Innovative Solutions for Online Recruitment – Gamified Assessment

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Abstract: Game-based ratings have received a lot of media attention and managed to capture the interests of many organizations (eg Unilever, AXA Group, Deloitte etc.). In a recent study of human resources practitioners, 75% of participants indicated that they would consider using gamification as part of their own recruitment and selection strategy in the near future. Following the methodological approach already used in educational environment, two approaches to building and using GBA in the organizational environment can be distinguished: gamified assessment – by gamifying (already existing) psychometric test; psychometric play - use of a game to gather evaluation data. It is well accepted that, the basis of the success of any company is due to the human capital, which is the combination of people's capabilities and skills. Therefore, the fundamental job of any recruiter is sourcing talent and engaging employees in the organization. For this, they have to ensure that the candidate's skills match well with the organization's requirement and culture. Previous studies highlighted that those applying for a job are eager to use game-based assessment for self-evaluation, especially when these games are available for free. Game-based assessments can also help maintain a high commitment during the evaluation, which reduces the likelihood of some candidates dropping out in the process and also increases the amount of time that data can be collected. Current paper aim at presenting the preliminary efforts made to gamify two psychometric tests, namely spatial and verbal reasoning.

Keywords: *game based assessment; recruitment; spatial reasoning; verbal reasoning.*

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1. Introduction

One of the most important objectives of any human resource department is to attract, select and hire the most suitable candidate. Thus, it is critical to evaluate the Person-Organization Fit and Person-Job Fit before making hiring decisions (Kadir, Osman, Özlem, Emrah, & Tugba, 2016).

According to Rynes and Gerhart (1990) the aim of any recruitment process is to attract and select the best possible applicant who has the capacities that are needed in the job and who will fit with the organization (Rynes & Gerhart, 1990). Therefore, the most used theory in the employee selection context is perhaps the theory of fit (Sekiguchi, 2004). In line with this theory, the employee selection processes have been focused on achieving the best possible person-job fit (Werbel & Gilliland, 1999), namely the congruence between the skills and abilities of a person and the demands of a specific job (Edwards, 1991; Kristof, 1996).

The previous studies focused on fit were mainly targeted on Person-Environment fit, defined as a match between the person and the environment (Kristof, 1996). A broad definition of Person-Environment fit is “the compatibility between an individual and a work environment that occurs when their characteristics are well matched” (Kristof-Brown, Zimmerman, & Johnson, 2005: 281).

A series of different types of fit have been defined in the literature: Person-Organization Fit, Person-Job Fit, Person-Vocation Fit, Person-Group Fit and Person-Person Fit (Hoffman, & Woehr, 2006). One of the most discussed types of fit, and the one considered to best predicting job performance is Person-Job Fit. It is defined as the congruence or match between a person's characteristics and those of the job or tasks that are performed at work (Lee, Reiche, & Song, 2010). As it can be observed, Person-Job Fit might be understood from two main perspectives, one of them regarding the match of employees' knowledge, skills and ability with the job requires and the other one is the fit of employee's needs, desire and preferences with the job itself (Kristof-Brown et al., 2005). Person-Job Fit refers to the congruence between the abilities of a person and the demands of a job (Edwards, 1991; Kristof, 1996), between the characteristics of the tasks and the individual's ability to perform these tasks (Rahmadani & Sebayang, 2017).

The common operationalization of Person-Job fit includes needs-supplies perspective and demands-abilities perspective (Edwards, 1991). Thus, Person-Job fit can be defined as the fit between the abilities of a person and the demands of a job or the desires of a person and the

attributes of a job. Bohlander and Snell (2004) stated that the person-job fit represent a continuous effort to help identify which kind of employees are needed in certain jobs to achieve high performance, including the knowledge, skills, and other factors that may refer to the acquisition of superior performance.

As Sekiguchi (2004) stated, the person-job fit has traditionally considered being the most influential view in the employee selection studies (Sekiguchi, 2004). Different systematic reviews (Edwards, 1991) and meta-analyses (Kristof-Brown et al., 2005) have pointed out that high level of Person-Job fit has positive outcomes, for example on job satisfaction, low job stress, motivation, performance, attendance, retention, organizational commitment and negative correlation with intent to quit. Also Cable and Judge (1996), Edwards (1996), Hall, Schneider, and Nygren, (1970), Lauver and Kristof-Brown (2001), and O'Reilly, Chatman, and Caldwell (1991) have found similar results which supports the view that if the employees experience higher level of job fit they are satisfied with their work. Moreover, the fit between the employees' ability and the job demands will also increase employees' commitment to the job (Meyer & Allen, 1997), and employees' commitment and achievement motivation (Behling, 1998).

According to Scroggins (2008) person-job fit found to be a significant predictor of meaningful work. The review of the Person-Job fit literature by Edwards (1991) showed that it positively increases job satisfaction, motivation, performance, attendance, and retention (Edwards, 1991).

During the last decades, employee selection processes of most organizations have traditionally focused on achieving Person-Job fit (Werbel & Gilliland, 1999). Previous empirical studies have demonstrated that validated and structured procedures for determining Person-Job fit have led to more effective selection of employees in comparison to unstructured techniques (Buckley & Russell, 1997; McDaniel, Whetzel, Schmidt, & Maurer, 1994). Therefore, the primary concern in employee selection has been with finding those applicants who have the skills and abilities necessary to do the specific job. Traditionally, Person-Job fit is assessed by determining the demand of the job through a job analysis, which identifies the essential job tasks that an incumbent performs, and the required skills, knowledge, and abilities to perform the job tasks (Peltokangas, 2014).

One of the most important dimensions of person-job fit according to Robbins (2006) is ability. Ability can be defined as an individual's capacity to perform various tasks in a job. In other words, the ability is a function of knowledge and skills. Abilities include education, experience, and employee

aptitudes or knowledge (Caldwell & O'Reilly, 1990; Dawis & Lofquist, 1984; French, Caplan, & Harrison, 1982). In employee selection practices, the strategies to assess Person-Job fit include resumes, tests, interviews, reference checks, and a variety of other selection tools (Werbel & Gulliland, 1999).

Nevertheless, the reality of organizational life shows that employees will hold multiple jobs over the course of their employment with different companies. This leads to a more wide and universal perspective (e.g. Universal Competency Framework – SHL, which provides a rational, consistent, and practical basis for understanding people's behaviors at work and their likelihood of succeeding in certain roles and environments) that focuses on key characteristics such as general cognitive ability in selecting job applicant rather than specific Person-Job fit (Behling, 1998; Ree & Earles, 1992; Schmidt & Hunter, 1998).

One of the major challenges in recruitment and selection field lies not only in the application and scoring of different types of tests, but also in matching the applicant with the available jobs (Kristoff, 1996; Kristoff-Brown et al., 2005). By assessing the candidates using "serious" games, one can obtain a set of scores for some of their most important skills and abilities. Moreover, starting from an existing occupational standard, it is possible to determine which skills and features are most relevant for a job. Thus, by matching candidates' scores with specific job requirements, an objective ranking of the most suitable candidates for that job can be established.

For practical reason, a narrower set skills and abilities must be chosen for candidates' evaluation. One possible approach is to use Holland Occupational Themes (RIASEC), based on personality types originally developed by American psychologist John L. Holland (1973). However, this approach might be considered limited, as the number of classes (primary types) is far too low relative to the diversity of jobs and is based on the expression of personality rather than on relevant occupational skills.

A more appropriate approach is the use of Fleishman's (Fleishman & Reilly, 1992) human skills taxonomy, which provides sufficient diversity and it is already correlated with specific job requirements. Fleishman's classification is widely used in organizational and occupational psychology and is thus relevant to the intended purpose.

The very large diversity of jobs and associated skills represent a difficult factor in selecting the most relevant skills. Using an already established standard for occupational classification and a framework for the required skills for those jobs simplifies the approach provided that a

correlation between the job requirements and the wider occupational category is already established.

In this respect, the European Qualifications Framework (EQF), which became effective in 2008 (www.cedefop.europa.eu), represent a possible alternative, although it does not always make a clear distinction between knowledge, skills and abilities, and the extent to which they are relevant to a particular occupation is not consistent. In addition, the O*Net standard (Occupational Information Network - O*NET) is the primary source of occupational information in United States (www.onetcenter.org) and, although correlation with occupations in the European region may be a little difficult sometimes, the quality of the data, availability as a relational database, and the way the information is organized recommending it for use. O*NET has been already used in previous empirical studies (Feser, 2003; Hirsch, 2005) and it is likely that interest in O*NET will grow, due to the usefulness of using it as a source of social science data (Handel, 2016).

O*NET has started its classification from the Fleishman taxonomy and provides a framework that identifies the most important types of information about work. For this reason, the correlation of skills already defined for different occupations with the ones that can be assessed is relatively easy. The O* NET standard provides a list of abilities and scores for a relatively wide range of occupations and embodies a view that reflects the character of occupations, via job-oriented descriptors, and people, via worker-oriented descriptors (www.onetcenter.org). Thus, a list of relevant abilities for a specific job can be obtained. Table 1 (www.onetcenter.org) present the main domains of O*NET and their respective content.

Table 1. O*NET surveys and principal content

Survey	Main content
Education/ training	Required education, related work experience, training ^[1]
Knowledge	Various specific functional and academic areas (e.g., physics, marketing, design, clerical, food production, construction)
Skills ^[1]	Reading, writing, math, science, critical thinking, learning, resource management, communication, social relations, technology ^[1]
Abilities ^[1]	Writing, math, general cognitive abilities, perceptual, sensory-motor, dexterity, physical coordination, speed, strength

Work activities	Various activities (e.g., information processing, making decisions, thinking creatively, inspecting equipment, scheduling work) ^[1]
Work context	Working conditions (e.g., public speaking, teamwork, conflict resolution, working outdoors, physical strains, exposure to heat, noise, and chemicals, job autonomy)
Work style	Personal characteristics (e.g., leadership, persistence, cooperation, adaptability)

O*Net proposes two measures (descriptors) for all of the abilities included in it's content model, namely importance and level. *Importance* refers to the extent to which the ability is relevant to a specific occupation. The *level* refers to the degree to which a specific ability is required to perform an occupation. For our purpose - the correlation between job and candidate - both measures are relevant.

2. Our approach

Our proposed model is based on finding the best match between job and candidate by correlating the skills required for the job with the assessed candidate's skills. To determine the candidate's skill score, we suggest using a set of gamified-tests to assess as precise as possible a single ability or a limited set of abilities. Thus, in order to determine the scores of multiple abilities, several different tests are required. This approach allows us to obtain a much more precise match between the abilities of a person and abilities as required by the job.

The use of games (psychometrically valid) as an evaluation tool can extend and even strengthen the field of assessment as this type of games has the potential to reveal both the knowledge and the skills and traits that are more difficult to detect when evaluated through traditional evaluation methods (De Klerk, Eggen, & Veldkamp, 2014; Mislevy et al., 2014). In a study by Montefiori in 2016, it was observed that from the perspective of the candidate, the presence of game based assessment in the selection process was a motivating factor for more than half of the surveyed participants (Montefiori, 2016). Previous studies (Laumer, Eckhard, & Weitzel, 2012) highlighted that those applying for a job are eager to use game-based assessment for self-evaluation, especially when these games are available for free. Game-based assessments can also help maintain a high commitment during the evaluation, which reduces the likelihood of some

candidates dropping out in the process and also increases the amount of time that data can be collected (Iseli, Koeig, Lee, & Wainess, 2010; Levy, 2013).

Also, in the GBA, it is likely to be less obvious to a candidate what behavioral / response elements are measured, although a good assessment game must have a good face validity (the extent to which a test is subjectively viewed as covering the concept it purports to measure). This aspect was highlighted by Csikszentmihalyi (1990), who asserts that game-based assessment is more likely to generate genuine responses from candidates because they are immersed in gaming experience, thereby reducing the likelihood of falsification and distortion responses (Csikszentmihalyi, 1990). Previous studies (Kato & De Klerk, 2017) have also shown that game-based assessment reduces testing anxiety and that this type of games has been well received by candidates in real selection settings.

Following the methodological approach already used in educational environment (Al-Azawi, Al-Faliti, & Al-Blushi, 2016), two approaches to building and using GBA in the organizational environment can be distinguished: gamified assessment – by gamifying (already existing) psychometric test; psychometric play - use of a game to gather evaluation data. In our case, the decision was made to try to gamify two psychometric tests previously developed by Bontilă (1971), namely verbal reasoning and spatial reasoning.

Verbal reasoning is the ability to understand, interpret and logically evaluate written information (www.psionline.com). A verbal reasoning test it aims at evaluating ability to think constructively, the understanding and reasoning using concepts framed in words, rather than a simple fluency or vocabulary recognition (www.gradtests.com.au). On the other side, spatial reasoning, also called spatial visualization ability, refers to the ability to see a two or three-dimensional object and then mentally manipulate it. It also refers to the capacity to think about objects in three dimensions and to draw conclusions about those objects from limited information (Voyer, Voyer, & Bryden, 1995). Spatial reasoning relates to how well someone will be able to take in new and potentially abstract information and then apply that information appropriately (Kozhevnikov, Motes, & Hegarty, 2007). In this way, it's directly related to problem solving ability and critical thinking, two major components of cognitive aptitude (Pierce, 2018). Spatial thinking, or reasoning, involves the location and movement of objects and ourselves, either mentally or physically, in space (National Research Council, 2006). Research has shown that spatial ability is a predictor of success in areas such as sciences, technology, engineering and mathematics (Newcombe, 2013;

Wai, Lubinski, & Benbow, 2009). Spatial reasoning is also strongly employed in architecture, graphic design, computer sciences, biology, physics, chemistry, geology, geography and even medicine (www.edu.gov.on.ca).

The verbal reasoning test selected for gamification involve the comprehension of words presented in a randomized order (e.g. *horses feathers have all*), the rapid construction of a grammatically correct proposition (e.g. *all horses have feathers*) and the decision of true/false type about the respective proposition (e.g. *all horses have feathers* is false). The gamified test contains 24 propositions randomly extracted from the test database. In Figure 1 are presented two of the screen captures form the real (Romanian language) verbal reasoning gamified test: the title screen and one example item.

Figure 1. Verbal reasoning screen capture (Romanian language)

The spatial reasoning test selected for gamification involve the processes of apprehending, encoding, and mentally manipulating spatial forms (Lohman, 1988), more precise, the identification and counting of a series of cubes distributed in different type of piles, including the ones that are not visible directly (e.g. the ones in the back of the front row of cubes). The test contains 15 images that imply the utilization of two main abilities namely spatial visualization ability, which is the ability to imagine or visualize spatial images in your mind and spatial reasoning, the ability to mentally manipulate and reason with these images. Figure 2 show two of the screen

captures form the real (Romanian language) spatial reasoning gamified test: the instructions screen and one example item.

Figure 2. Spatial reasoning screen capture (Romanian language)

3. What next?

After the finalization of the draft version of the two gamified applications, the collection of data will begin. For this purpose a convenience sample of participants will be selected. Then, a series of psychometrics will be calculated.

In order to prove that a test is worthy of use in selection, one must prove the reliability and validity of it. Therefore, a good test must have a high level of reliability, meaning to obtain stable and consistent results under consistent conditions. One way of testing the consistency of the results is test-retest reliability. It refers to how consistently the findings of a test are repeated with the passage of time and imply administering the same test twice over a period of time to a group of individuals. Another way of testing the consistency is by administering different versions of an assessment tool (pencil-paper/electronic) to the same group of individuals, the so-called parallel forms reliability. Validity refers to the extent that the instrument measures what it was designed to measure. In our case, due to the fact that we are gamifying already existing tests, the construct validity, that prove that the measure is actually measure what it is intended to measure, is not

necessary to be calculated. Yet, we intent to verify the face validity, which refers to the transparency or relevance of a test as it appears to the participants (Holden, 2010). As Gravetter and Forzano (2012: 78) stated, a test can be said to have face validity if it "looks like" it is going to measure what it is supposed to measure.

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