



The Use of Serious Games in the Corporate Sector

A State of the Art Report

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1 Executive Summary

Corporate training is facing major challenges. Employees are no longer engaging with traditional forms of training including eLearning, finding the whole experience 'unexciting' and 'boring'. Compounding this situation is the growing numbers of 'millennials'¹ entering the workforce. According to Bersin and Associates, by 2014, 47% of the US workforce will be under 35. There is a need to make training more engaging, relevant and 'sticky' because a well trained workforce impacts key business drivers.

There is growing corporate interest in the 'gamification' of business processes such as training, marketing and recruitment. Gamification is the application of game mechanics to non-gaming environments to improve engagement and motivation and to influence behaviours. Examples of game mechanics include attainable challenges, rewards (badges, points) and public recognition (leaderboards). Gartner estimates that by 2015 a quarter of all business processes will be 'gamified'.

The 'gamification' of training is different to the 'gamification' of other business processes because there are clearly defined learning objectives with associated learning outcomes to be achieved. Properly designed educational games (serious games) are underpinned by both learning theory and computer games theory; the pedagogical foundation ensuring that successful learning outcomes are the primary drivers. Serious games, driven by instructional goals and appropriate application of game mechanics, have considerable potential to engage, motivate and influence the behaviours of a corporate workforce. It is the attributes of games, such as compelling storylines, attainable challenges, rewards, recognition and control that make them so powerful for learning.

The use of serious games in the corporate sector is growing at a steady rather than stellar pace. According to the *Towards Maturity 2012 Benchmark Report: Bridging the Gap*, 20% of the organisations who took part in the survey are using games or simulations as part of their learning solutions. The slow uptake is due to a number of factors including cost and a perception that all computer games are casual² games. However, large organisations such as Deloitte, IBM and Cisco are embracing serious games for training, marketing and recruitment purposes and are seeing positive impacts on all three business processes. Serious games are being used across the employee lifecycle from recruitment to onboarding, compliance and leadership training. They are being used in areas such as financial services, hospitality, business, and healthcare; in fact anywhere there is a need to attract, engage and motivate employees and to influence their attitudes and behaviours.

There is an increasing body of empirical research to support the effectiveness of games-based learning. Improvements in attitudes, engagement and motivation have been demonstrated. Improved cognitive gains have also been identified when compared to conventional instructional methods. Furthermore, there is research evidence demonstrating positive impact on higher order skills such as decision making and problem solving. Because the uptake of serious games in the corporate sector is still low in comparison to other sectors, such as schools and higher education, hard business metrics as to the effectiveness of the games-based learning approach is somewhat sparse. Some games have been shown to significantly cut training time while improving employee engagement. Deloitte

¹ Millennials are defined as the generation born between 1980 – 1999 who have grown up with technology

² Casual games are primarily for entertainment purposes



Leadership Academy has noted marked improvements in engagement levels and module completion rates since introducing game mechanics into their leadership training programme.

eLearning providers are noticing an increase in the number of customers enquiring about games-based learning solutions. However, cost is still a major barrier to uptake. Some eLearning providers are using games engines in a bid to address customer demand for games-based learning solutions and also to reduce the cost of games development.

Looking ahead, game analytics dashboards, already being used in some organisations, can be used to track and analyse employee game performance data and identify where and when performance support and intervention is needed, thus improving the training process.



2 Introduction

The industry partners of the Learnovate Centre identified the need for a state-of-the-art (SotA) report into the use of serious games for learning in the corporate sector. The catalyst for the report was an increase in the number of enquiries eLearning providers were receiving from corporate customers for games-based learning solutions and uncertainty amongst eLearning providers as to the validity and justification of the approach for learning.

The report is intended to provide the industry partners with the research evidence for the effectiveness of serious games in learning; provide examples of serious games usage in the corporate sector; identify the types of learning content suited to a games-based learning approach; and outline key considerations when designing games for learning.

The coverage and structure of the report reflects the industry partners' requirements. The report begins by identifying the parallels between the learning theories applied to the design of eLearning content and the principles of game design. It examines the research evidence for the effectiveness of game-based learning. Moreover, the report identifies appropriate applications for serious games across the broad spectrum of corporate training. It includes examples of serious games currently being used in the corporate sector for a variety of business processes including training. The implications of serious games for eLearning providers are discussed and the report concludes by outlining key design considerations for serious games.

The audience for this report includes the business development, learning design and serious games development sections of eLearning organisations.

3 The Pedagogy of Games-based Learning

Learning through play is nothing new. Educational computer games, underpinned by instructional goals and appropriate application of game mechanics, have considerable potential for learning through their ability to engage, motivate and influence the behaviour of learners. It is the attributes of games, such as compelling storylines, attainable challenges, rewards, recognition, control and a safe environment in which to fail and try again that make them so powerful for learning.

Well-designed serious (educational) games make learning fun, challenging and rewarding. Learners don't realise they are learning when engaged in a game. They are so focussed on achieving goals, competing with others and having fun that they become immersed in and master the subject matter without realising it. In terms of suitability for learning, it is not widely understood that there are significant parallels between many of the learning theories applied to the design of eLearning courses and the principles of game design. Some of the common learning theories applied to learning design are discussed below under the main headings and the parallels with game design principles are highlighted in each case.

3.1 Motivation and Engagement

Motivation and engagement are key drivers of learning. Learning designers use motivation theories and motivation models such as ARCS (Keller, 1987) as part of their frameworks for effective learning. Intrinsically motivating learners is the Holy Grail of instruction and studies show that computer games are particularly effective in this regard. Malone and Lepper (1987) put forward a taxonomy of intrinsic motivation for serious computer games. They contend that it is the combination of personal and inter-personal motivation in computer games that make them so intrinsically motivating. Examples of personal motivators include control, purpose, challenge, fantasy, curiosity and mastery. Examples of inter-personal factors include co-operation, competition and recognition.

Flow Theory was proposed by Mihaly Csikszentmihalyi to describe the experiences of intrinsically motivated people who engaged in an activity for its own sake (Csikszentmihalyi, 1975, 1990). According to Csikszentmihalyi, flow is a mental state in which someone is fully immersed and focussed on what they are doing. It is the state between boredom and frustration where someone finds the task challenging but also believes they have the skills and knowledge to accomplish it. This state fosters intrinsic motivation and provides the ideal conditions for learning. In contrast, when challenges and skills are mismatched, a task can evoke anxiety and frustration. Instructional designers strive to get the right balance of flow when designing eLearning content. One of the many affordances of serious game environments is that they dynamically create the appropriate state of flow for the learner, ensuring that they are always operating within their personal zone of ability and are intrinsically motivated as a consequence.

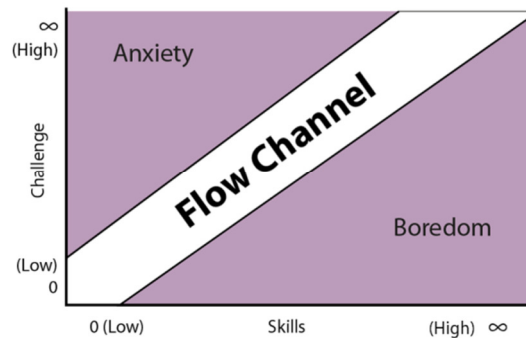


Figure 1: Flow Theory

Serious games are more engaging than traditional forms of learning, including eLearning, because of their ability to tap into the affective domain of learning, eliciting emotions such as enjoyment, excitement, anger and fun. Traditional learning tends to focus on the cognitive domain and learning outcomes without due regard to the affective domain. It is the emotional engagement with the game that causes learners to persevere and in doing so, master the embedded instructional objectives.

Research shows that incorporating game design principles, such as those outlined above, into learning design improves motivation and engagement, and results in improved learning outcomes and retention (Ricci et al., 1996, Chen et al., 1998).

3.2 Constructivism

Constructivism is an approach to learning that views learners as active participants in their own learning, constructing their own understanding of new concepts and experiences by relating them to their existing knowledge structures. Learners internalise information, form hypotheses and make decisions in much the same way they do when playing computer games. Serious games provide safe environments in which learners feel they can try and fail, learn from their mistakes and eventually master the task themselves.

Jean Piaget's work is central to constructivist thinking and many of the learning theories associated with, and underpinning, games-based learning have their roots in constructivism such as situated learning, experiential learning, and problem-based learning. Piaget's contention that cognitive structures change through the processes of adaptation, assimilation and accommodation of new information and experiences resulting in deep and meaningful learning (Piaget, 1970), mirrors what is taking place in game-based learning environments.

Social constructivism, often associated with Lev Vygotsky, extends constructivist thinking to consider the social context (co-workers, the instructor, other players in a game, society) as part of the learning process. Vygotsky contends that learners do not operate alone but as part of a social framework. Vygotsky's Zone of Proximal Development (ZPD) theory (Vygotsky, 1978) is particularly relevant to game-based learning. Vygotsky contends that when a learner is at the ZPD for a particular task, providing the appropriate assistance (scaffolding) at that point will give them enough of a "boost" to achieve the task. The assistance can come from the instructor, a peer or system prompts in the case of game-based learning. Once the learner, with the benefit of scaffolding, has mastered the task, the



scaffolding can be removed and they can then complete the task on their own and move onto the next new task.

3.3 Cognitive Apprenticeship

The theory of Cognitive Apprenticeship (Brown et al., 1989) has its roots in Situated Cognition (Lave, 1988). The theory proposes that effective learning occurs through authentic activities and contexts. Game-based learning facilitates this type of learning, enabling learners to solve real-world problems in contexts similar to those in which they will arise. The player (learner) is an apprentice in the game environment which teaches appropriate behaviours and expedites the acquisition of skills. Through the provision of continuous feedback and guidance, the system helps the learner build on skills and behaviours mastered in previous levels. There is evidence that situated learning improves the transfer of learning – a major issue for corporates where significant financial investment goes into training but the knowledge or skills are never transferred to the workplace (Choi and Hannifin, 1995).

3.4 Experiential Learning

In proposing his Experiential Learning Cycle, Kolb (1984) was building on the work of other proponents of experiential learning, for example, Dewey (1938) and Lewin (1951). Underpinning Kolb's model is the premise that learning is the process whereby new knowledge and understanding is created through the transformation of experience.

Herz and Merz (1998) showed that design of many educational games mirrors the four stages of the experiential learning cycle with players initially as active experimenters, then gaining concrete experience, then reflecting on experiences and finally analysing, generalising and hypothesising which brings about new learning.

3.5 Social Learning Theory

Observation and imitation of others can lead to change in behaviour according to Robert Bandura (1969, 1977). Research shows that humans can be socially influenced to change their behaviours and attitudes through human social models (Gredler, 1997).

In games-based learning environments, the use of avatars (anthropomorphic agents) enables the modelling of required behaviours which players (learners) will internalise and imitate.

3.6 Self Determination Theory

Self Determination Theory describes the factors which drive people to fully engage with some challenges to achieve mastery without the need for extrinsic motivation. The three factors are autonomy, a feeling of being in full control of the situation; competence, a feeling that mastery is possible; and relatedness, a feeling of being connected to others.

Research shows that player enjoyment of and engagement in a game is strongly related to the feelings of control and competence the game elicits in the player. The same study also links the feelings of control with how intuitive the game is. This has implications for serious game design in terms of fostering intrinsic motivation in learners (Ryan et al., 2006).

3.7 Summary

This section identifies some key learning theories which are applied to the design of eLearning content. It also draws parallels between the applications of these learning theories to learning content design and serious game design. It is not widely understood that well-designed serious games provide us with learning environments where theories of motivation, engagement and constructivism can be applied and exploited far beyond the limitations of traditional learning environments.

4 The Research Evidence to Support Games-based Learning

There is a growing body of research evidence to support the effectiveness of games-based learning. While the majority of studies have been carried out in educational settings, there have also been studies relating to the effectiveness of game-based learning for corporate training.

The evidence presented in this section is based on research which was published in peer reviewed journals and subsequently collated (Kapp, 2012). The evidence comes from a number of meta-analysis³ reports and also from research into the effectiveness of individual game elements.

Other research also shows the potential of game-based learning for different types of learning (Garris et al., 2002). This study analysed the learning outcomes from educational games and identified gains for both the cognitive and affective domains.

4.1 Overall Effectiveness of Games

4.1.1 Impact of game-based learning on learning outcomes

Sitzmann's meta-analysis (2011) looked at the research findings from 55 research publications relating to the use of game-based learning in training in a number of sectors including business, medicine and education. She reports that procedural knowledge was 14% higher and declarative knowledge 11% higher in trainees taught using the games-based learning approach when compared to trainees taught using more conventional methods including eLearning.

Vogel's meta-analysis (2006) of 32 research publications also showed higher cognitive gains for trial participants using games or simulations compared to those being taught conventionally.

Wolfe's meta-analysis (1997), examined seven research publications relating to the use of instructional computer games to teach strategic management. He found that in all of the seven research studies, the games-based approach yielded improved learning outcomes and significant knowledge gains when compared to more conventional teaching methods such as case studies.

While the above meta-analyses are quantitative (based on statistical analysis of combined research data), Ke (2009) conducted a qualitative meta-analysis on 65 research publications. One of her key findings was that instructional computer games seem more suited to the development of higher order thinking skills than for imparting declarative knowledge. This would appear to validate the increasing use of computer games in areas such as leadership and strategic management training.

4.1.2 Impact of games-based learning on attitudes or motivation

Vogel's meta-analysis (2006) found that games promote better attitudes to learning than other instructional methods.

To evaluate the impact of computer games on motivation or attitude as part of her meta-analysis, Ke (2009) examined research studies that looked at affective learning outcomes such as attitudes to the

³ A meta-analysis combines the results of a number of research studies to identify trends or patterns

subject matter, attitudes to game-based learning, etc. She found that game-based learning improved motivation and attitudes across different learning cohorts and subject matter domains.

Sitzmann (2011) found that engagement and motivation levels were high when the instructional game actively involved the trainee. Given that the average age of the trainees across the 55 research publications was 23, this is an interesting finding. This is the 'millennial' group many organisations are having trouble motivating, engaging and indeed retaining. Identifying ways of effecting attitudinal change in this cohort would benefit organisations.

4.1.3 Impact of games-based learning on retention or transfer of knowledge

Sitzmann (2011) found that trainees who used the game-based learning approach had 20% higher confidence that they had mastered the learning and could perform the tasks on the job. This is an interesting finding. Interviews with eLearning providers, conducted as part of the research for this report, indicates that one of the drivers of commissioned eLearning games is that corporates are concerned that knowledge, skills or desired behaviours are not being effectively transferred from training programmes to the workplace environment.

4.1.4 Other meta-analysis findings

Hays (2005) conducted a meta-analysis of 105 research studies relating to the design, use and instructional effectiveness of instructional games. He carried out the analysis to identify the disadvantages as well as the advantages of games-based learning. He observes that because there are many variables between one research study and the next (profile of trial participants, subject domain, task type, simulation or 2D game), caution should be exercised when generalising as to effectiveness, or otherwise, of games-based learning. Furthermore, he contends that there are flaws in the methodology associated with some of the existing research.

According to Hays' findings, games are more effective when used as part of a blended instructional strategy with learners being debriefed after the game to consolidate and reinforce the instructional objectives of the game. He also recommends that instructional designers should be closely involved in the design of games for learning.

Hays found that there was not enough evidence to support a blanket use of games for instruction; he found that just because a game-based learning approach is effective for one group of learners in a particular learning domain and context, it shouldn't be assumed that it will be effective for a different group of learners in a different learning domain and context.

4.2 Research Evidence for Effectiveness of Game Mechanisms

4.2.1 Rewards

Stars, badges and points are some of the rewards given to players in a game. While learning designers tend to place a higher value on intrinsic⁴ motivation than extrinsic⁵ motivation, there is research evidence to support the use of the extrinsic reward mechanisms found in games where the learning content is not perceived as interesting or valuable by learners (Lepper, 1988). In a corporate training environment, this has particular resonance for compliance training.

⁴ Intrinsic motivation is where mastering the task or learning is reward in itself

⁵ Extrinsic motivation is where the rewards are external to the task or the learning e.g. stars, prizes

There is also research evidence to indicate that appropriate performance-contingent rewards (extrinsic motivation) in games can lead to intrinsic motivation and also positively change attitudes to tasks (Harackiewicz and Manderlink, 1984, Eisenberger et al., 1999). However, inappropriately used, performance-contingent rewards can undermine intrinsic motivation (Deci et al., 1999). Learners must perceive the reward as being commensurate with level of effort involved.

In the context of serious games, rewards should be meaningful in the context of the learning and well managed. If awarded too frequently, they lose their motivational value. The research indicates that to maintain motivation, the appropriate level of uncertainty for rewards in a game is 50% (Atkinson, 1957).

4.2.2 Avatars

Serious games are often used as part of corporate learning programmes to effect behavioural change. There are many research studies to support the effectiveness of avatars in changing behaviours and also in transferring those behaviours to the real world (Hershfield et al., 2011; Yee et al., 2009).

In serious games, research shows that it is more effective to have one expert avatar and another motivational avatar than to have one combined mentor avatar. Baylor and Kim (2005) reported that students learned significantly more and had significantly greater motivation when the functions were separate.

Avatars have been widely used in the healthcare sector to effect behavioural change. Their use enables the modelling of required behaviours which players (learners) will observe, internalise and imitate (Fox and Bailenson, 2009).

4.3 Summary

The research evidence to date suggests that game-based learning appropriately used and driven by instructional goals, can positively impact learning outcomes, improve engagement and motivation, and influence behaviours. However, more research and analysis is needed to enable us to draw meaningful conclusions and to address concerns relating to research methodology in this area.

5 Application of Games-based Learning to Corporate Training

There is evidence to show that, appropriately used, computer games can positively impact learning outcomes in all three learning domains; cognitive⁶, affective⁷ and psychomotor⁸. Much corporate training is focussed on the cognitive domain, which deals with learning ranging from factual (declarative) knowledge to problem solving and decision making skills. When considering a games-based learning approach it is important that the appropriate instructional strategy for the different types of training is considered. Learning designers currently deploy these best-practice instructional strategies when designing eLearning courses and it is important that they are not overlooked when moving to a games-based learning approach. The games-based environment offers the opportunity to improve, extend and exploit some of the instructional strategies over and above what traditional eLearning environments can facilitate in order to improve the effectiveness and transfer of training.

5.1 Cognitive Domain

5.1.1 Factual (declarative) knowledge

A considerable amount of training in organisations involves declarative (factual) knowledge. For employees this type of learning can be boring and un-engaging. For employers, it's important that employees take this type of information onboard and apply it to their job. What does a games-based learning approach do more effectively in terms of learner engagement than conventional eLearning courses for this type of content? Games provide a narrative structure that helps encode facts in memory more effectively than other non-game instructional strategies. Of course learning designers can employ storytelling to provide context to the learning as part of eLearning courses, but it is the interplay between the various elements in a game that potentiate the narrative effect in a computer game. The narrative effect in a game can also facilitate elaboration – the linking of prior knowledge (previously learned facts) to new facts.

5.1.2 Conceptual knowledge

Over and above the usual instructional strategies used to teach concepts, games facilitate experiential learning. Learners can experience the concept first hand for themselves through cause and effect scenarios based on their understanding of the concept. Examples and non-examples of the concept should be an inherent element of the game scenario. A complex 3D environment is not necessary for learners to become effectively immersed in the concept being taught.

5.1.3 Compliance training (rules-based knowledge)

Compliance training is considered a necessary evil for most organisations. This type of training is generally dry and un-engaging for employees. Very often learning and development (L&D) departments don't see the value in ensuring and evaluating the effectiveness of compliance training, yet ineffective compliance training can be very costly for organisations. As well as the motivational and engagement advantages of games-based learning for compliance training, games can improve on traditional eLearning in many ways. Compliance training by its nature is rules-based. Games can enable learners to apply rules through role play simulations and experience cause-and-effect of appropriate or inappropriate application of the rules.

⁶ The cognitive domain deals with the acquisition, understanding and application of knowledge and skills

⁷ The affective domain deals with attitudes, emotions, feelings and values

⁸ The psychomotor domain deals with motor skills including movement and co-ordination



5.1.4 Skills training

Game-based simulations⁹ can be particularly effective in teaching procedures and can move learners from novice to expert in a safe environment which allows them to practise, make mistakes and learn from them through scaffolded feedback. Guidance can be gradually withdrawn as novices, through experiential learning, progressively and actively work their way through the spectrum of expertise without realising it.

5.1.5 Soft-skills training

Soft skills refer to the character traits and interpersonal skills that characterise a person's relationships with, and ability to interact with, other people. Examples of soft skills in a corporate setting would be communication skills and leadership skills.

Although many eLearning programmes use video role play as the appropriate instructional strategy for this type of training, it is often too costly to do effectively. Branched scenarios and professional actors are required for video role play to be realistic and effective and costs can mount up in terms of production.

Games are as effective as video role play for teaching leadership skills and more cost effective. John Seely Brown and John Hagel (2009) are advocates of using games such as World of Warcraft to teach leadership and other soft skills required for success in business. Through experience of interacting with characters in the game-based learning environment, learners figure out for themselves the appropriate skills to apply while simultaneously learning about group dynamics.

5.1.6 Problem-based learning and decision making

Problem solving skills are valuable skills within a workforce. They contribute to an organisation's competitive edge in the marketplace enabling them to be agile and respond quickly to change. There is a growing body of evidence to support the use of games-based learning in the development of critical thinking and problem solving skills and to suggest that after engagement and motivation, this is possibly the most powerful pedagogical application of games-based learning. Problem-based learning is an instructional strategy used by educators whereby the learner is presented with real-world problems and provided with the tools and support to solve it, alone or collaboratively. Games are ideal environments in which to exploit this instructional strategy to its full potential, enabling learners to manipulate variables and to synthesise knowledge in order to solve problems.

5.2 Affective Domain

The real power of games is that they can simultaneously, and positively, impact both the cognitive and affective domains. The affective domain deals with feelings, attitudes and values. If a learner has a positive attitude towards learning, as they do when learning through well-designed games, they should learn more effectively and intrinsic motivation should be higher.

Tapping into the affective domain can also be used to effectively change behaviours and attitudes. For example, games can be used effectively to alter attitudes and behaviours to training in the case of employees and to influence purchasing decisions of existing or future customers when used as a marketing tool.

⁹ Simulations incorporating game mechanics such as goals, challenges and rewards

5.3 Psychomotor Domain

The psychomotor domain of learning includes physical movement, coordination, and use of the motor-skills. Development of these skills requires practice and is measured in terms of speed, precision, distance, technique, etc.

Serious games provide environments in which psychomotor skills can be practised and developed. They are widely used in surgical training for both technical and non-technical skills. A recent meta-analysis of serious games in medical education and surgical training supported their use in terms of learning and skills outcomes (Graffland, 2012).

The use of augmented reality haptic¹⁰ devices for teaching psychomotor skills is also growing in areas such as dental training. The haptic device enhances the immersive experience enabling the learner to experience force and fine tune their precision skills.

5.4 Summary

Evidence shows that serious games can positively impact learning outcomes in all three learning domains. The implication for corporate training is that a similar training strategy can be applied to soft skills, motor skills and cognitive skills training. This enables training departments, currently purchasing different training solutions for each of the different learning domains, to improve efficiencies while not compromising training outcomes. However, when considering a games-based learning approach it is important that the appropriate instructional strategy for the different types of learning content is applied. Learning designers currently deploy these best-practice instructional strategies when designing eLearning courses and it is important that they are not overlooked when moving to a games-based learning approach.

¹⁰ Haptic devices enable users to feel and manipulate objects in virtual environments

6 The Uptake of Serious Games in the Corporate Sector

Increasingly, organisations are using serious games to attract new employees, engage and motivate their workforce, improve training outcomes and to influence the behaviour of their existing and potential customers. Gartner estimates that by 2014, 70% of large organisations will have 'gamified' ¹¹ at least one business process.

According to an M2 Research report – Gamification in 2012, 56% of organisations purchasing 'gamified' solutions are seeking to improve user engagement and motivation.

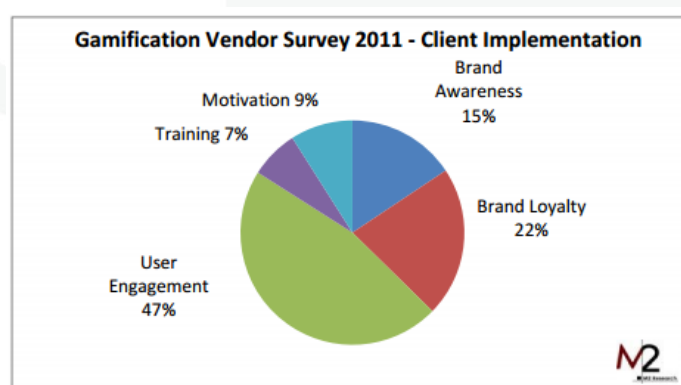


Figure 2: From M2 Research Report – Gamification in 2012

While the growth in the uptake of serious games by the corporate sector is less than in other sectors, it continues to grow at a steady pace. Ambient Insight, a market research firm that uses quantitative predictive analytics to identify revenue opportunities for global eLearning and mobile learning suppliers, predicts that the global games-based learning market will grow significantly to 2016.

Region	2011 Revenue US\$ Millions	2016 Revenue US\$ Millions	Five Year CAGR 2011-2016
North America	\$286.73	\$514.83	12.4%
Latin America	\$21.51	\$77.22	29.1%
Western Europe	\$83.15	\$136.43	10.4%
Eastern Europe	\$11.47	\$36.04	25.7%
Asia	\$813.18	\$1,723.20	16.2%
Middle East	\$2.87	\$6.18	16.6%
Africa	\$10.04	\$25.74	20.7%
Total	\$1,228.95	\$2,519.64	15.4%

Figure 3: Ambient Insight 2012 Report on Worldwide Game-based Learning Market

It could be argued that some of the examples presented in this section are simulations, not games. It's important therefore to clarify the difference. Simulations such as a flight simulator or a simulated kitchen environment used as part of hospitality training enable learners to explore the environment for themselves, to practice skills in the safe environment, to learn from their mistakes with feedback and

¹¹ 'Gamify' – to apply gaming mechanics to a process



eventually master the skills. So far it's similar to the attributes of many serious games. The difference lies in the application of game mechanics. Serious games have goals (rather than open exploration), competition, rewards and a compelling storyline. However, the division between simulations and serious games is blurring as game mechanics, such as goals and leaderboards, are being introduced into simulations as is the case with any of the 'simulation' examples in this section.

Because of their ability to motivate, engage and influence behaviours, serious games are being used for three key processes in organisations:

1. Training
2. Recruitment
3. Marketing and Sales

6.1 Use of Serious Games for Training

The affordances of serious games for corporate training and development across many subject domains are increasingly being recognised. Serious games can be used for training throughout the employee lifecycle from recruitment through to onboarding and onto leadership training.

Large organisations such as IBM, Cisco and Deloitte are increasingly using games to train their workforces in areas ranging from compliance training to leadership training. These organisations recognise that, due to exposure to new and exciting technologies in their everyday lives, new employees are not engaged and motivated by traditional forms of training (including page-turning, linear eLearning) resulting in a poorly trained workforce. This is a serious problem for all sectors but particularly for pharmaceuticals where breaches of compliance can lead to very heavy fines.

Organisations are finding that the application of a game-based learning approach to corporate training is helping them increase employee engagement and drive performance over and above that previously delivered by traditional training approaches. Serious games provide employees with a compelling context-relevant storyline, achievable goals, constant feedback on their progress and rewards such as achievement badges and public recognition. They also provide employees with opportunities to fail, learn from their mistakes and try again in safe environments.

Going one step further, game analytics dashboards can provide organisations with the ability to collect and analyse employee performance data, enabling them to track performance on an ongoing basis and identify where and when performance support and intervention is needed.

6.1.1 Finance training

In the financial services sector, serious games are being used for compliance training, to attract new customers and to explain complicated financial offerings.

€conomia is a serious game based on the monetary policies of the European Central Bank to teach employees about the impact of interest rate changes on unemployment, production growth, inflation, and other vital economic indicators.

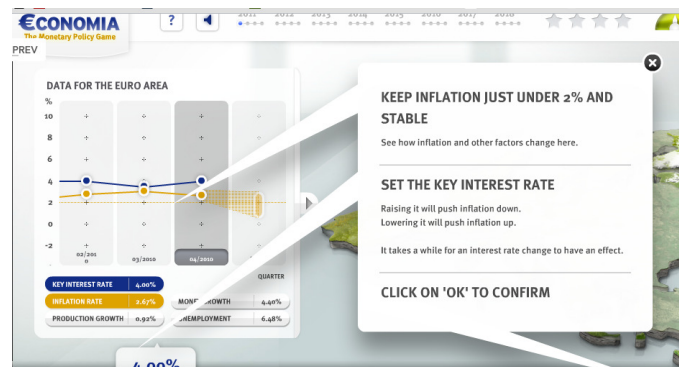


Figure 4: *Economia*

BankersLab provides a suite of 'gamified' training products to the retail banking industry which includes CollectionLab, a serious game designed to train employees on how to optimise delinquent collections. In order to win, players must successfully operate the most profitable virtual bank with the most satisfied customers. Teams have to demonstrate expertise in each of the key areas of collection management, including staffing, resource allocation, economic stress, and product growth. Each module of the game is linked to course materials, digitally integrated case studies, and supportive iOS mobile learning apps.

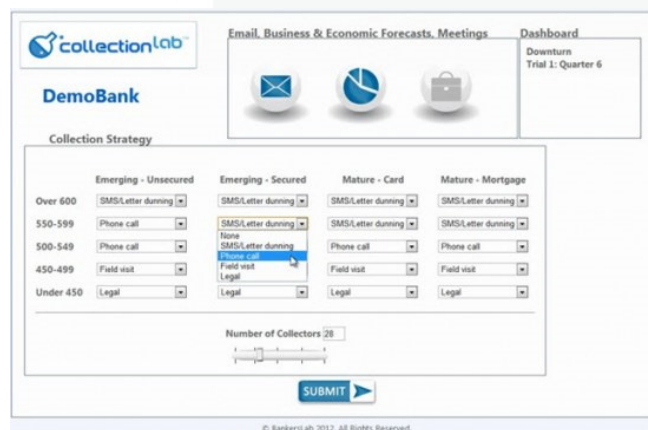


Figure 5: BankersLab's *CollectionLab*

The financial services sector is also making use of games such as True Office to deliver engaging compliance training (generally accepted as the most boring type of training). True Office enables employees to explore scenarios such as anti-money laundering and insider trading through interactive gameplay and immersion. The analytics dashboard enables management to analyse overall employee performance and provide early intervention and support. True Office also provides a variety of games that can be tailored to match each company's own internal policies through customisable narratives. The most popular game has been shown to condense 45 minutes of compliance training into a 15-minute role-play game which cuts training time by 33% while improving engagement.



Figure 6: True Office

6.1.2 Business training

The Deloitte Business Simulation game is designed to train employees in corporate responsibility and sustainability. The game enables players to experiment with a realistic model of their company and its potential future scenarios. During the game, the players go through various scenarios and are confronted with the consequences of their decisions just as in the real world. This hands-on experiential learning helps to sharpen management skills through practice and feedback.

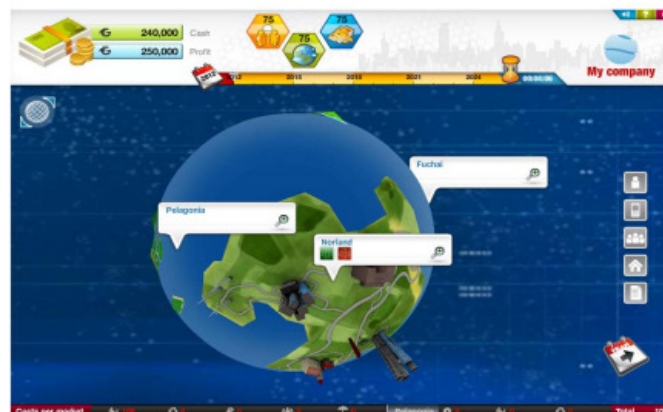


Figure 7: Deloitte's Business Simulation Game

CoCo Sim, developed by Front Square, is a game based in a fictional New York-based chocolate store, where the player must manage cash flow and stock levels in order to achieve a high customer satisfaction level while also remaining profitable. The game integrates modules on business process, problem solving and basic accounting. The knowledge and skills are applied to the game in order to improve the score. Player's skills are tested with regular questions and the combined game and question scores are then posted on a leaderboard to help drive competition and engagement. Line managers and HR managers have access to the learning analytics to see who is doing well and who needs performance intervention.



Figure 8: Front Square's *CoCo Sim*

Deloitte Leadership Academy, a digital executive training programme for more than 10,000 senior executives in over 150 companies around the world, partnered with Badgeville to add game mechanics to its leadership training programme to drive desired behaviours and increase engagement. The programme is delivered to senior executives via an online portal or mobile devices.

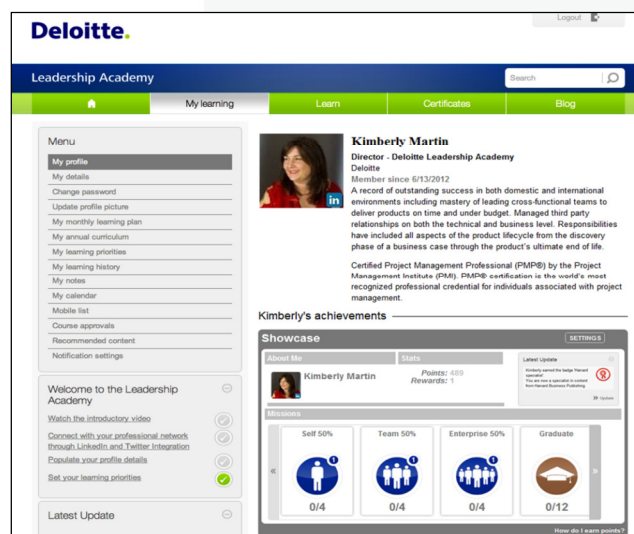


Figure 9: Deloitte's 'gamified' Leadership Academy

As players contribute, share knowledge and complete learning programmes, they receive badges, rewards and can share these accomplishments on sites such as LinkedIn, improving their reputation in their field of expertise. After three months of use the results were impressive in terms of improved engagement and module completion:

- 46.6% increase in the number of users that return to the site daily
- 36.3% increase in the number of users that return to the site weekly
- An average of three badges per active user
- The top user had collected 30 badges
- One user has earned the Leadership Academy Graduate badge which was expected to take 12 months to achieve

Deloitte Leadership Academy attributes the improvement in engagement and motivation to the application of game mechanics to the programme.

6.1.3 Hospitality training



Figure 10: Hilton Garden Inn's *Ultimate Team Play*

Hilton Garden Inn's *Ultimate Team Play* is a serious game to demonstrate to hotel employees how their actions have an impact on the hotel and on the guest's mood, which in turn drives the brand's satisfaction and loyalty tracking system - SALT. SALT is the real-world survey tool used by Hilton Garden Inn to measure and track guest loyalty, satisfaction and overall experience at a particular hotel, as well as guest thoughts on the brand in general. The game puts employees in a 3D virtual Hilton Garden Inn hotel where they must respond to a number of different guest-related requests by a specific deadline. The appropriateness, level and speed of their response directly affect the guest's satisfaction in the game as well as the hotel's SALT scores. The game integrates training content for positions in housekeeping, food and beverage, engineering/maintenance and front desk customer service.

6.1.4 Skills training

Cisco designed the Mind Share game to help employees learn, practise and reinforce their networking skills in preparation for Cisco certification. In the game, players learn, practise and validate core networking skills in each module. To ensure that the game promotes learning and does not frustrate players, there are three levels of difficulty: easy, medium, and hard.



Figure 11: Cisco's *Mind Share*

6.1.5 New hire orientation

Onboarding is an important stage in the employee lifecycle. According to a 2008 study by the Aberdeen Group, 86% of new employees make a stay-or-leave decision about a company within their first six months of employment. For many organisations, high attrition rates are a significant problem. Making new hire orientation as engaging and 'sticky' as possible can help turn new hires into productive and committed employees.

AllAboard is a 'gamified' learning platform from MindTickle that can supplement or replace a company's existing new hire and training process. *AllAboard* can leverage existing training content and transform it into an engaging, game-like, interactive learning experience.

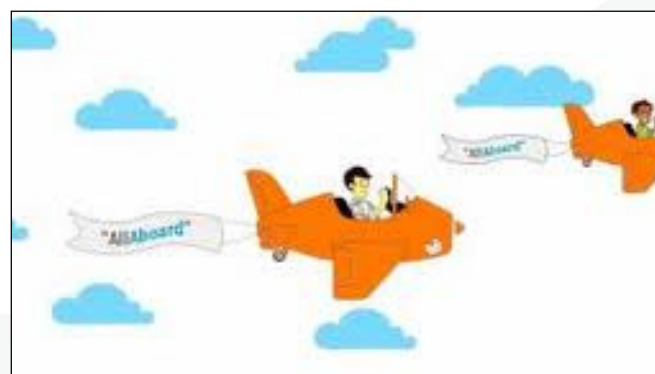


Figure 12: MindTickle's *AllAboard*

6.2 Use of Serious Games for Recruitment

Organisations are increasingly turning to Facebook as a recruitment tool. As the Marriott Hotel group grows in countries such as China and India, it uses a Facebook game called *My Marriott Hotel* to attract the next generation of hospitality employees. Having prospective employees experience the hotel working environment for themselves in the game, ensures that Marriott is more likely to get

applicants who understand the nature of the job for which they are applying thereby improving the efficiency of the recruitment process. The game can be re-used as part of the onboarding training process. Being able to deploy the same game for recruitment, onboarding and general training purposes justifies the development costs for Marriott - develop once, deploy many times.



Figure 13: Marriott Hotels' *My Marriott Hotel*

6.3 Use of Serious Games for Marketing and Sales



Figure 14: IBM's *CityOne*

Facebook games are so popular that organisations are using them as mainstream marketing tools. An example of this is IBM's *CityOne*, a serious game which aims to influence the behaviour of their own employees, business partners, clients and future clients. As a marketing tool, the game enables companies like IBM to market its products and services in a way that engages existing customers and potential customers more deeply, making the company's value proposition clearer and more compelling. *CityOne* demonstrates how municipal systems connect, how industries evolve, and how IT investment impacts people, profit, and the planet.



Figure 15: Siemens' *Plantville*

Siemens uses *Plantville*, a serious game, as an online marketing tool to showcase its products and services. It also uses the game as online recruitment tool and as part of employee training. *Plantville* gives players the opportunity and challenge of running a virtual factory, complete with evaluation of key performance indicators, allocation of scarce capital funds, and the ability to improve process efficiency with the purchase and installation of Siemens equipment. Factory managers in *Plantville* are required to hire and deploy workers, balance worker safety and satisfaction against production delivery schedules and continuously adapt strategies to changing external conditions.

6.4 Summary

Serious games are being used for training, recruitment and marketing in many sectors including healthcare, pharmaceutical and the public sector. Serious games provide an engaging opportunity for active learning in which employees are challenged and rewarded. They respond to much more difficult cognitive and affective challenges than is afforded by more traditional forms of training.

The examples shown in this report are a not intended to be a definitive list but a snapshot of the serious games that are currently being used in the corporate sector. Wherever there is a need to engage and motivate staff in training and/or influence attitudes or behaviours, games provide an appropriate vehicle. It's worth noting from the examples above, that in many cases, the same game was used for recruitment, training, marketing and sales – an example of a 'develop-once, deploy-many-times' strategy that cuts costs for the organisation.

7 Implications of Serious Games for eLearning Providers

Research for this section was carried out using a series of questions posed to the industry partners of the Learnovate Centre who are currently providing serious games to the corporate sector. The responses were collated and provide an indication of what customers in this sector are asking for, the type of solutions the eLearning industry is providing and some feedback from customers as to the impact the serious games are having in the workplace. The responses also identify potential barriers to the uptake of serious games by the corporate sector and attempt to compare the cost of developing a serious game to an equivalent piece of eLearning.

7.1 Questions posed to the Learnovate Centre's Industry Partners

Q: What is driving customer requests for serious games?

A: eLearning providers identified two main drivers of requests for games-based learning solutions from their corporate customers:

- To engage learners 'jaded' by existing eLearning solutions. Organisations are finding it increasingly difficult to persuade their workforce to take crucial training
- To attract and retain younger talent by signalling that this company is different in its approach to training

Q: Are the requests confined to specific sectors?

A: Requests for game-based learning solutions extend to all sectors. There is also a global spread with requests coming from the UK, US, Asia, etc.

Q: For what types of training are your customers proposing to use serious games?

A: As serious games have broad applications for corporate training, it varies. eLearning providers have identified the following contexts for deployment based on customer requests for game-based learning solutions:

- To influence/change attitudes
- For process improvement
- To improve knowledge/skills transfer
- For induction training
- For assessment purposes

Q: Are you providing simple 2D games or complex 3D simulations?

Because there is still a lot of confusion out there as to the difference between a serious game and a simulation, before presenting the eLearning providers responses to the above question let's attempt to clarify the difference. Simulations, such as a flight simulator or a simulated kitchen environment used as part of hospitality training, enables learners to explore the environment for themselves, to practice skills in the safe environment, to learn from their mistakes with feedback and eventually master the skills. So far it's similar to the attributes of many serious games. The difference lies in the

application of game mechanics. Serious games have goals (rather than open exploration), competition, rewards and a compelling storyline. The division between both is blurring as game mechanics such as leaderboards and goals are being introduced into simulations. Well-designed simulations and serious games are separately very effective for learning. Combining the most effective attributes of both has great potential for learning.

A: It depends on the client request and willingness to pay the high costs associated with the development of a complex 3D simulation. It also depends on the type of training involved; complex 3D simulations are not appropriate for some types of training and can divert the learner from the instructional goals which should be paramount in a serious game. Depending on their client base, some eLearning providers provide a mix of simple games and 3D simulations.

Q: How does the cost of developing a serious game compare to developing traditional eLearning?

There are no definitive answers to this question, however, responses from the eLearning providers provide interesting insight.

A: A key cost which is often overlooked when comparing the development of a serious game to a piece of traditional eLearning is the cost of upfront client engagement and support. According to eLearning provider feedback, there is considerably more upfront client engagement associated with the design of serious games than for traditional eLearning which adds to the cost of development. Upfront client engagement would be required to establish if the game characters, mood boards etc. were acceptable. When upfront costs are excluded, one eLearning provider estimated that developing a medium fidelity game compares to developing a high-end piece of eLearning.

The cost also depends on the type of game and whether or not a game engine is used in the development. Assuming the game is a medium fidelity game and that a game engine is not used for development, another eLearning provider estimated the development cost when compared to a traditional piece of eLearning with the same instructional objectives, might be an additional 30%-50%. However, once the functionality of the game is built, the game could be repurposed by the provider for another client requiring games-based training with similar instructional objectives.

Q: Have you had any customer feedback as to the impact/effectiveness of your serious games?

A: According to eLearning provider responses, customer feedback is very positive. In one case the game-based learning approach improved the uptake and completion of a course, and also learner attitudes to the content when compared to the standard eLearning content.

While the feedback is overwhelmingly positive, it is qualitative. Some eLearning providers, interested in following up on the impact of the games in the organisations they developed the game for, are having difficulty in getting their customers to engage in this regard. Once the training solution has been delivered and is perceived to be working, customers appear to be happy, which suggests that they are not making the link between training effectiveness and business impact.



Q: What are the barriers to adoption of serious games in corporate training as you perceive them?

A: eLearning providers have identified the following as being barriers to the adoption of serious games for corporate training:

- Poorly designed games which are not driven by instructional objectives
- A perception that serious games are only useful for content such as leadership training
- Cost

7.2 Further Implications for eLearning Providers

Some eLearning providers are layering a game engine over their existing eLearning platform and pulling eLearning content into a game narrative. This enables them to re-use existing content but make it more engaging through the application of game mechanics. From the learner's perspective, it also means that the eLearning content has less of a linear feel. The game mechanics can be adjusted so that they do not frustrate the learner or compromise the instructional integrity of the training content. Layering a game mechanics engine over existing course content is somewhat similar to what Deloitte Leadership Academy did by partnering with Badgeville where game elements were 'bolted' on to Deloitte's legacy content (Section 6.1).

As adoption of serious games increases and more eLearning providers start to use them, guidelines are required for the selection of appropriate game engines. The Serious Games Institute in the UK has published a framework that informs the selection of the appropriate game engine based on the technical requirements of the serious game and also the instructional content involved (Petridis et al., 2011). Some game engines provide basic functionality and enable the creation of game show type games while others offer comprehensive functionality that enables the creation of complex 3D environments. Examples of such game engines for corporate training are <http://unity3d.com/sim/> and <http://www.sealund.com/justplayit.php>.

In terms of the delivery platforms being used for serious games, it appears as though simple games, for example games incorporating assessment quizzes, are being delivered via mobile devices, whereas the more complex games for learning are being delivered via PC/laptop.

Organisations using stand-alone serious games for training purposes often find that games under-perform. It is prudent for organisations to consider how existing and new training technologies can work together to support specific learning and development objectives. Integrating games into existing training frameworks can be very effective. At a more granular level, bolting relevant games or game mechanics onto existing eLearning training content can improve the engagement value of the content and remonetise legacy content for the organisation.

7.3 Summary

According to the Learnovate Centre's eLearning industry partners, client requests for serious games are being driven primarily by poor learner engagement with existing training solutions. Customers indicated that they intended to use serious games for a variety of training purposes including influencing behaviours, improving processes, improving skills transfer and for induction training.

Depending on customer requests and willingness to pay, eLearning providers are creating both simple 2D games and more complex 3D games. Industry partner feedback, albeit limited, suggests that the cost of developing a medium fidelity serious game is similar to the cost of developing a high-end piece of eLearning content with the same instructional objectives. However, in a bid to keep game development costs down, some eLearning providers are layering game engines over their learning management system (LMS). This enables them to 'gamify' existing training content and improve its engagement value. It also enables them to smartly develop new games which can be re-used for training in the same learning domain by simply re-populating the games with new learning content.

8 Designing Serious Games – Key Considerations

There are some similarities between the design principles applied to the development of serious games and eLearning. For example, both are underpinned by instructional goals. However, well-designed serious games can be more effective than traditional eLearning because of the potential of games to positively impact the affective learning domain and thereby improve learner engagement. When designing serious games it is important to fully exploit their many affordances for learning.

However, according to Gartner (Gamification Trends and Strategies to Help Prepare for the Future – Webinar, November 2012), poor game design is one of the key failings of many ‘gamified’ applications. Gartner predicts that by 2014, 80% of current ‘gamified’ applications will fail to meet business objectives primarily because the sole focus of the ‘gamification’ is on points, badges and leaderboards rather than balancing them with the other important learning affordances of games.

8.1 Designing for Challenge, Curiosity, Control and Fantasy

According to Malone and Lepper (1987), there are four key attributes of a serious game:

1. Challenge
2. Curiosity
3. Control
4. Fantasy

Designing games for learning, as opposed to casual games, involves the application of best practice guidelines for providing challenge, curiosity, control and fantasy.

8.1.1 Challenge

Challenge is created by having clear, fixed goals that are relevant to and attainable by the player.

8.1.1.1 Narrative

The use of a narrative creates a context in which the goals of a game can be understood and achieved. The story provides meaning and context for the learning, contributes to the flow of the game and aids in the recall and far-transfer of learning (transferring the skills and knowledge to a new situation). Like any good story, a game narrative typically will have characters, a challenge, problems to be solved along the way and resolution.

8.1.1.2 Goals

Goals add structure, purpose and measurable outcomes to a game. In a serious game, it is recommended that the game is designed around a terminal learning goal that is supported by a series of instructional objectives. The objectives are small incremental goals that move the player towards the terminal goal. The terminal goal requires the application and consolidation of the skills acquired along the way. Enabling players to view their goal progress is highly motivating.

8.1.1.3 Flow

To maintain the flow of a game, challenges must be appropriate to the ability of the player in order to avoid player frustration if challenges are too difficult, and boredom if challenges are too easy. The challenges should promote feelings of competence in the player. Learning designers can use game levels to address this dilemma; skills are acquired and reinforced at each level before moving on to the next level where the player might have to apply them.

8.1.1.4 Feedback

Feedback is inextricably linked with challenge. Players require feedback on their performance as they work through the challenges. As in a well-designed eLearning course, there are different types of feedback that should be included as part of serious game design; positive feedback, corrective feedback and supportive/guiding feedback. All types of feedback should be unambiguous and immediate. Positive feedback, given in response to a correct action, should be appropriate to the complexity of the task or it will lose its relevance later in the game. Corrective feedback should be immediate and relevant to the action and narrative. Supportive/guiding feedback should guide and prompt the player towards the correct action rather than explicitly telling them what to do.

8.1.2 Curiosity

Curiosity exists in two different forms: sensory curiosity and cognitive curiosity. Cognitive curiosity can be aroused in players by placing them in an unexpected situation in which they do not have enough information to solve the problem or complete the step – this surprises them, forcing them to reflect on and identify information they encountered earlier in the game that might be useful.

Audio and visual effects, providing that they are relevant to the storyline and not superfluous, can be used to elicit sensory curiosity.

8.1.3 Control

Feelings of self-determination and control are powerful motivators in games. A well-designed game elicits a sense of power, contingency and choice in the player. When players make choices that produce powerful effects it increases their sense of personal control.

When designing serious games for learning, it's important to avoid game features which would adversely impact a player's sense of control e.g. dead ends, closed loops and back-to-the-start mechanisms. All of these would extend the learning time and undermine key affordances of the games-based learning approach – motivation and engagement – replacing them with frustration.

8.1.4 Fantasy

The fantasy element contributes significantly to the engagement and intrinsic motivation afforded by games. In serious games, the fantasy element should have an integral relationship to the material covered (Dodge, 2000). Research shows that endogenous fantasy, where the learning content is deeply interwoven into the game narrative, has a positive effect on learning outcomes (Ricci, K. et al., 1996).

8.2 Evaluating the Effectiveness of the Game

There is a lot of uncertainty as to how to evaluate the success of games-based learning. As with the design any eLearning course, the learning outcomes for a serious game should be defined as soon as the learning objectives have been identified. Because serious games are being used to improve engagement and motivation in addition to learning, some of the learning outcomes and associated metrics will be different to those familiar to eLearning designers.

For serious games the affective metrics might include some of the following:

- Average length of time spent on game module, time taken to reach the next “level” of the game, time taken to complete a task
- Performance of employees who completed game-based training vs. those who completed traditional training or eLearning
- Number of players or user registrations based on region, business unit, or other user demographics

8.3 Integrating Games into a Blended Training Strategy

Organisations using stand-alone serious games for training purposes often find that games underperform. It is prudent for organisations to consider how existing and new training technologies can work together to support specific learning and development objectives. Integrating games into existing training frameworks can be very effective. At a more granular level, bolting relevant games or game mechanics onto existing eLearning training content can improve the engagement value of the content and remonetise legacy content for the organisation.

8.4 Involving Instructional Designers in Game Design

The instructional designer knows the learning audience and the subject matter and can help define the instructional goals which will drive the game. They can also help define the narrative of the game so that it is relevant to the cohort of learners and the learning content. They can also advise on the suitability of the game type for the content being taught.

8.5 Summary

A key affordance for the use of serious games in learning is their ability to tap into the affective domain and positively impact engagement and motivation. Games for learning should be designed to provide challenge, control, curiosity and fantasy.

There is a lot of confusion surrounding how to best evaluate the effectiveness of games-based learning in terms of learning outcomes. This section suggests possible metrics for evaluating the success and organisational impact of games-based learning.

When new learning technologies emerge, there is a tendency to re-think existing training strategies. Rather than replacing one learning technology with the other, it is prudent for organisations to consider how existing and new learning technologies can work together to support specific L&D and organisational objectives.

9 Conclusion

Traditional forms of training, including eLearning, are no longer engaging corporate workforces. New models of training, more relevant to the workforce of today and tomorrow need to be explored. Games-based learning is one such model. There is empirical evidence to support its learning effectiveness across all three domains of learning but more research is required.

Early adopters of serious games, mainly large organisations, are using them for training, marketing and recruitment purposes. Improved efficiencies have been noted across these three processes in terms of employee engagement, motivation and transfer of learning.

However, the cost of developing serious games is an issue for smaller organisations and is a barrier to uptake. Game engines, which enable organisations to apply game mechanics or 'gamify' their business processes, may go some way to addressing the issue of cost for these organisations.

eLearning providers are also looking to game engines as a means of improving the engagement value and learning effectiveness of their existing eLearning content and also for creating new, more engaging content in response to customer requests.

Another barrier to corporate adoption of serious games is the perception that games are exotic modes of training delivery. This is in part due to confusing casual games with serious games.

Whatever the barriers to adoption, the effectiveness of serious games for learning cannot be overlooked. They can impact learning engagement and motivation in a way that no other mode of training delivery can and effectively address the current challenges in corporate training where employees are no longer engaging with traditional forms of training including eLearning. Because a well trained workforce impacts key business drivers, there is a need to make corporate learning more engaging, motivating and relevant for 21st century workforces. Serious games have a valuable role to play in this regard and should be considered as an integral part of corporate learning strategies.

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Learnovate Centre is an Enterprise Ireland and IDA Ireland funded industry-led centre of excellence for innovation and research in learning technologies.

Our mission is to enhance the competitive advantage of the learning industry by partnering industry with leading academic research groups. Our team is resourced by industry professionals and highly qualified researchers, who together are advancing a world class industry-relevant research agenda.

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