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## Introduction

The use of serious games is quickly becoming a more mainstream method for achieving key objectives in a variety of business initiatives. Having produced many positive outcomes as a result of applications designed for the military, education, healthcare, and the government, serious games have infiltrated the corporate world on a large scale. Programs such as customer attraction and retention, employee recruitment and training, marketing, performance management, and talent measurement (just to name a few) are quickly realizing the benefits of serious games and the broader trend of gamification (see DuVernet & Popp, 2014). In fact, analysts have posited that this trend will be a part of 25% of business processes by 2015 (Gartner, 2011a), will expand to more than a \$2.8 billion business by 2016, and will see 70% of global businesses utilizing at least one “gamified” application by 2014 (Gartner, 2011b). If these predictions materialize, we will be sitting on the verge of a revolution in the way the corporate world approaches traditional business challenges.

Serious games, defined here as games utilized for purposes other than pure entertainment, incorporate elements of game design in order to enhance the level of engagement of the target audience. This increased level of engagement then leads to subsequent gains in important business

outcomes such as customer acquisition and retention, employee knowledge retention, market penetration, product awareness, employee performance enhancement, and talent measurement. It is these gains that have captured the interest of the corporate world, where the drive for continuous improvement and innovative approaches is now the norm.

The term “serious game” has been traced back to the Renaissance, but it wasn’t until 1970 that the term was used with a meaning more closely aligned with today’s notion of serious games. In his book titled *Serious Games*, Clark Abt used the term to describe computer games that were developed for military training purposes, including T.E.M.P.E.R (Abt, 1970). Some say that the term was leveraged to provide a euphemism for the term “war games,” which was falling out of favor for those seeking federal funding (Ambrose, et al., 2005).

In the 1990s, several concepts emerged that overlapped (to varying degrees) with serious games. Domains such as e-learning, edutainment, game-based learning, and digital game-based learning are clearly focused on the benefits of applying technology and/or game mechanics to enhance learning outcomes. E-learning emerged in the early 1990s as a very broad domain that encompassed any sort of computer-based learning, whether or not any game mechanics are utilized. On the

other hand, digital game-based learning is a more recent evolution of e-learning that incorporates digital (video) game technologies to enhance educational outcomes.

Although not primarily designed for training purposes, many consider the U.S. Army's release of the video game America's Army (<http://www.americasarmy.com>) to be the start of today's serious gaming era. Toward the end of the 1990s, army recruitment numbers were dwindling, and the Army needed a new tool to attract and engage its target demographic of 18–25 year-old males. Given the popularity of "first person shooter" console video games such as Halo and Call of Duty, the U.S. Army hoped to capitalize on the potential to increase their recruitment numbers through a serious games approach (Gudmundsen, 2006). America's Army was (and continues to be) an incredibly useful recruitment tool, enabling potential recruits to try their hand in various specialties and gain a somewhat first-hand experience of what it's like to be a soldier by playing a game that is very similar to popular entertainment games (Grossman, 2005).

Serious games can come in various forms, many of which incorporate technologies used in today's entertainment gaming industry. Computer-generated animation (2D or 3D), branching storylines, adaptive gameplay, level progression, and immersive environments are all tools that can be leveraged to further enhance players' engagement and user experience. Although not a requirement to be classified as a serious game, the same technologies used in high-end video games are becoming more

accessible to serious game developers. In fact, many companies engaged in serious games development are using the same resources (staff, hardware, software) found in the entertainment gaming industry.

### Characteristics of Serious Games

There is no universally agreed upon set of characteristics that define a serious game. In fact, even the definition of "serious game" is often the source of debate (Susi, Johannesson, & Backlund, 2007). However, by using a combination of approaches (e.g., Bedwell, Paylas, Heyne, Lazzara, & Salas, 2012; Shute & Ke, 2012), the set of characteristics below should help clarify what qualifies as a serious game in the current environment. Certain attributes you might expect when describing a game (e.g., engaging, fun) are not included due to their subjective nature; rather, the focus is on objective characteristics. It is important to note that the extent to which each of the following characteristics are represented within a serious game can vary, but a true serious game should incorporate all characteristics below to some degree.

- *Interactive problem solving*: Ongoing interaction between the player and the serious game is a key characteristic. This interactivity usually involves solving a series of problems or completing a series of tasks, but it can also take other forms such as responding to in-game characters, choosing appropriate paths (literal or figurative) to reach the goal, or collecting items or pieces of information that impact the outcome.

- *Specific goal(s)*: Every game should have one or more goals the player is required to accomplish. This may simply be gaining as many “points” as possible or successfully completing the game. Some games are designed with competing goals in order to enhance the level of challenge (e.g., achieve the right balance between earning money and keeping your business running). Goals in games may be implicit or explicit.
- *Rules*: Without some rules, a game would essentially be pointless. Rules may take the form of limiting certain actions or movements, requiring certain items to be obtained before being able to accomplish certain tasks, or completing a series of tasks successfully in order to advance to the next level. A good game contains enough rules to make the game challenging but not have too many rules that lead to player frustration.
- *Adaptive or branching gameplay*: Games incorporate some form of adaptive or branching process to allow for multiple possible outcomes and/or game experiences. Some extremely complex games can give the impression of some form of artificial intelligence built in (although this has yet to be fully achieved), whereas other games leverage branching methods to increase the number of potential outcomes within a finite number of possible paths. Allowing multiple players to participate in the same game can greatly enhance this characteristic, as long as the actions of the other players can influence the experience/outcome.
- *Control*: Players need to be able to influence the game play to some extent. Having complete control would detract from the challenging aspect(s) of the game, but having no control would result in frustration or boredom. Games should encourage players to explore alternate paths to achieving the goal(s) by manipulating the game environment, characters or objects within the game, or the sequence in which they complete certain tasks or activities.
- *Ongoing feedback*: Feedback on a player’s performance during the game provides the player with information on the degree of success (or failure) of their actions in order to direct them toward achieving a positive or desired outcome. Feedback can be explicit or implicit. Explicit feedback can take the form of points displayed on screen, noting achievement of certain objectives, audio/visual cues when certain actions are taken, or progression on to subsequent levels. Implicit feedback can be expressed by characters within the game or other “subtle” cues in the game environment.
- *Uncertainty*: Similar to the characteristic of adaptive or branching game play, the use of uncertainty in a game evokes suspense and increases player engagement. The right move/action/decision should not be transparent, otherwise the game would be too easy and players would quickly lose interest. There does, however, need to be some rationale behind the uncertainty so that players will understand the reason for the outcome once the move/action/decision has been made.

- *Sensory stimuli*: Sensory stimuli can refer to graphics (static or animated), video, sounds, and/or storylines used to excite the senses and increase immersion in the game. Stimuli should be used in the right amount, as too much will overwhelm the player but not enough stimuli will result in decreased engagement.
- *Purpose* (beyond pure entertainment): As noted above, the characteristic that separates serious games from “traditional” games is being utilized for a purpose other than pure entertainment. This “other” purpose can vary widely, and of course serious games should also be entertaining to some degree.
- *Technology enabled*: Although this characteristic is not typically found in most definitions of serious games, today’s high-tech environment and the penetration of all things technology in our daily lives almost demands that serious games utilize some form of technology. This can take the form of computer/online games, smart phone apps, or even popular gaming consoles.

Serious games will evolve, and new elements will be leveraged in the design and delivery of serious games, but the characteristics described above should serve as a strong basis for determining what is (and is not) a serious game.

### **Current Users (and Uses) of Serious Games**

The number of ways serious games can be used is increasing and expanding beyond the areas where serious games have initially proven successful. According to a

collaborative online database of serious games, over 3,000 games have been classified (see <http://serious.gameclassification.com> for a searchable database as well as games available to the public). This is likely just the veritable tip of the iceberg as the database doesn’t include many custom or proprietary games. Today, serious games users can be found in the following environments:

- Healthcare
- Education
- Government
- Military
- Corporate

In healthcare, serious games have been used in such diverse areas as physical fitness, patient education, rehabilitation, clinical training, diagnosis of mental disorders, improvement of cognitive functioning, and biofeedback control (Michael & Chen, 2006; Susi et al., 2007). In education, games have been used at all levels (pre-K through postgraduate) to enhance learning and skill development across a wide variety of subjects (Vogel, et al., 2006; Wouters, van Nimwegen, van Oostendorp, & van der Spek, 2013). These days, it would be rare to find a student in most developed countries who has not played at least one serious game during the course of their education (Michael & Chen, 2006).

The government has utilized serious games across municipal, state, and federal levels mainly for training employees in areas such as pandemics, biohazards, disaster management, city planning, police and

firefighter training, ethics and policy training, and even defensive driving (Michael & Chen, 2006; Squire & Jenkins, 2003).

The military is by far the largest developer and consumer of serious games (Susi et al., 2007). Primarily used for training purposes, serious games offer the military a method to train its members on complex and/or dangerous situations that would otherwise be cost prohibitive or too risky to accomplish in a real-world situation. As noted above, another use of serious games by the military is to attract new recruits (i.e., America's Army).

In the corporate world, the use of serious games has increased exponentially over the past decade, and additional applications are currently being developed (e.g., Dale, 2014). Like the military, the most prevalent use of serious games in corporate environments is for training. Serious games used for corporate training purposes range from teamwork, leadership, time and project management, communication skills, strategic planning, customer service, sales, onboarding, and of course job-specific skill development (Greco, Baldissin, & Nonino, 2013; Lopes, Fialho, Cunha, & Niveiros, 2013; Michael & Chen, 2006). In addition to training, serious games have also been used to attract and retain customers, launch new products, enhance job performance, and attract potential job candidates. One promising new area for serious games in the corporate arena involves the use of serious games for personnel selection, which will be covered in the following section.

## **Moving Forward: Serious Games for Personnel Selection**

The use of simulations and other multimedia-rich applications for the purposes of evaluating the qualifications of potential new hires has increased dramatically over the past decade. These assessments are used to evaluate a wide variety of knowledge, skills, abilities, and other characteristics (KSAOs) of candidates seeking employment and provide unique methods for determining employment suitability. Simulations and multimedia-based assessments are currently used to measure KSAOS that are critical for managers, customer service and sales representatives, clerical and administrative personnel, contact center and collections agents, bank tellers, cashiers, manufacturing workers, professional staff, and many others (for a comprehensive review, see Fetzer & Tuzinski, 2013). These types of talent measurement tools are not only highly predictive of on-the-job performance (e.g., Schmidt & Hunter, 1998), but they also provide opportunities for the hiring organization to enhance their brand awareness, increase candidate engagement, enhance perceptions of being on the leading-edge of technology, and provide a competitive advantage in the war for talent.

Given the relative success of simulations in the selection arena, one may question the need for using serious games. The rationale lies in a concept called stealth assessment, which refers to embedding assessments in a game environment (Shute, 2011; Shute & Ventura, 2013; Shute, Ventura, Bauer, & Zapata-Rivera, 2009). When players become engaged in playing the game, atten-

tiveness to the fact they are being assessed is reduced and/or eliminated, due in part to a level of engagement not unlike Csikszentmihalyi's concept of flow (Csikszentmihalyi, 1990). This is a point where true behaviors emerge, which serves to increase the accuracy of assessment by reducing measurement error, bias due to social desirability, and the propensity of candidates to "second guess" their actions (responses).

Developing and implementing serious games for personnel selection requires special considerations. There are a few fundamental differences between traditional serious games and those that may be used for hiring purposes. First, as opposed to games used in training environments, selection games would likely be played only once. Because the purpose would be to evaluate current candidate skills, there is a strong need to avoid contaminating the scores obtained with practice effects. In other words, candidates should not be given the opportunity to play the game multiple times, as doing so would enable the candidates to artificially inflate their scores. Similarly, it would not be advantageous to provide ongoing feedback, especially explicit feedback, as the player would then adjust his/her approach and potentially increase measurement error. Second, there is a greater need for security when it comes to serious games used for hiring purposes. In a training environment, players who cheats (e.g., by attempting to get the "right answers" from others) are only cheating themselves out of a learning opportunity, so the risk of cheating is small. In a hiring situation, especially one that is high stakes, there can

be a larger proportion of the players who might attempt to "game the game."

Security considerations should not be taken lightly as serious games are developed and implemented in a personnel selection context. As with any form of assessment for selection purposes, care should be exercised in the development and implementation of the game to protect it from being compromised, especially if the game is accessible from an unproctored environment. The use of adaptive or branching methods within the game is one way to increase security, as is limiting access and only allowing candidates to play the game once. Other characteristics of serious games (e.g., uncertainty, nonlinear design, gameplay rules, etc.) should be maximized in order to reduce the potential for cheating. In addition, ongoing monitoring is recommended in order to detect suspicious data trends and/or outright content breaches.

Finally, serious games used for personnel selection must meet certain legal criteria. Primarily, the game must have evidence that it is valid for its intended use (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999; Equal Employment Opportunity Commission, 1978; Society for Industrial and Organizational Psychology, 2003). In other words, research is required to show the job relatedness of the score(s) produced by the game that are to be used for making employment decisions. Evidence is also required to show that the game is a reliable (consistently accurate) measure of whatever KSAO(s) it is claiming to measure. In ad-

dition, games used for selection should not result in adverse impact against protected classes (e.g., racial/ethnic groups, gender, age). However, if the validation evidence clearly supports the use of the game, then the concern for adverse impact is mitigated from a legal perspective.

These considerations should not be taken lightly as serious games are developed and implemented in a personnel selection context. Care should be exercised in the development and implementation of the game to protect it from being compromised. The use of adaptive or branching methods within the game is one way to increase security, as is limiting access and only allowing candidates to play the game once. Other characteristics of serious games (e.g., uncertainty, interactive problem solving, rules) should be maximized in order to reduce the potential for cheating. Like any other test or assessment, gathering evidence of the game's validity and reliability should be incorporated into any development and implementation process. In short, the use of serious games for personnel selection purposes is not that different from using any other method to evaluate candidate qualifications and can result in some incremental benefits to the hiring organization.

### **Future Research**

Given the relative infancy of serious games as a selection method, there is no shortage of future research needs. At this point, the following three categories are the most important: validity, scoring methods, and adverse impact. Aside from simulations, very

little evidence exists regarding the validity of serious games when used for selection purposes. Criterion-related validity studies, especially those examining incremental validity compared to other (traditional) predictors of job performance have yet to be published. Beyond that, comparative validity studies examining different game genres, job performance criteria, multimedia styles, and other characteristics would lead to further advancements.

Serious games also represent an opportunity to develop and refine new forms of scoring methods, beyond the traditional question/answer approaches. Even in a relatively short game, hundreds or even thousands of potentially "scoreable" events can be captured. Similar to consumers of other forms of "big data," the challenge lies not in capturing the data but rather making sense of all the data that are available. Of course, from a theoretical standpoint, the question of which data should be captured and scored in the first place is always paramount. However, there are sure to be advocates for the merits of dustbowl empiricism when the practicalities of traditional approaches are stretched to their limits.

Despite the shrinking gaps among gamer demographic groups, little is known about relative game performance across these groups. More importantly, which types of games have more (or less) adverse impact? What game characteristics can be modified in order to reduce adverse impact? Are their expected differences based on KSAOs measured? Or, better yet, do games result in little to no adverse impact in general, given their engaging and immersive nature?



On a broader level, leveraging ongoing research in other fields (e.g., education, training & development) is highly recommended, to the extent it is relevant in a selection context. As the use of serious games for selection becomes more prevalent, future research needs will get broader and deeper, assuming the relatively fundamental directions noted above are covered appropriately. Finally, as gaming technology advances into more immersive experiences such as Oculus Rift and Magic Leap, new research opportunities will evolve.

### Conclusion

Serious games are becoming more prevalent as useful and effective methods for accomplishing many different objectives across a wide variety of fields. Increasing engagement through the use of game design techniques has resulted in benefits that are not achievable using nongame approaches. As the use of serious games continues to expand both in terms of purpose and application, the reader is encouraged to consider how this innovative methodology could address current business challenges. For those in the talent management space, exploration of serious games for training and personnel selection purposes would be a worthwhile endeavor.

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