be part of an elaborate system of individual or team interviews, coaching, benchmarking, and knowledge management.

A complete virtual learning environment can include not only serious games but also e-learning modules, messaging and videoconferencing systems, social networks, practice communities, a digital resource center, and an individual skills portfolio. An intelligent agent may be used to personalize the learning path and adapt the tools to the learners' profiles (Xu, Huang, Wang, & Heales, 2014). Such a system improves the product and cognitive values of serious games.

Some serious games can be played in teams, with a preparatory phase during a possibly virtual meeting, which is decisive, and improves perceptions of the game. Players can also discuss the game on forums and social networks, in heterogenous and fluid groups (Araujo, 1998). These discussions sometimes last longer than the game itself and are more instructive. Solutions to problems in serious games can be made available online and debated by the players (Lam, De Rue, Karam, & Hollenbeck, 2011). Sometimes, a company's best salespeople share their tricks spontaneously in simulated sales situations, which they would be less willing to do if it were a real sales activity.

In our exploratory study, as we examine the profiles of the different learning modalities, complementarity is suggested at several levels. For example, serious game and asynchronous learning complement each other in positive emotional perceived value and cognitive perceived value, whereas asynchronous and synchronous learning are complementary on positive social perceived value and negative financial perceived value. Yet we must also take notice that none of the learning modalities seem to bring any positive perceived values at a cognitive level, at a financial level, and not even at product level. Whether a balanced combination of these modalities would provide a much better outcome, remains to be seen.

Results of qualitative analyses demonstrate that serious games can create cognitive, emotional, social, and financial value. They require a period of adaptation and appropriation. Financial constraints may lead learners to feel left by themselves. The ability to reinvest what is learned in the real world should be evaluated. Results of quantitative analyses suggest that the serious game perceived values profile is significantly distinct from the perceived values profiles of the other learning modalities. Furthermore, the managers acknowledge significantly higher perceived values where the trainers and learners do not.

Conclusions are that: (1) serious games should be used as modules of a global training protocol; (2) face-to-face and distant learning should be balanced in serious games design; (3) learners must discuss their objectives before and after playing; (4) Human Resources Management should invest in add-ons to serious games; and (5) perceived values depend on the type of learning modalities, and on the type of stakeholder.

4.3. The limits and dangers of serious games

Learners and trainers, who have very diverse profiles, initially had a positive view of the use of digital technologies in training. They perceive serious games as more intuitive and interactive than e-learning tools, and as positively influencing emotional processes involving authenticity and cognitive engagement (Marshall, 2008; Pallud, 2017; Whittaker, Mulcahy, & Russell-Bennett, 2021). However, we find that AXA learners (and to some extent the trainers) do not perceive significant value (See Tables 2.1 and 2.2) in serious games for training with regard to their main objective: acquiring skills and knowledge. Interviewees concede that the serious game "saves time and allows more work"; they recognize its efficiency and that it "wastes less time on the basics" and spends more on "study and implementation." The playful side receives positive assessments, but both learners and trainers feel it can damage "pedagogical credibility." Playing games is particularly attractive to younger users, but a trainer emphasizes that people over 40 are insensitive to it and wonder what they have learned when the training ends (Ivanaj, Nganmini, & Antoine, 2019; Spil, Romijnders, Sundaram, Wickramasinghe, & Kijl, 2021).

Serious game design is a key factor in improving perceived product

value. Indeed, if games are merely animated quizzes, or questionnaires illustrated by cartoons, they do not fulfill their role and rightly risk being considered bogus. Training methods involving digital technologies require a sophisticated, design-oriented environment (Larson, 2020). The most effective serious games are accurate, immersive, realistic simulations that use the game's features to generate cognitive and perceptual benefits.

In some cases, even if serious training games do not generate better performance than other training modes, they improve motivation, concentration, enthusiasm, and curiosity (Boughzala, 2014; Koivisto & Hamari, 2019). 3D environments, which accurately reproduce context and professional situations, foster learners' immersion in their training. In addition, serious games are particularly effective in replicating intense, unusual situations that learners have never experienced and for which they must prepare: a stock market crash, a financial crisis, an accident at a nuclear power plant or an oil rig, chemical or bacterial leakage, or a fire at an industrial site.

This is obviously not the case in "M for Managers," which centers on appraisal interviews that do not involve the same technological and procedural complexity, the same challenges and risks, and the same spectacular and extraordinary character. The simulation is much simpler and does not require a sophisticated 3D simulation. Themes such as appraisal interviews involve human contact, relationships, psychology, behaviorism, and sensitivity (Willems, 2017). Serious games, although realistic, cannot reproduce all the diversity and complexity of human behavior. The cases studied may be perceived as caricatures, oversimplified, and unrepresentative of the actual situations encountered in interviews (Shahri, Hosseini, Phalp, Taylor, & Ali, 2019).

Although learners find the serious game "intuitive," "aesthetic," "pleasing," and "fun," and consider the learning method "innovative" and "unusual," this alone does not generate a breakthrough in training, with significantly more added value than other types. The tool appears oversophisticated and just a gadget, because it offers nothing remarkable or essential to justify its use (Köse, Morschheuser, & Hamari, 2019; Spil, Romijnders, Sundaram, Wickramasinghe, & Kijl, 2021). The effect becomes counterproductive, because learners and trainers see only the entertaining and cost-cutting dimensions, but not how serious games improve training. Indeed, Fig. 1 shows that the serious game is credited with a significantly higher level of positive emotional value (wellbeing, satisfaction and fun) but also a higher-than-expected level of negative cognitive value. In short, "it's fun but we do not believe we are really learning anything."

5. Conclusion

Although serious games seem to have many advantages, it is essential to find the right balance between the playfulness and realism of the situation (Phillips, Chang, & Su, 2019). If the game is too entertaining, the learning objectives become secondary and the learners no longer perceive it as a valuable learning experience (Ivanaj, Nganmini, & Antoine, 2019). If the game is too faithful to reality, it is not attractive enough and can quickly become boring. To solve this dilemma, serious games require rigorous specifications and design. Intended and actual game use often differs, making it difficult for learners and managers to understand and describe certain games and specify learning goals.

Our comparative study of training modes used by AXA reveals a number of aspects of the perceived value of serious games. Considered as modern and innovative, they benefit from favorable initial attitudes, especially among young people, who appreciate their graphic qualities and ergonomics. The playfulness of serious games is an asset and a drawback: it contributes to learner motivation and concentration before and during the game, but it reduces the credibility of this training method (Koivisto & Hamari, 2019; Larson, 2020). We would suggest several ways to optimize the use of serious games and improve their value creation.

First, trainers and managers have to consider serious games as

modules in a comprehensive multi-channel training protocol. Preparatory and confirmatory processes are essential to make learners aware of the learning objectives and monitor their achievements. The use of multimodal tools enables the firm to target heterogeneous groups and compensates for the weaknesses of serious games, and particularly their lack of cognitive value. The overall training system that combines different approaches also becomes more credible, which increases the product value.

Second, serious games designers should balance face-to-face and distance learning. When learners can interact with a trainer and discuss their reactions to the game, this can improve emotional and social value (Shipton & Sillince, 2012). Financial constraints should not lead to learners feeling left on their own, following low-cost training courses with no support. Learners and trainers emphasize that learning often occurs more during the discussion than during the simulation.

Third, trainers and managers have to carefully evaluate knowledge transfer, that is, the ability of learners to reinvest what they have learned in the real world. Although some work has confirmed the potential of serious games in the field of knowledge management and benchmarking, companies must control and optimize the transfer of new skills to improve cognitive value.

This AXA case study highlighted the advantages and dangers of serious games and compared the value creation of this training method with other methods used in the company. However, although the results are internally valid, their generalization is limited to similar contexts, especially the services sector. Future research should investigate industrial firms to understand how technology and science determines the effectiveness of serious games in this environment. Each dimension of the value creation of serious games could be the subject of further study, in particular socialization and emotions which are largely ignored by the literature. Certain ethical questions relating to learners' awareness of being in a game and the power of persuasion of serious games could also be the subject of a specific study.

CRedit authorship contribution statement

Oihab Allal-Chérif: Writing – review & editing, Writing – original draft, Validation, Project administration, Methodology, Investigation, Conceptualization. **Evelyn Lombardo:** Writing – review & editing, Writing – original draft, Validation, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Franck Jao-tombo:** Writing – original draft, Methodology, Data curation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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