



EMPIRICAL ANALYSIS OF THE INFLUENCE OF GAMIFICATION ON EMPLOYEES' BEHAVIOR

Ibrahim Hamza

Faculty of Economic and Social science, Budapest University of Technology and Economics, Hungary
hamza.ibrahim@gtk.bme.hu

Sarolta Tóvölgyi

Faculty of Economic and Social science, Budapest University of Technology and Economics, Hungary
tovolgyi.sarolta@gtk.bme.hu

Abstract

Gamification is a relatively new concept that refers to the use of game elements in non-game productive activity. It also can be implemented as a behavioral modeling tool influencing behavioral change in an organizational context. A remaining challenge in gamification is the absence of measurement focus to empirically quantify gamification attributes. This paper measures key behavioral changes that gamification influence among employees and assesses their theoretical foundation. We combined validated measurement tools to empirically measure behavior changes, especially engagement, performance, and satisfaction. The combined measurement tool includes the Utrecht Work Engagement Scale (UWES), the Individual Work Performance Questionnaire (IWPQ), and the Minnesota Satisfaction Questionnaire (MSQ). Research results proved that there is a significant behavioral difference between employees that were influenced by gamification and employees that were not. Employees that were exposed to gamification demonstrated higher engagement and satisfaction levels and verified the potency of gamification. Research results evidenced no significant differences between the two groups in terms of performance levels. This research paper will guide practitioners to better evaluate gamification attributes and improve gamification organizational assimilation.

Keywords: gamification, engagement, job performance, satisfaction, organizational behavior

1 INTRODUCTION

Gamification can be defined as embedding game elements into activities that are not themselves games (Werbach & Hunter, 2012). This engaging phenomenon helps in implementing motivational affordances in services to evoke game-like experiences and improve behavioral results. Gamification processes are being applied today in numerous fields, including education, health, business, and management (Bozkurt & Durak, 2018). This effective problem-solving and goal-achieving tool (Zainuddin, Chu, Shujahat, & Perera, 2020) also is implemented for behavioral change by influencing and promoting desired learning behavior (Ērgle & Ludviga, 2018; Buckley & Doyle, 2017), and invoking in individuals the same psycho-

logical experiences as games generally do (Huotari & Hamari, 2012). Gamification is portrayed through and defined by game elements, the choice of which differs from one researcher to another. However, the most identified ones in the literature are points, badges, leader boards, avatars, quests, performance graphs, and certificates (Scheiner, 2015; Cardador, Northcraft, & Whicker, 2017; Mekler, Brühlmann, Opwis, & Tuch, 2013). With its potent game design aspects, gamification stimulates individual incentives and drives user behavior. Therefore, to better understand gamification, it is of supreme importance to acknowledge and fully comprehend user behavior, specifically user behavioral changes in organizational contexts. These changes are induced by interpersonal and organizational factors.

Behavioral change is the abandonment of certain behaviors and the adoption of new ones (Prochaska & Velicer, 1997). Changing behavior is not about changing one act; it is about altering the behavioral routines in which the acts are embedded (Heimlich & Ardoin, 2008). Behavioral change is saturated with complexities, and for that reason there is no single theory that can fully account for it. However, such a change could be well described when it is caused by gamification. Self-determination theory and flow theory could be classified as principal theories that elucidate how gamification influences behavioral change (Krath, Schürmann, & von Korfflesch, 2021).

According to self-determination theory (SDT), relatedness, autonomy, and competence are three primary psychological needs that all individuals aspire to fulfil. SDT is applicable to the settings of learning and games because it explains the social contexts that can either boost or lessen intrinsic motivation (Kam & Umar, 2018). On the other hand, flow theory delineates the state in which users become entangled in a certain activity and lose their sense of time (Csikszentmihalyi, 1991). When individuals are fully engaged in an activity, they perceive the intrinsic nature of hoped-for rewards (Csikszentmihalyi, 2014). Flow theory illustrates one of the principal goals of gamification, and the recent literature has examined the efficacy of using gamification elements to retain users in a flow experience (Huang et al., 2018).

Empirically evaluating the behavioral changes imposed by gamification on employees has remained a hurdle. There are no studies that clearly show how such a measurement can be quantified exclusively. In our work, we applied a combined tool that is formed by three validated measurement tools to empirically measure employees' engagement, performance, and satisfaction, because these are important factors of organizational behavior.

2 METHODOLOGY

2.1 Hypotheses

Previous research addressed the importance of implementing gamification in business and its potential positive influence on employees' engagement (Robson et al., 2016; Ponis et al., 2020),

performance (Nacke & Deterding, 2017; Hosseini et al., 2021) and satisfaction (Nacke & Deterding, 2017; Schöbel et al., 2020). Gamification is a kind of technology that influences change without enforcing it (Liu, Santhanam, & Webster, 2017). We developed a novel approach that validates gamification effects on employees' behavior, and which can quantitatively measure behavioral aspects. Gamification is a behavioral-change modeling tool when tailored adequately. In this research, the hypotheses are as follows:

H1. Gamification has a positive effect on employees' behavior.

H1-1. Gamification has a positive effect on employees' engagement.

H1-2. Gamification has a positive effect on employees' performance.

H1-3. Gamification has a positive effect on employees' satisfaction.

2.2 Measurement

To address these hypotheses, we constructed a measurement tool that can analyze employees' key behavioral changes in an organizational context. Our measurement tool is a combination of three self-reporting validated tools: the Utrecht work engagement scale (UWES), the Individual Work Performance Questionnaire (IWQP), and the Minnesota Satisfaction Questionnaire (MSQ). We name this novel theoretical contribution EPS, which highlights the three variables measured: engagement, performance, and satisfaction. We applied the Utrecht scale to measure empirically how gamification implementations influences engagement. The method consists of 17 items and provides a more concrete overview of employees' vigor, dedication, and absorption (Schaufeli & Bakker, 2003; Seppälä et al., 2009). Vigor refers to energy levels and mental resilience while working. Respondents answer the scale using a 7-point Likert in which 0 indicates Never and 7 indicates Always. The second applied measurement tool is the IWQP, which incorporates task performance, interpersonal performance, and counterproductive work behavior (Koopmans et al., 2012; Koopmans, Bernaards, Hildebrandt, De Vet, & Van Der Beek, 2014). Originally the IWQP consisted of 47 items, however, to address our re-

search aim we selected a shorter 25-item version. The items were scored on a 5-point Likert scale in which 1 indicates Strongly disagree and 5 indicates Strongly agree. Finally, we applied the MSQ to measure the effect of gamification on employees' satisfaction. The measurement tool is used widely in the literature (Gillet & Schwab, 1975; Weiss, Dawis, England, & Lofquist, 1967; Inayat & Khan, 2021) and provides actual evidence of any changes in employees satisfaction levels. The MSQ is a 5-point Likert-type scale formed of 20 items and is a time-stable instrument.

2.3 Participants and Procedures

Our sample was formed of 62 European employees who were pursuing their higher education in Hungary. Our data were obtained using questionnaires. The surveys were distributed using Google forms, emails, and social media. Because gamification is not yet a widely recognized concept, we conveniently conducted this research among employees who were continuing their higher education at Budapest University of Technology and Economics. Our sample comprised 56.5% males, 41.9% females, and 1.6% who identified themselves as other; 54.8% of our questionnaire respondents were between 18 and 25, 37.1% were between 26 and 35, and only 8.1% were between 36 and 45. Most of our respondents were university graduates; 48.4% had finished their bachelor's degree, and 33.9% had completed their master's degree. The level of work experience also indicated that 53.2% of our respondents had 1–5 years of experience, whereas 24.2% had less than 1 year.

Our demographical data can help us unravel employees' perception factors, which are examined in the Analysis and Results section. Table 1 presents our sample's age distribution, Table 2 presents their educational distribution, and Table 3 presents our respondents' years of experience.

Table 1: Age distribution

Age	Percentage
18-25	54.8%
26-35	37.1%
36-45	8.1%

Table 2: Educational level distribution

Education levels	Percentage
Elementary school	1.6%
High school graduate	11.3%
Bachelor's degree graduate	48.4%
Master's degree graduate	33.9%
PhD graduate	4.8%

Table 3: Employment years distribution

Employment years	Percentage
1	24.2%
1-5	53.2%
6-10	17.7%
11-15	4.8%

3 ANALYSIS AND RESULTS

Our research data indicates that 21% of our respondents were never exposed to gamification at work, whereas 79% acknowledged being exposed to gamification and game design elements in an organizational context. Furthermore, 41.9% of the respondents acknowledged a high level of familiarity with the concept of gamification and procedures, and 27.5% of respondents indicated low familiarity levels. The collected data demonstrate that most of our sample had a good level of familiarity and understanding of gamification in an organizational context. Our population was divided into two groups: Group 1 (G1) is the employees that were not exposed to gamification, and Group 2 (G2) is formed of employees that were exposed to gamification in an organizational context. Our research goal was to empirically measure the effects of gamification and compare Groups G1 and G2 in terms of engagement, performance, and satisfaction levels. Firstly, we conducted Kolmogorov–Smirnov and Shapiro–Wilk normality tests to address our sample distribution better.

Table 4: Test of normalities: Kolmogorov–Smirnov

	Statistics	df (Sig)
Satisfaction	0.135	62 (0.46)
Engagement	0.150	62 (0.007)
Performance	0.113	62 (0.001)

According to the Kolmogorov–Smirnov test, our data on satisfaction and engagement are not normally distributed ($0.0113 < 0.05$, and $0.153 < 0.05$). Our test results analysis indicates that performance levels are normally distributed ($0.150 > 0.05$). We also conducted a Shapiro–Wilk normality test to validate our results further (Table 5).

Table 5: Test of normalities: Shapiro–Wilk

	Statistics	df (Sig)
Satisfaction	0.980	62 (0.398)
Engagement	0.914	62 (0.000)
Performance	0.915	62 (0.000)

The Shapiro–Wilk test indicates the same results as the Kolmogorov–Smirnov test. Our data on satisfaction and engagement are not normally distributed ($0.0113 < 0.05$, and $0.153 < 0.05$), and, in contrast, our performance levels are normally distributed ($0.150 > 0.05$).

Based on our results, we conducted Mann–Whitney U tests on our variables of satisfaction and engagement levels, and an independent T-test on our variables of performance levels. These tests allow us to determine if there were any differences between Groups G1 and G2. Table 6 presents the results of the Mann–Whitney U test.

Table 6: Mann–Whitney test statistics

	Satisfaction	Engagement
Total N	62	62
Mann-Whitney U	452.500	450.000
Wilcoxon W	1677.500	1675.000
Test Statistic	452.500	450.000
Standard Error	57.786	57.792
Standard Test Stat	2.319	2.275
Asymptotic Sig. (2-sided test)	0.020	0.023

Data analysis in Table 6 indicates moderate to strong differences between Groups G1 and G2 in terms of engagement levels ($0.023 < 0.05$), with a Mann–Whitney U value of 450.0 and a standard error of 57.792. Examining the data results carefully led us to conclude the validity of our first sub-hypothesis, H1-1. Moderate to strong differences exist between employees that were exposed to gamification and employees that were not in terms of organizational engagement. The same differentiated result was evident when we replicated the data analysis on our satisfaction variable as indicated in Table 6. There were moderate to strong differences between Groups G1 and G2 in terms of job satisfaction ($0.020 < 0.05$), with a Mann–Whitney U value of 452.5 and a standard error of 57.78. Based on this analysis, we can conclude that Hypothesis H1-3 is accepted: moderate to strong differences exist between employees that were exposed to gamification and employees that were not exposed to gamification in terms of organizational satisfaction. Owing the results of the normality tests in Tables 4 and 5 that proved the normality of our performance variable distribution, we conducted an independent T-test to validate our second sub-hypothesis. Table 7 demonstrates the independence of performance from the influence of gamification. No significant differences existed between Groups G1 and G2 in terms of organizational performance (significance value of $0.082 > 0.05$, and a T-value of 1.731). Elaborating on our results, we conclude that our second sub-hypothesis is rejected. We repeated our tests on satisfaction and engagement levels using the independent T-test to validate the achieved results further.

Table 7: Performance: independent T-test

	t	df	Sig. (2-tailed)	St. Error Differences
Equal Variances assumed	-1.731	60	0.089	0.19277
Equal Variances not assumed	-1.519	16.298	0.148	0.21974

The T-test measurements demonstrate a significance value of engagement: ($0.039 < 0.05$, and a T-value of -2.236), which also validates Sub-hypothesis H1-1. Employees that were exposed to gamification

demonstrated higher engagement levels than employees that were not. Our results also were significant ($0.037 < 0.05$, and a T-value of -2.268), which validates our third research sub-hypothesis, H1-3. Employees demonstrates higher satisfaction levels in a gamified work environment. Furthermore, as explained by Pallant (2016) we applied the eta-squared rule to measure how significantly game elements influenced employees' engagement and satisfaction. In the following equations, N1 is the number of respondents of Group 1, and N2 is the number of respondents of Group 2.

$$\text{Eta}^2 = \frac{-2.5^2}{-2.5^2 + (13 + 49 - 2)}$$

$$\text{Eta}^2 = 0.09434$$

$$\text{Eta}^2 = \frac{t^2}{t^2 + (N1 + N2 - 2)}$$

Engagement analysis indicates that gamification exposure had moderate to strong effects on employees' engagement levels. Results demonstrate the efficiency of gamification in changing employees' behavior. We applied the same formula to measure employees' satisfaction levels.

$$\text{Eta}^2 = \frac{-2.617^2}{-2.617^2 + (13 + 49 - 2)}$$

$$\text{Eta}^2 = 0.102451$$

The analysis of satisfaction levels also indicates that gamification had moderate to strong effects on employees' organizational satisfaction levels. We can conclude that gamification changes employees' behavior by improving their engagement levels and satisfaction levels.

Because of the importance of initial or accumulated perceptions, we investigated employees' perceptions of the gamification concept and if they realised its potential negative attributes. Results indicate that only 4.3% of the respondents stated that gamification is a source of nuisance, and 8.5% indicated no negative or positive attributes. The solid majority of our respondents—precisely 87.2%—in-

dicated positive effects after being exposed to gamification. Positive responses included better psychological well-being, improved interdepartmental communication, knowledge sharing, and higher motivation levels.

4 DISCUSSION AND CONCLUSION

4.1 Theoretical Contributions

Our research methodology was based on a hybrid-type approach that utilized three scales to measure and compare employee's engagement, performance, and satisfaction. Combining the Utrecht Work Engagement Scale, Individual Work Performance Questionnaire and Minnesota Satisfaction Questionnaire enabled us to conduct a holistic analysis of gamification behavioral influence. Consistent with the previous literature (Huang et al., 2018; Krath, Schürmann, & von Korfflesch, 2021) self-determination theory and flow theory are two of the most important theories in the field of gamification, and our proposed measurement tool, EPS, incorporates them both. Gamification influences behavior change rather than mandating it, and every game element can be categorized according to its own influence and psychological effect. Therefore, game element selection is crucial in promoting the desired behavioral change.

4.2 Practical Implications

Our research elaborated a new approach in investigating the influence of gamification on employees, and is a cost-effective and fast empirical approach. Furthermore, the results of this study can help practitioners scientifically quantify behavioral changes in an organizational environment. Research results proved the usefulness of gamification in influencing organizational behavior. Our results also indicate gamification assimilation among employees between 18 and 35. Gamification exposure moderately to strongly increased employees' organizational engagement and satisfaction. Moreover, the research findings indicate that in this sample, gamification had no significant influence on employees' organizational performance, which is a notable exception.

4.3 Limitations

Because gamification is a relatively new concept, measuring gamification influence among blue-collar employees proved difficult, which is a notable limitation. Therefore, the implementation processes should include a comprehensive gamification description. We planned to assess the impact of gamification on employees' turnover rates, but acquiring such data contradicted corporate regulations. Our combined measurement tool is accurate; nevertheless, owing to its hybrid nature, it was paired with a lengthy questionnaire, making it more difficult to obtain employees' responses.

4.4 Future Research Directions

Our research was conducted among employees residing in Hungary, from different cultural backgrounds. Selecting a more homogeneous sample would enable researchers to detect a mediating role of culture in gamification and should provide cultural perception of integrated game elements by applying the same hybrid measurement tool. Researchers' interpretations of what constitutes "gamification" varies depending on the game elements they select

to include. Therefore, we recommend utilizing a larger sample of employees to evaluate the effects of game elements individually and collectively. The aforementioned method would provide empirical evidence of the appropriate game element combinations based on organizational objectives. Employees did not provide consent before participating in a gamified process, which is a noteworthy observation. Gamification incorporation in on-site job tasks adds a fun layer to organizational activities. Nevertheless, employees' awareness of the process and its goals should be addressed.

EXTENDED SUMMARY/IZVLEČEK

Igrifikacija je razmeroma nov koncept, ki se nanaša na uporabo elementov igre v neigrnih produktivnih dejavnostih. Prav tako se lahko uporablja kot orodje za vedenjsko modeliranje, ki vpliva na vedenjske spremembe v organizacijskem kontekstu. Izziv, ki ostaja povezan s tem konceptom, je pomanjkanje empiričnih meritev lastnosti igrifikacije. Prispevek meri ključne vedenjske spremembe, na katere vpliva igrifikacija med zaposlenimi, in ocenjuje njihovo teoretično podlago. Združili smo že prej potrjena merska orodja za empirično ugotavljanje sprememb vedenja, predvsem zavzetosti, uspešnosti in zadovoljstva. Skupno merilno orodje vključuje Utrechtsko lestvico delovne zavzetosti (angl. Utrecht Work Engagement Scale; UWES), vprašalnik o individualni delovni uspešnosti (angl. Individual Work Performance Questionnaire; IW PQ) in Minnesota vprašalnik o zadovoljstvu (angl. Minnesota Satisfaction Questionnaire; MSQ). Rezultati raziskave so pokazali, da obstaja velika vedenjska razlika med zaposlenimi, na katere je vplivala igrifikacija, in zaposlenimi, na katere ni. Zaposleni, ki so bili izpostavljeni igrifikaciji, so pokazali višjo stopnjo zavzetosti in zadovoljstva ter tako potrdili moč igrifikacije. Glede ravni uspešnosti pa rezultati niso pokazali statistično značilnih razlik med obema skupinama. Ta raziskovalni članek bo v praksi vodil k boljšemu ocenjevanju lastnosti igrifikacije in k izboljšanju uporabe koncepta v organizacijah.

REFERENCES

- Bozkurt, A., & Durak, G. (2018). A systematic review of gamification research: In pursuit of homo ludens. *International Journal of Game-Based Learning*, 8(3), 15–33.
- Buckley, P., & Doyle, E. (2017). Individualising gamification: An investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market. *Computers and Education*, 106, 43–55.
- Cardador, M. T., Northcraft, G. B., & Whicker, J. (2017). A theory of work gamification: Something old, something new, something borrowed, something cool? *Human Resource Management Review*, 27(2), 353–365.
- Csikszentmihalyi, M. (1991). *Flow, the psychology of optimal experience - Steps towards enhancing the quality of life*. Harper & Row Publishers.
- Csikszentmihalyi, M. (2014). *Flow and the foundations of positive psychology*. In *Flow and the foundations of positive psychology*.
- Ērgle, D., & Ludviga, I. (2018). *Use of Gamification in Human Resource Management: Impact on Engagement and Satisfaction*. February.
- Gillet, B., Schwab, D.B. (1975). Convergent and discriminant validities of corresponding Job Descriptive Index and Minnesota Satisfaction Questionnaire scales. *Journal of Applied Psychology* 60(3), 313–317.
- Heimlich, J. E., & Ardoin, N. M. (2008). Understanding behavior to understand behavior change: a literature review. *Environmental Education Research*, 14(3), 215–237.
- Hosseini, C., Humlung, O., Fagerstrøm, A., & Haddara, M. (2021). An experimental study on the effects of gamification on task performance. *Procedia Computer Science*, 196, 999–1006.
- Huang, H. C., Pham, T. T. L., Wong, M. K., Chiu, H. Y., Yang, Y. H., & Teng, C. I. (2018). How to create flow experience in exergames? Perspective of flow theory. *Telematics and Informatics*, 35(5), 1288–1296.
- Huotari, K., & Hamari, J. (2012). Defining gamification - A service marketing perspective. *Proceedings of the 16th International Academic MindTrek Conference 2012: "Envisioning Future Media Environments"*, MindTrek 2012, 17–22.
- Inayat, W., & Jahanzeb Khan, M. (2021). A Study of Job Satisfaction and Its Effect on the Performance of Employees Working in Private Sector Organizations, Peshawar. *Education Research International*, 2021.
- Kam, A. H. T., & Umar, I. N. (2018). Fostering authentic learning motivations through gamification: A self-determination theory (SDT) approach. *Journal of Engineering Science and Technology*, 13(Special Issue), 1–9.
- Koopmans, L., Bernaards, C., Hildebrandt, V., Van Buuren, S., Van Der Beek, A. J., & de Vet, H. C. w. (2012). Development of an individual work performance questionnaire. *International Journal of Productivity and Performance Management*, 62(1), 6–28.
- Koopmans, L., Bernaards, C. M., Hildebrandt, V. H., De Vet, H. C. W., & Van Der Beek, A. J. (2014). Construct validity of the individual work performance questionnaire. *Journal of Occupational and Environmental Medicine*, 56(3), 331–337.
- Krath, J., Schürmann, L., & von Korfflesch, H. F. O. (2021). Revealing the theoretical basis of gamification: A systematic review and analysis of theory in research on gamification, serious games and game-based learning. *Computers in Human Behavior*, 125(January), 106963.
- Liu, D., Santhanam, R., & Webster, J. (2017). Toward meaningful engagement: A framework for design and research of gamified information systems. *MIS Quarterly: Management Information Systems*, 41(4), 1011–1034.
- Mekler, E. D., Brühlmann, F., Opwis, K., & Tuch, A. N. (2013). Do points, levels and leaderboards harm intrinsic motivation? An empirical analysis of common gamification elements. *ACM International Conference Proceeding Series*, 66–73.
- Nacke, L. E., & Deterding, S. (2017). The maturing of gamification research. *Computers in Human Behavior*, 71, 450–454.
- Pallant, J. (2016). *SPSS Survival Manual, 6th edition, 2016*. Open University Press.
- Ponis, S. T., Plakas, G., Agalinos, K., Aretoulaki, E., Gayialis, S. P., & Andrianopoulos, A. (2020). Augmented reality and gamification to increase productivity and job satisfaction in the warehouse of the future. *Procedia Manufacturing*, 51(2020), 1621–1628.
- Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, 12(1), 38–48.
- Robson, K., Plangger, K., Kietzmann, J. H., McCarthy, I., & Pitt, L. (2016). Game on: Engaging customers and employees through gamification. *Business Horizons*, 59(1), 29–36.
- Schaufeli, W. B., & Bakker, A. B. (2003). UWES-Utrecht Work Engagement Scale: Test Manual. Unpublished Article, Department of Psychology, Utrecht University, Utrecht.
- Scheiner, C. W. (2015). The motivational fabric of gamified idea competitions: The evaluation of game mechanics from a longitudinal perspective. *Creativity and Innovation Management*, 24(2), 341–352.
- Schöbel, S. M., Janson, A., & Söllner, M. (2020). Capturing the complexity of gamification elements: a holistic approach for analysing existing and deriving novel gamification designs. *European Journal of Information Systems*, 29(6), 641–668.

- Seppälä, P., Mauno, S., Feldt, T., Hakanen, J., Kinnunen, U., Tolvanen, A., & Schaufeli, W. (2009). The construct validity of the Utrecht Work Engagement Scale: Multisample and longitudinal evidence. *Journal of Happiness Studies, 10*(4), 459–481.
- Weiss, D.J., Dawis, R.V., England, G.W., Lofquist, L.H. (1967) *Manual for the Minnesota Satisfaction Questionnaire*. University of Minnesota, Minneapolis Industrial Relations Center.
- Werbach, K., & Hunter, D. (2012). *For the Win: How Game Thinking can Revolutionize your Business*.
- Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review, 30*(February).