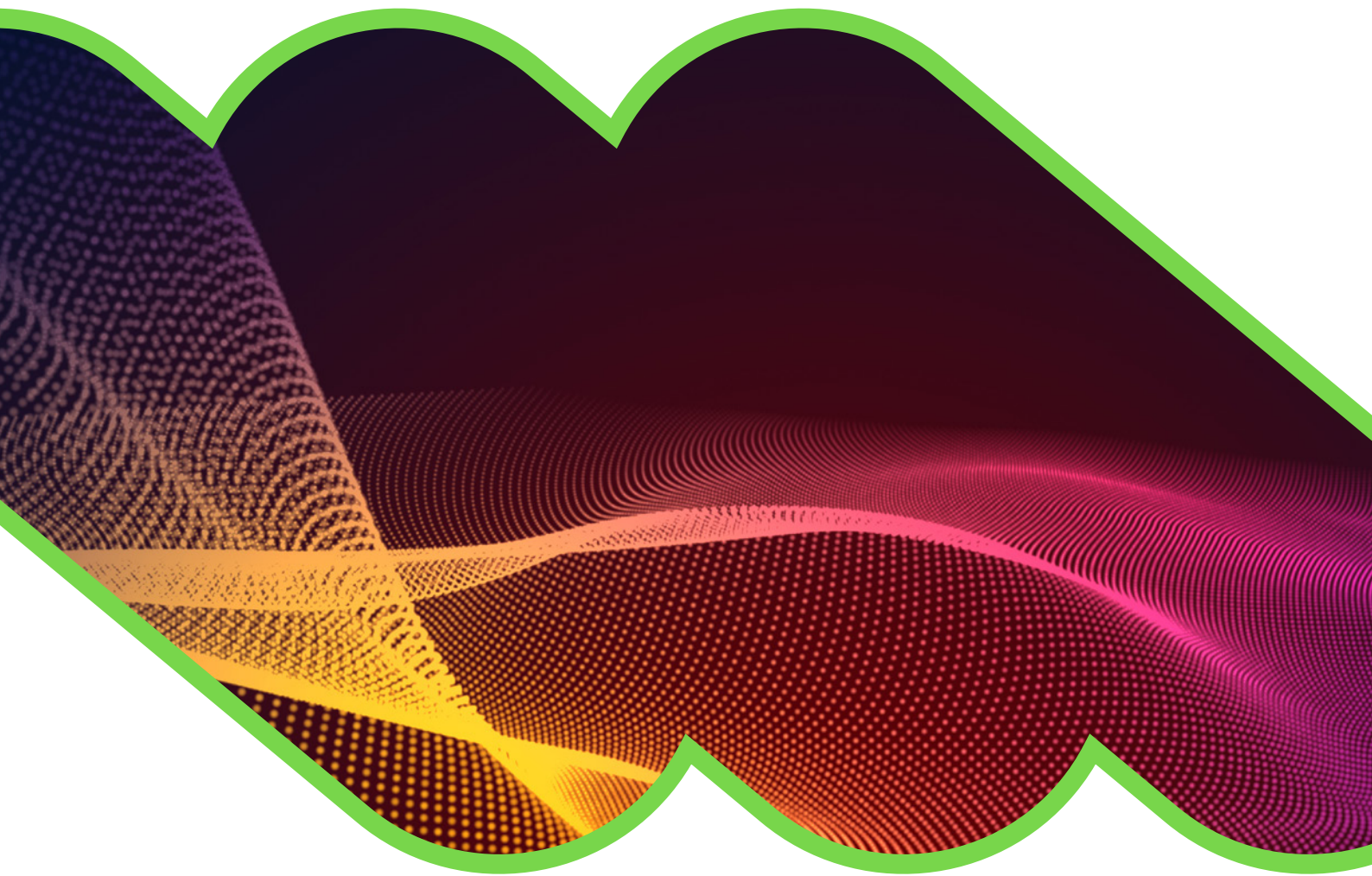


Gamification and Game-Based Assessment



Introduction

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Up until early in this century it was quite common to have candidates complete pen-and-paper assessments during hiring processes to determine if they were qualified for the role. Things have changed immensely in the past two decades. Beginning with the move to unsupervised internet testing and followed by mobile-enabled testing, assessment has become focused on increased availability, increased measurement efficiency, decreased testing time, and, probably most importantly, increased interest in candidate experience. The buzz, the trend, the must-have nowadays is that assessments should be quick, fun, and entertaining, with the main goal to “hook” candidates and win them over in the forever evolving and never-ending “War for Talent.” A trend in assessments focused on improving the candidate experience, and the focus of this paper, is gamification and game-based assessment. These terms refer to a technological evolution in assessment, where entertainment merges with a scientifically solid experience. Organizations seeking to hire new employees are coming to SHL in increasingly greater numbers asking about gamification. Can we use serious games and game-based assessment as part of our recruitment process? Can we make our hiring process fun and entertaining for our candidates? Can we have a fully branded gamified experience? Unfortunately, these terms have often been misused and misunderstood due to the hype that has been built around them.

This paper will untangle the terms gamification and serious games/game-based assessment and discuss how they differ. The paper will then describe in greater detail the elements that make up gamification and the practical and scientific considerations that should be taken into account when applying gamified elements or when designing a game-based assessment.



Origins and Definitions

Gamification and serious games are two different concepts that are often confused with each other. Gamification is a term coined by game designer Nick Pelling in the early '00s (Rughiniş, 2013). At that time, he tried to use a game-like enhanced interface to make electronic transactions, such as using in-flight entertainment, more eye-catching and engaging for the user. Gamification was broadly defined as the use of “game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems” (Kapp, 2013).

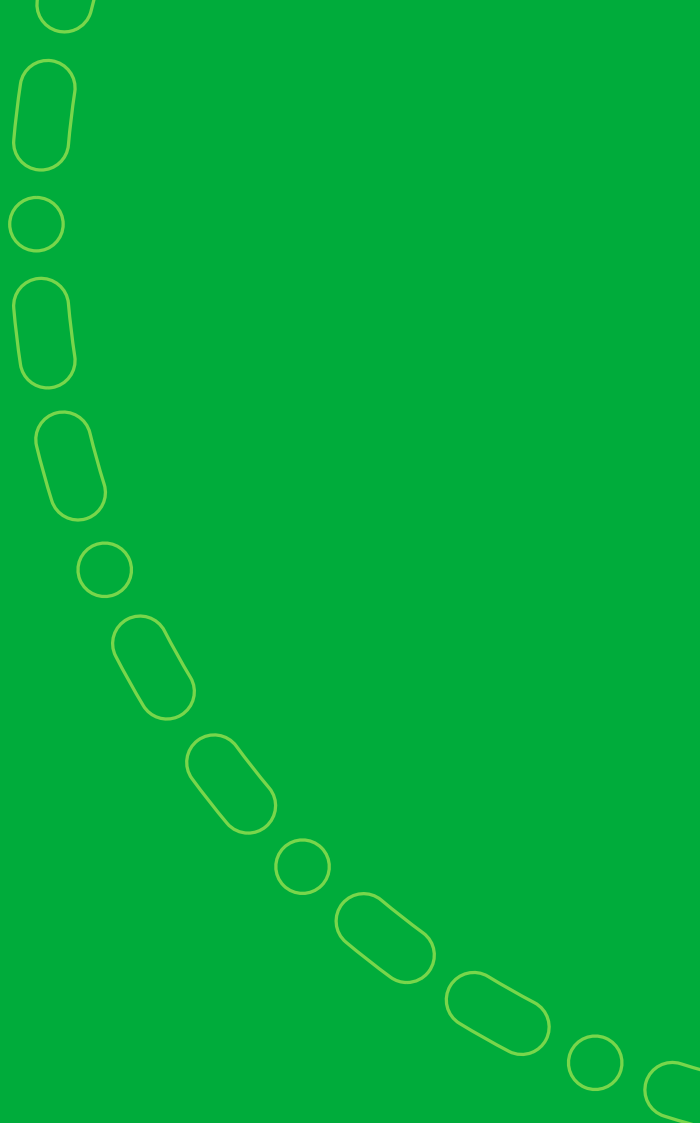
Serious games (including game-based assessment), on the other hand, have been around for far longer - going back as early as the 1960s and 1970s. ‘The Bradley Tanker,’ was developed in the early 1980s for the American army to train recruits to operate a Bradley tank (Atari, 1981). The “serious” in serious games is meant to describe the reason the games were developed, meaning not for enjoyment. The purpose of the Bradley tank game was to determine how effective an individual would be in warfare. Serious games are defined as “games that do not have entertainment, enjoyment, or fun as their primary purpose” (Michael & Chen, 2005), however, most research agrees that digital serious games currently in use include an essential entertainment dimension (Sawyer & Rejeski, 2002), have the potential to enhance the user’s experience, and contain a multitude of different media (Arnab, et al, 2011; de Freitas & Liarokapis, 2011; Consolvo, et al., 2008; Lin, et al, 2006; Yim & Graham, 2007.; Orozco, et al, 2012). Serious games have multiple applications including training, education, and, of course assessment.

In summary, gamification and serious games can be differentiated through the parts versus the whole. Essentially, serious games involve thorough usage of the whole gaming system to achieve the goals, while gamification focuses on the parts of the gaming elements (e.g., game technology, practices, and design). Imagine a flower arranging game where the player is immersed in a world where they are working to create as many arrangements as they can in a specified time limit. This game is fun and entertaining, but it was designed to

measure how quickly someone can meet customer demands and how creative they are. This is an example of a serious game because the entire game was created to measure customer service aptitude and creativity. If one took an existing test of customer service and added some game elements, like a storyline, freedom to progress through the test in a different order, and virtual trophies when the candidate does well, this would be an example of gamification because individual game elements were added to an existing test.

Though both serious games and gamification have their roots in gaming, they differ in value/return on investment, candidate reactions, the methods applied to ensure psychometric rigor, and how aspects of the methods affect construct measurement. The next sections will discuss both serious games/game-based assessment and gamification and what factors SHL has evaluated when implementing gamification and elements of game-based assessments in our assessment portfolio, specifically return on investment, candidate engagement, candidate reactions, validity, and adverse impact.










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Gamification

Gamification has a broad definition and near infinite applications. Over the last decade, attempts have been made to aggregate scientific research spanning dozens of domains into a universal taxonomy of gamification elements to organize the nomological network for gamification. There is no universally agreed upon taxonomy, and general disagreement about the number of gamification elements across taxonomies. As an example, work by Toda et al (2019) provides a useful breakdown of gamification elements into five basic categories (see below for overview).

 Performance/ Measurement	 Ecological	 Social	 Personal	 Fictional
<p>This element is related to providing feedback to the individual on how well they are doing and how they are progressing. This can include trophies/badges that are awarded for performing specific tasks within the activity, progress indicators, "levels", or "points" that inform the individual how far along they are, or performance feedback given during and/or after the activity is completed.</p> <p>In the OPQ, if candidates are taking too long to respond to questions, they will see a pop-up that tells them they should not overthink their responses. They will also see a similar notification if they are responding too quickly.</p>	<p>This element deals with the type of environment the activity is presented in. Some elements of the activity may appear randomly, introducing an element of chance into the activity.</p> <p>Other ecological elements include a timer or deadlines which force time pressure onto the individual, and branches in the activity which require the individual to select a specific path in order to proceed. The level of control an individual has over their progress through the activity is an ecological element.</p> <p>In our Contact Center Simulations, candidates have multiple options when using the simulated tools presented to achieve specific goals within the simulation.</p>	<p>This element connects an individual's performance to others. This can take the form of leader boards which show everyone how well they are doing in relation to all other participants but can also include team-based activities that involve cooperation.</p> <p>Similar to badges, ranks or titles can be awarded that an individual can share with other participants to indicate how they performed in comparison.</p>	<p>This element drives how the individual draws meaning and motivation from the activity. Activities that are repeated need novelty to keep the activity from becoming repetitive. Elective challenges give participants choice in how many activities to engage in and how to proceed.</p> <p>This category also includes elements related to all sounds, animations, vibrations, and tactical interfaces used to connect the participant more to the activity.</p> <p>In our Verify Interactive assessments, candidates have multiple options in how they choose to engage with the questions. They can use drag and drop features via touch screen or mouse or use arrow buttons to manipulate the response input interface.</p>	<p>This element relates to adding a narrative to the activity. Narrative elements can be fantastical or, in the case of gamified selection tests, job relevant</p> <p>In our Contact Center Simulations, candidates are asked to engage with different fictional customers that range from confused to angry and respond appropriately.</p>

Gamified assessments can include one or all of the elements described above in endless combinations. Many elements are relatively inexpensive to implement, so organizations have options when applying these elements.

The Value of Gamification

Organizations are attracted to gamified assessments with the belief that these methods will increase candidate engagement compared to traditional selection assessments (Bina et al, 2021; Lowman, 2016). However, because gamification can incorporate different things, there is no simple answer regarding its value. Research on gamification in selection contexts is new and many questions remain.

Return on Investment

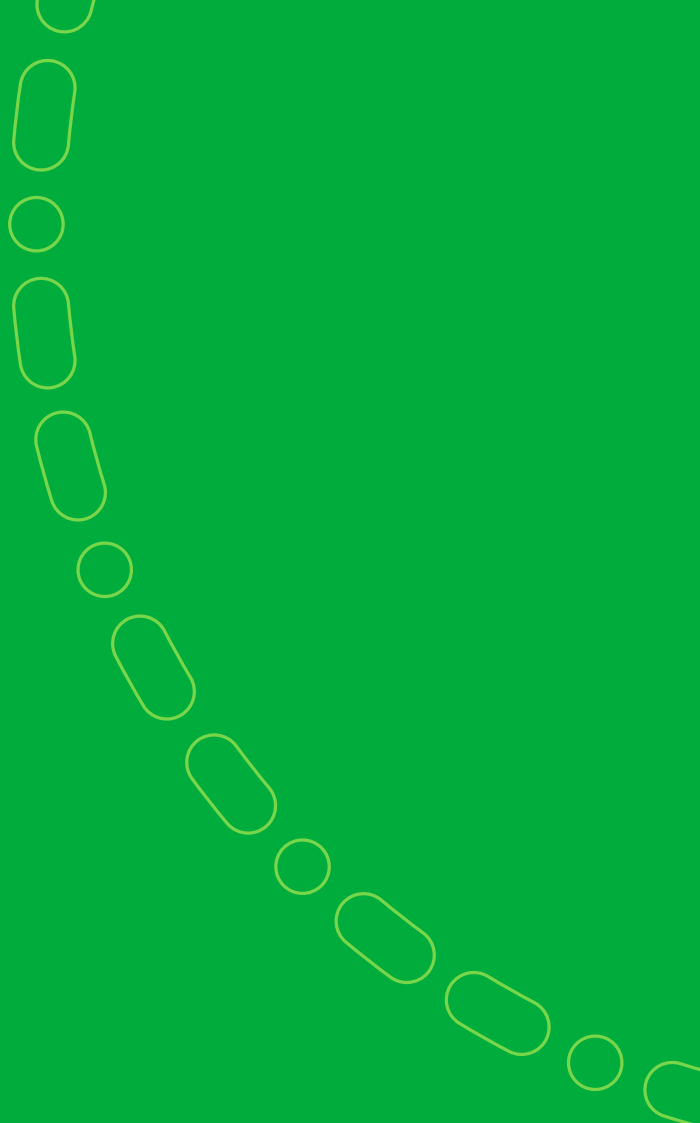
Gamification can be relatively inexpensive to implement if the number and type of game elements that are applied are kept to a manageable level. Naturally, the cost and efficacy of gamification is dependent upon which and how many gamified elements are selected. Organizations should have clear goals when implementing gamified elements and weigh the costs of implementation against the benefits of the desired outcomes. Researchers suggest that adding a few targeted game elements to an existing assessment is

likely to produce a greater return on investment for an organization than producing a digital game-based assessment for the same purpose because serious games require a gaming platform (Armstrong, et al., 2016; Landers, 2014).


Candidate Engagement

Organizations want candidates to put forth full effort when completing assessments, so it is important that candidates feel engaged in the process and motivated to perform well. Though there has been an increase in scholarly work on the effects of gamification on candidate engagement, there is still insufficient research to conclude that candidates are more engaged or motivated to perform well on a gamified assessment, which is the key reason to justify their use. For example, one study applied several game elements to an inductive reasoning test: an immersive storyline with 3D animation, immediate feedback during the test, and a drag and drop interactive item type (Geimer, et al, 2015). The study found no differences in test scores due to gamification and test takers in highly gamified conditions were not more motivated to complete the assessment than those in less gamified conditions. Instead, participants in the most gamified condition showed less ability to concentrate and higher anxiety than candidates in less gamified conditions, indicating gamification can detract from the overall experience.





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The researchers concluded that providing negative feedback while taking a selection assessment may increase anxiety, lower candidate perceptions of having an opportunity to show their skills on the test and may reduce candidate motivation. Similarly, another study found that when cognitive assessments were framed as games, the perceived length of the test was reduced, but those who perceived the testing time to be shorter also reported lower test taking motivation (Collmus, 2016). Candidate reactions such as these

must be carefully considered when implementing new assessment methods.

Research indicates that the relationship between gamification and engagement is not a simple one. Specific gamification elements affect engagement through satisfying specific psychological needs (Suh, et al, 2018), so care should be taken to select the most appropriate gamification elements to achieve one's assessment goals.

Candidate reactions must be carefully considered when implementing new assessment methods.

Candidate Reactions


Perceived Fairness

Research shows that candidates' perceptions of fairness in the selection process have important implications for the organization. These include job acceptance intentions, likelihood to recommend the organization to others, intention to pursue legal action, and post hire job satisfaction (Bauer et al., 1998; Gilliland, 1993; Hausknecht, et al, 2004). The type of test administered in a selection process is an important decision as it can impact perceived fairness of the process. Job relatedness, or whether the test is perceived to measure constructs relevant to the job, is one of the most important aspects of perceived fairness (Hausknecht et al., 2004). Candidates generally prefer methods that are perceived to be related to the job, and job-related selection methods relate to overall positive reactions (Bauer et al., 1998; Hausknecht et al., 2004; Truxillo, et al, 2001). The perceived opportunity to demonstrate knowledge, skills, and abilities is another important determinant of perceived fairness (Schleicher et al., 2006). While it seems that gamified assessments that bear little or no resemblance to the job run a higher risk of negative reactions, including perceived unfairness and inability to demonstrate job related skills, one study found that a non-job-related adventure storyline added to a situational judgment test actually increased perceptions of fairness and organizational attractiveness (Georgiou & Nikolaou, 2020). This indicates that more research is needed to understand the relationship between job-relatedness and perceived fairness.

Assessment Length

Organizations often desire to implement an assessment process that is as short as possible, with the intention of reducing the effort required from the candidate. However, research shows that assessments that are too short are generally seen as less credible than longer ones and may undermine the candidate's perception of the opportunity to perform. Candidates are likely to feel that they have a better opportunity to perform if the assessment is long enough to allow for sufficient measurement of their knowledge, skills, and abilities (Bauer et al., 1998). In fact, individuals report more favorable reactions to longer cognitive assessments than shorter ones (Speer, et al, 2016). Specifically, longer cognitive assessments are perceived to be fairer than shorter ones and are positively related to perceived organizational attractiveness and intentions to accept a job offer. This finding is likely due to the notion that a longer test increases the perception of job relatedness and opportunity to perform, both important determinants of candidate reactions. These findings suggest that candidates are willing to put forth the effort to complete a lengthier assessment process in exchange for the chance to demonstrate job relevant skills and receive fair consideration.

A non-job-related adventure storyline added to a situational judgment test actually increased perceptions of fairness and organizational attractiveness

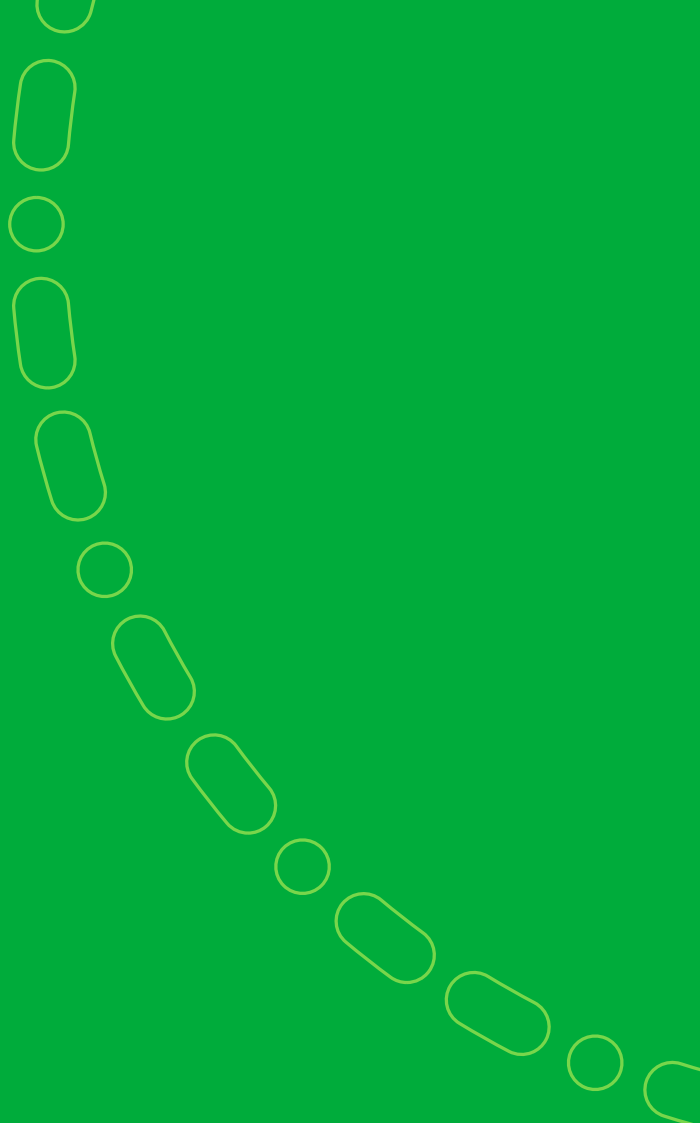


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SHL recently added some gamified elements to the Occupational Personality Questionnaire (OPQ) to improve how instructions are provided to candidates. Rather than a full page of text about how to respond to test questions, candidates are provided with in-test tips and performance feedback at various intervals throughout their test. The user interface was also updated to be more dynamic and to make it easier for candidates to respond. These gamified elements were implemented to improve the candidate experience, which it did, but these changes also had the added benefit of reducing testing time by 30%. Actual assessment length is important, but a recent study found an interesting relationship between adding gamified elements and perceived test length. Collmus and Landers (2019) found evidence that gamification was negatively related to perceived test length, and test length positively related to test motivation. This study along with the findings related to the OPQ demonstrate that adding gamified elements can have unintended consequences. In this case, those consequences were very positive, but assessments with added gamified elements should be carefully evaluated before being used in high stakes situations.

Delivery

Gamification opens opportunities for delivery, like testing on a mobile device, that traditional assessments cannot accommodate. As ownership of smart phones increases, so has the desire for organizations to implement mobile enabled assessments (Kantrowitz, 2014) due to potential benefits like reaching a more diverse pool of candidates (Arthur, et al, 2014) and increasing convenience of the testing process. Despite these potential benefits, preliminary studies seemed to indicate that device-equivalent tests of cognitive ability were out of reach (e.g. King, et al, 2014). More recent research has shown that it is possible to develop a test of complex reasoning that can be taken on any device without concern for device-type differences seen in earlier research with the use of gamified elements and mobile-first strategies (Grelle & Gutierrez, 2019). The Structural Characteristic Information Processing model (SCIP; Arthur, et al, 2018) describes the various device-oriented elements that can have an impact on information processing and test performance. Following the SCIP model with a mobile-first approach and adding interactive and gamified elements, SHL successfully developed a suite of mobile-equivalent cognitive ability tests called SHL Verify Interactive. The mobile-first approach was critical for the success of this project, and gamified elements were well suited for mobile-first design.



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Validity of Gamified Assessments

Regardless of how many game elements are added to an assessment, the assessment must still meet the psychometric rigor of any other assessment used for selection. A key psychometric consideration when evaluating new assessment methods for use in selection contexts is validity. Before using a gamified assessment for hiring purposes, it is important to gather evidence that performance on the assessment will lead to desired business outcomes, such as better job performance. When augmenting existing assessments with gamified elements, SHL ensures that the assessment is still measuring the construct of interest and that the new elements do not interfere with the assessment's ability to predict job performance.

The validity of a gamified assessment depends in part on how the assessment is designed and which game elements are used. When packaging known assessment content with established validity evidence into a more engaging experience, the validity lies in the underlying content and is not likely to change with different packaging. For example, this is true of the user interface updates to the OPQ, which has a robust record of criterion-related validity studies. Though several gamified elements were incorporated into the test, the content remained unchanged. As is best practice when altering any psychometric assessment, SHL conducted research to support the conclusion that the test maintained validity while enhancing the candidate experience.

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predict job performance.

Validity can also be impacted by the choice of game elements. When selecting or designing a gamified assessment, it is important to define the business objectives that are desired to be met by using the assessment (e.g., attracting candidates who will be a good fit to the job), identify the target behaviors of the test taker and how the behaviors will be measured, and select the appropriate game elements and tools to meet the desired objectives and foster the target behaviors (Werbach & Hunter, 2012).

Selecting a game element that is counter to the business objectives or target behaviors could potentially have a negative impact on the validity of an existing assessment. For example, game elements that are designed to trigger feelings of competition, such as leaderboards that rank candidates, may increase candidate levels of anxiety, which could theoretically affect how the candidate performs on the assessment. Researchers also suggest that the number of game elements can have a measurement impact. The more game elements that are employed, the higher the risk of measurement contamination and the harder it can be to interpret behavior from the assessment (Narayanan, et al, 2016). There is a greater likelihood of introducing error into assessment scores when

technology provides greater levels of autonomy to candidates (Horn, et al, 2016).

Regardless of how many game elements are added to an assessment, it still must be held to rigorous psychometric standards. Care should be taken to ensure that a gamified assessment is still measuring the construct of interest at least as accurately as before gamified elements were added, and while game elements are not expected to impact gender, race, or age differences, analyses should be conducted to ensure that the addition of game elements does not introduce adverse impact. Finally, if adding gamified elements does not meet the intended objectives, it may not be

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Implementation Checklist

Goal

- What are your business objectives that you want to achieve by using the assessment?

Game element

- Do the game elements introduce any adverse impact?
- How many game elements should you employ to reach your objective?
- Do the game elements help measure the construct of your interest?

Serious Games and Game-Based Assessment

Developing a serious game to directly assess behaviors is more complicated and resource intensive than including gamified elements in a proven assessment. Historically, some of the most common business applications of serious game designs have been in the areas of training and skill development, behavior change (e.g., promoting exercise, buying a product), or problem solving and innovation (Werbach & Hunter, 2012). Organizations developing game-based assessments have taken one of two broad approaches to constructing games.

Data-Driven Approach

Measurement

In this approach, the game is created first. The in-game behaviors are collected as data points that are then compared to outcomes of interest. For game-based assessment, these outcomes are typically job performance metrics, but could be job-relevant competencies as measured by more traditional assessments allowing the game designer to indicate which specific competencies the game measures.

Generalizability

This approach relies upon the availability of criterion data and may require score recalibration when applied to different contexts or use cases.

Theory-Driven Approach

Measurement

In this approach, the game designers identify which construct or competency they wish to measure with the game. The game mechanics are then specifically designed to capture the competency. Scores from the game can be compared to traditional measures of the competency to ensure that the construct of interest is being measured completely and accurately.

Generalizability

Theory-driven games are likely more generalizable as they are likely to predict when job analysis indicates that a specific competency is important for a job and the game has been construct validated to ensure that competency is being measured.

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Compared to gamification, less is known about the utility and predictive value of game-based assessment (serious games in a selection context). Developing a game-based assessment requires substantially more effort and large amounts of data to provide evidence to support that the new and innovative game works to predict job performance. In fact, some foundational design elements of game-based assessment may be counterproductive in high stakes selection contexts (Beck & Wade, 2013), so game designers should take great care when developing a new game that is used for hiring.



The Value of Game-Based Assessment

Game-based assessments are quite expensive to develop and maintain, so assessment developers should seriously consider their goals to confirm that a game-based approach is the best path.

Return on Investment

An expectation from many organizational users of assessment is that it should be tailored or customized to a very specific purpose, for instance, the job context, the specific requirements of the job, the company values and mission, or the company's product portfolio. The pace of change in organizations along with rapidly changing technology, however, may result in a game-based assessment with limited shelf life. These types of tools may require continual updates and investment to ensure they continue to be reflective of the current organizational environment and fit for purpose. When game-based assessments are not theory driven and designed to measure specific competencies that generalize to many different roles and/or job levels, there will be a need to tailor assessments to different jobs or organizations and to recalibrate scoring, which can be rather costly.

Additionally, the expectation is that game-based assessments will be slick and fun, leading to a high design standard and high costs to keep up with continuing technology advancements. Multimedia technology can have a short shelf life, requiring frequent updates. Implementing game-based assessment means ongoing development costs for game designers and updated media. For example, America's Army, a successful game-based assessment designed as a realistic job preview for the U.S. Army, has had numerous updates since it was first developed.

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While some updates in game-based assessment may be needed to reflect more modern expectations for digital game interfaces and animation, in high stakes assessment, revisions may also be required to reflect adaptations to changes in the job or work environment if it is meant to be highly realistic. To minimize the need for such frequent revisions, a game-based assessment in high stakes assessment could be generic and agnostic to the job to be able to use it across many jobs. However, this could result in perceptions of a lack of job relevance which, in turn, may result in poor user reactions. Therefore there is a delicate balance to strike and failure to appropriately implement updates to reflect changes in the job could reduce the lifespan of the assessment.

In summary, due to the high rate of change within organizations and across job contexts, along with changes in available technology and multimedia, there is likely to be an ongoing and high cost associated with game-based assessment. This makes the investment for game-based assessment substantial and the return on investment questionable. A theory-driven, competency focused game-based assessment that is job role agnostic would be costly to develop, and may require occasional technology updates, but would be much less expensive than a tailored, data-driven approach over time.

Candidate Reactions

Compared to research on gamification, there is less peer-reviewed research on game-based assessment and candidate reactions. Preliminary research suggests that, generally, candidates enjoy game-based assessments, but positive reactions are highly influenced by whether or not the candidate perceives the assessment to be fair and job related (Ellison, et al, 2020). This research also indicated that reactions and perceptions of fairness were influenced by individual differences like gender and technical proficiency. Candidates may enjoy completing game-based assessments, but it is important that candidates feel assessments are fair, face valid, and job related (Hausknecht, et al, 2004). This research suggests that candidates may have negative reactions to game-based assessments that do not look like the job to which they are applying or where it is unclear what the assessment is measuring.

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Validity of Game-Based Assessment

Some researchers argue that the large number of data points obtained from game-based assessments will allow for better alignment between predictors and criteria (Chamorro-Premuzic, et al, 2016). However, there is still little peer-reviewed research showing criterion-related validity for game-based assessments (Bina, et al, 2021). Existing studies are for specific game-based assessments (e.g Nikolaou, et al, 2019) in particular contexts.

The jury is still out on adverse impact and incremental validity of game-based assessment over traditional or gamified assessments. To reduce the risk of adverse impact, it is important to minimize potential demographic differences in selection scores when game-based assessments are used. By reducing complexity in the game structure and user interface and making it easy to learn how to play the game, one can reduce the potential bias of prior gaming experience and decrease the likelihood that differences across demographic groups will be an issue (Fetzer, et al, 2017).

At the present time there is more research to support gamification of an assessment with established validity than using game-based assessments for selection. Assessment providers and developers will need to investigate the technology and research based on this method before adopting this technique for selection given the lack of validity evidence and high development costs. Lack of familiarity with the serious game interface could lead to poor performance that is not due to what the assessment is designed to measure.

Practice Effects

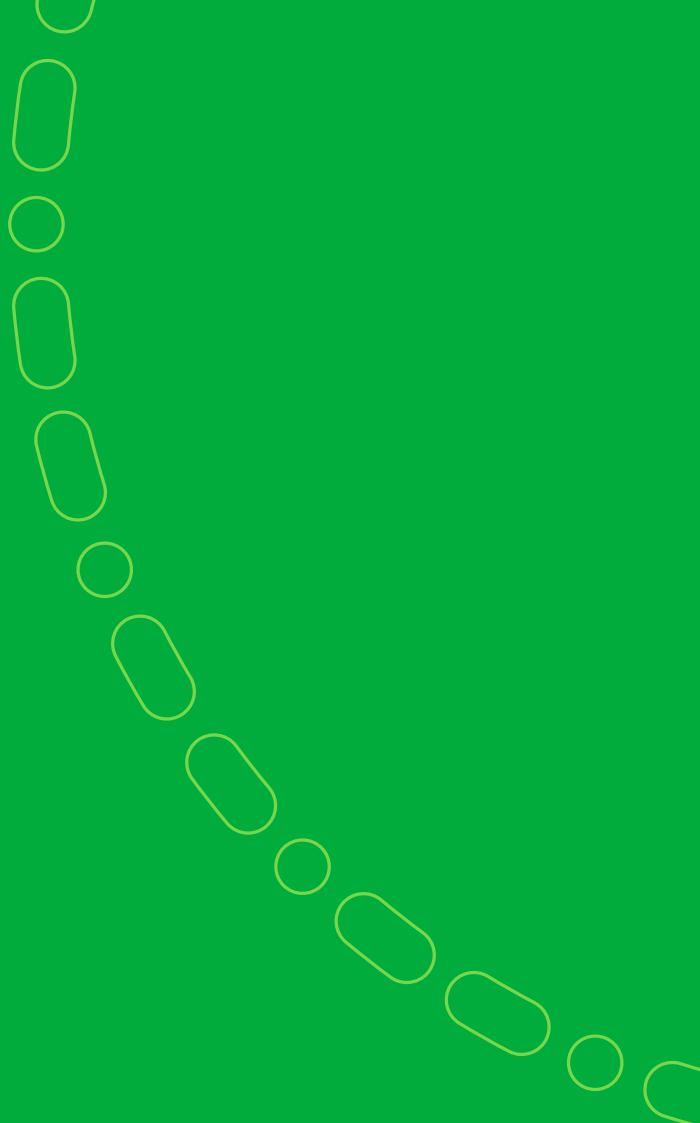
One core design characteristic of game-based assessment is that it encourages trial and error learning through testing and retesting problem-solving strategies (Beck & Wade, 2013), which is often accomplished by allowing for repeated play. What we know from

research and experience is that a person tends to get better at games after playing them several times. When performance improves with practice, it makes for a poor assessment because the scores are unstable. This is also problematic because practice effects could lead candidates to change their test taking strategies in order to “game the system” and improve performance to increase their chances of being hired.

Reducing complexity in the game structure and user interface and making it easy to learn how to play the game can reduce the potential bias of prior gaming experience and decrease the likelihood that differences across demographic groups will be an issue.

There is also a potential for bias in favor of those who regularly play digital games. If we developed a game that was similar to other games in the market, people who play these similar games often may score higher than those who do not play digital games. The objective of selection assessments is to evaluate candidates on the competencies, skills, or abilities that lead to desired business outcomes such as successful job performance or hiring candidates who are more likely to fit with the organization and remain on the job. The game design should not lead to an advantage or disadvantage for any subset of candidates based on characteristics that are not related to job performance, such as frequent game use in non-work contexts (Fetzer et al, 2017).

As part of the game-based assessment development process, the game should be trialled to determine the extent to which repeated play affects scores. If there is a practice effect, candidates should be provided with ample opportunity to practice completing the game in order to mitigate the practice effect and to stabilize score.



The game design should not lead to an advantage or disadvantage for any subset of candidates based on characteristics that are not related to job performance, such as frequent game use in non-work contexts.

Conclusion

Gamification has clearly demonstrated the potential to substantially change and improve the assessment landscape, and to some degree this has happened already. Though the body of research on gamification in assessment is growing, there are still many unanswered questions related to the effectiveness of gamification and how the addition of gamified elements affects the measurement properties of the assessment. For game-based assessment, there are still many unanswered questions on how effective it is as a tool for identifying top talent. Preliminary research seems to suggest that there is potential for game-based assessments that are job related and face valid.

Studies have been conducted to investigate specific gamified assessments, but the literature is lacking a more systematic approach to addressing the outcomes of specific gamified elements at varying levels of intensity and across different assessment types. In the absence of this type of research, organizations interested in gamification should take care to gather empirical support for any gamified elements they choose to incorporate into established assessments. SHL is working to responsibly apply advances in technology and findings related to gamification within our assessments, ensuring rigorous research is conducted prior to implementation. SHL recommends that any organizations looking to apply game elements to their selection process should determine if the changes have the expected positive outcomes while

also ensuring that validity and measurement precision are not affected. They should also consider all possible unintended outcomes like changes in testing time, shifts in adverse impact, and the introduction of construct irrelevant variance.

SHL also suggests that organizations looking to employ game-based assessment conduct ample user acceptance testing and work closely with user experience professionals and game designers to ensure success. If potential candidates have the opportunity to see wireframes of potential game designs, reaction data may provide valuable information on whether the game development process should continue before too much time and too many resources are invested.

Gamification has moved from trend to expectation and is likely to increasingly change how assessments are delivered in the years to come. As these changes become more commonplace, the literature supporting gamification will also grow. SHL has studied gamification and contributed to the literature and is looking forward to additional research opportunities as we continue to evolve our products.

Preliminary research seems to suggest that there is potential for game-based assessments that are job related and face valid.

Consideration	Gamification	Game-Based Assessment
Return on Investment	Cost of gamification is a function of how many game elements are added. A few, inexpensive elements can have a significant positive impact on desired outcomes.	Game-based assessments are very costly to develop and maintain. Organizations should seriously consider whether the benefits of game-based assessment outweigh the costs.
Candidate Reactions	Game elements vary in how they affect candidate reactions. Game elements that positively impact perceptions of fairness and perceived test length have better candidate reactions.	The little research that is available suggests that candidates may react poorly to game-based assessments that do not appear to be job related or if it is unclear what the game is measuring.
Adverse Impact	Game elements are not expected to introduce gender, race, or age differences, but potential for adverse impact should be evaluated empirically when game elements are added to an assessment.	No research exists that suggests that game-based assessments demonstrate adverse impact, but studies suggest that simpler games that provide ample opportunity to practice are less likely to show adverse impact.
Validity	Though most game elements are not expected to impact the validity of an assessment, data should be gathered to ensure that a gamified assessment is still measuring the construct of interest.	Data-driven game-based assessments will demonstrate validity in the contexts where the data were gathered, but the validity may not generalize to all contexts. All game-based assessments should be empirically validated.
Other Considerations	Game elements in isolation may facilitate the intended outcomes, but multiple game elements may interact in unexpected ways. Organizations should ensure that gamified assessments are meeting the desired goals while maintaining psychometric integrity.	Practice effects could impact the validity of a game-based assessment and introduce adverse impact. Ideally, games should not have any practice effects, but if they are present, candidates should have ample opportunity to practice before completing the scored assessment.

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