A Study of Gamification in Project Management Systems

Completed Research

Abdullah Azhari
Jeddah Community Collage King Abdulaziz University, Al-Marsad St, King Abdulaziz University, Jeddah 21589, KSA
aaazhari1@kau.edu.sa

Xiaowen Fang
School of Computing Collage of CDM DePaul University, 243 S Wabash Avenue Chicago, IL 60613 USA
xfang@cdm.depaul.edu

Abstract

This study presents a framework that would benefit professionals in implementing meaningful Gamification concepts within project management tools. This study was pioneered and it paves a foundation for any continuing endeavor to study Gamification. In particular, two major contributions are made. First, utilitarian aspect was introduced and combined with entertainment aspect into Gamification by analyzing large-scale online SMAs' reviews. Additionally, six factors of Gamification were discovered and were validated in the context of project management tools. Since this model is developed based on a well-established method from personality psychology and adopted revised lexical approach on a large scale of data, it is expected to motivate a new wave and new perspective of research in Gamification.

Keywords

Gamification, HCI, Project Management, Playability, Creativity, Trust, Sensation, Engagement, Model.

Introduction

Many studies defines Gamification as the application and the process of game design elements into non-game context (Deterding et al. 2011). Prior research has investigated different facets of gamification, particularly in how it changes user behavior. These studies focused on changing environments to alter user behavior in a limited field (Deterding et al. 2011). It discusses that there are many ambiguous uses of this technology and technical difficulties, because of the limited documentation of gamification data usage in the industry. Indeed, gamification has become a sort of phenomenon, and a regular part of our social, cultural, and professional life (Jung et al. 2010). Gamification has been commonly used in social media applications (SMAs) (Hamari and Järvinen 2011). Gamification provides game elements such as rewards, goals, shared boards, collaborations, interactions, and tracking. Thus, SMA users experience enjoyment, playfulness, and social recognition, and that would encourage them to continually engage in activities while using the applications (Lin and Lu 2011). Increasing globalization, use of video games, and use of social media applications generated huge challenges and opportunities for businesses at the same time (Jung et al. 2010). Project management is a very universal concept, encompassing techniques used in every organization. With the increase of globalization, the complexity of projects have also dramatically increased (Knutson 2002). Thus, the need for an effective project team has increased with the complexity of cultural, functional, and integration requirements (Knutson 2002). Applying the concept of gamification could reduce some of project management associated issues and increase the efficiency of project management (Bajdor and Dragolea 2011). However, most of the existing studies and frameworks of gamification ignored the utility elements, and focused on game design (Deterding et al. 2011). Developing gamification framework based on user experience in social media applications (SMAs) would cover both the utilitarian and entertainment aspects of gamification (Azhari and Fang 2017). The objective of this study is to develop a gamification framework then validate it by applying it in project management tools.

Literature Review

Gamification has been a hot topic of investigation since 2010. Most researchers define gamification as merging game design elements in non-gaming contexts (Deterding et al. 2011). Framework Development. A gamified layer on non-gaming systems adopts elements involving enjoyable factors, while providing options for decision making, creating additional feelings that transfer from the digital to the real world, uncertain connections to external values, and work by rules (Caillois and Barash 1961). Some studies identified gamified systems according to gaming and playing concepts (Deterding et al. 2011). According to these studies, any system can be gamified if one gaming element is used in part of that system. Also, gamification application uses game design elements rather than being a fully-developed game, video game, or serious game (Deterding et al. 2011; Muntean 2011). Gamified applications take the advantage of using powerful game design elements, and apply this advantage to solving problems in different fields (Lee and Hammer 2011). The use of gamification concepts has the ability to affect engagement and loyalty, improve motivation, change behavior, encourage contribution, increase involvement, and contribute to efficiency (Lee and Hammer 2011). Developing a framework that reflects both utility and entertainment elements of gamification would enhance project management experience (Calderón and Ruiz 2015). Thus, gamification design elements would improve the project team performance and meet the project and organizational objectives (Calderón and Ruiz 2015). Project management is a set of processes that include tools, techniques, and knowledge-based actions to achieve individual and organizational goals (Fernie et al. 2003). Agile project management is a project management approaches focus on iteration, continuous innovation and development and cost reduction trends (Fernandez and Fernandez 2008; Špundak 2014). We are in a digital age, and the familiarity with video games has increased. Also, many users of these project management tools are users of other SMAs. Thus, more research needs to be conducted to investigate user experiences on project management tools using elements from social media applications and games design elements.

Development of conceptual framework

A six-factor model (playability, usability, creativity, trust, sensation, and engagement) developed using revised lexical approach to investigate gamification framework by analyzing large-scale online SMAs' reviews (Azhari and Fang 2017). As suggested by Zhu and Fang (Zhu and Fang 2014), it employed a lexical analysis process by collecting online reviews, building a dictionary of SMA descriptive adjectives, extracting user ratings of adjectives, and conducting factor analyses. In addition a card sorting stage was added to further simplify the complex factor structure discovered the factor analysis. Playability is a set of criteria that describe user experience to evaluate user interaction to specific system to provide enjoyment, entertainment and learning strategies (Järvinen et al. 2002). SMAs support social playability, which provides user culture that encourages an enjoyable, attractive and meaningful sense of community (Järvinen et al. 2002). Usability represents another important aspect of SMA. As any computer applications, SMA must be effective, efficient, and user-friendly. Creativity is the emerging in action of a novel relation product, growing out of the uniqueness of the individual, environment, and its interactions (Rogers 1954). Both SMA and users have creativity characteristics and influence each other's creativity over time (Greenhow et al. 2011). In addition, users' interaction on SMAs develops trust with the application and other users over time (Lee and Hammer 2011). Sensation stands for users' affective reactions that may be stimulated by narratives, visual and audio effect, etc. When SMA users socialize with each other via the apps, users would have affective reaction toward the design and the content or both. Engagement elements such as personality, user needs, socialization, UX in SMA, and SMA activities affect SMA usage (Amichai-Hamburger and Ben-Artzi 2003). These elements are combinations of service and game design factors. Since these traits were extracted from a large number of online reviews, they represent the most critical traits in user experience. They can be used to measure and improve user experience. Gamification is associated to game design elements applied to utility software dealing with real life issues. Developing gamified systems based on understanding enjoyment and adding elements from the digital world can improve solving issues and enhance performances in the real world (Coonradt and Nelson 2007; Deterding et al. 2011). Since SMAs possess common characteristics with both utilitarian software and computer games, the proposed framework will be applicable to Gamification utilitarian applications. Thus, we propose to use the six factors to improve user experience in gamified applications. In summary we are hypothesizing the following:

- H1: There is positive relationship between user perception of playability (H1a) - usability (H1b) - creativity (H1c) - trust (H1d) - sensation (H1e) - engagement (H1f) and the time of using gamification features on the application "TSUGF".
- H2a: There is a positive relation between the time spent of gamification features and individual performance "number of completed projects" (H2a) - "annual performance management program report" (H2b).

Methodology

We conducted longitudinal surveys to validate our hypotheses and to gain insight about effects of the six factors of gamification on the user experience within project management tools of Alamar Foods Company.

Research Site, Tool and Participants

Domino's Pizza is franchised and operated by Alamar Foods Company in the MENAP (Middle East, North Africa and Pakistan) region. It is a multicultural workforce and international environment, they use English as the main language for internal communications. Kanbanflow.com was used as the gamified lean project management tool. The Kanban board provides an overview of the current work situation. It visualizes the work and simplifies communications. It provides a feature that can limit the number of projects and tasks. This feature focuses on completing tasks instead of starting new tasks. Also, it helps track the time spent on a task. Kanbanflow.com provides real time collaboration through webpage interface and a mobile web app. Moreover, it provides analytical reports of tasks and project status, user performance, time spent, and disruption analysis. Finally, kanbanflow.com has a point system called "Pomodoro." The "Pomodoro" technique helps users focus on tasks in multiple short time periods. Kanbanflow.com suggests that focusing on a specific task for multiple short sessions will get more work done for the long run in a shorter time.

Two hundred randomly selected Domino's Pizza of Middle East, North Africa and Pakistan (MENAP) (Alamar Food Company) employees in different, levels, departments, and authorities participated in this gamification study. All the participants speak English and have accounts at KanbanFlow.com.

Study Design

Longitudinal data was collected to measure effects of the six factors of gamification on time spent using gamification features. After every three months, participants were asked to fill a survey to measure the six-gamification factors. Kanbanflow.com generated the "Pomodoro" points automatically. Each department manager has access to these points. Each department manager submitted a project tracking report to show the number of completed projects and "Pomodoro" points for each employee. The "Pomodoro" points were used to record the time that employees spent using gamification features in the application. In addition, at the end of month 12, each department manager reported the participants' performance.

Instrument Development

Time spent using gamification features (TSUGF)

This variable was measured by collecting "Pomodoro" points. Each point of the "Pomodoro" points represent 1 minute in which the user utilized the gamification features within kanbanflow.com.

Employee performance

Employee performance includes two elements. First, annual performance management program report, which includes: (Individual contribution and engagement to the organization and social events has a value of 20% of total performance - Individual contribution to the business and functional related elements has a value of 80% of the total employee performance). Second, project tracker report, which includes: (Number of completed projects and "Pomodoro" points). Managers submitted an annual performance management program report at the end of month 12 associated with the identification code assigned for each employee. Also, they submitted a project tracker report every three months.

Six factors

A 7-point Likert scale was used for measuring each item in the six factors. Items that are considered not applicable to gamification or repetitive of other measures were removed.

Construct	# of Items	Source
Playability	34	(Fang et al. 2010; Fang et al. 2013).
Usability	5	(Nielsen 1994).
Creativity	10	(Carroll and Latulipe 2009; Carroll et al. 2009; Dong et al. 2017).
Trust	25	(Mcknight et al. 2011).
Sensation	8	(Harmon-Jones et al. 2016; Smith and Lazarus 1993).
Engagement	27	(Liu 2003; O'Brien and Toms 2013; Vivek et al. 2014; Weber et al. 2014).

Table 1. Six factors instruments development

Procedure

At the beginning, participants were asked to sign in and they were instructed to read an information sheet containing a brief description of the nature of the study. For the duration of the experiment, participants were asked to use the application in their own tasks and teamwork projects for twelve month. Identification code was assigned to each participant to track their progress without violating their privacy. Before starting the use of the application participants were asked to fill the initial survey to record self-efficacy (of computer, mobile applications, social media apps, video and mobile games), most important issues of any applications of their choice, and demographics. After that, in every three months participant were asked to fill a survey to measure gamification factors. Also, each department manager submitted project tracker report to show number of completed projects and "Pomodoro" points for each employee to record the time they spend using gamification features in the application every three months. At the end of month 12, each department manager reported the participants' performance.

Results & Discussion

Initially, the discriminant validity of the six factors items were examined at each phase. Confirmatory factor analysis with six constructs was conducted to test converging the items to six factors. A clear cut occurred, within the factors on each phase, by items having factor-loading values under 0.6. Items were eliminated because they did not contribute to a simple factor structure and failed to meet the minimum criteria of having a primary factor loading above the clear cut (0.6 or above), and no cross-loading of 0.4 or above in all phases. In addition, internal consistency of each factor, that has more than one item, was examined using Cronbach's alpha. Playability (33 items), usability (2 items), creativity (4 items), and engagement (27 items) show Cronbach's alpha values higher than 0.9 in all phases. The primary constraint of having only one item in trust and sensation construct was that we don't have the opportunity to verify its reliability. The results of the internal consistency analysis show that eliminating more items will have no substantial increases in alpha for any of the factors.

After three months of the participants using the application we used linear regression analysis to test H1a, H1b, H1c, H1d, H1e, H1f, and H2a (Table 2).

Model	R2 (p-value)	R2 Change	Beta	t-value (p-value)	Hypothesis testing result
1	0.930 (<0.0001)				
Playability		0.930	0.967	37.761 (<0.0001)	H1a was supported

Table 2. Regression analysis for TSUGF in gamified project management in phase 1

The regression analysis indicates that the TSUGF in the gamified project management (PM) tools is significantly influenced by Playability ($\beta = 0.967$, $t = 37.761$, $p < 0.0001$). Also, it suggests that the proposed model explains a significant percentage of variance in TSUGF in the gamified PM tools ($R2 = 0.930$, $F = 428.349$, $p < 0.0001$). Therefore, the results support H1a. Table 3 presents the results of stepwise linear regression analyses and hypothesis testing for H2a in phase 1.

Model	R2 (p-value)	Beta	t-value (p-value)	Hypothesis testing result
1	0.152 (<0.0001)			
TSUGF (Pomodoro)		0.390	5.957 (<0.0001)	H2a was supported

Table 3. Regression analysis of TSUGF and "number of completed projects" in phase 1

The results of the regression analysis show that the TSUGF explain a significant percentage of the variance ($R2 = 0.152$, $F = 35.482$, $p < 0.0001$). Also, it indicates that number of completed projects significantly influenced by the TSUGF in the gamified PM tool ($\beta = 0.390$, $t = 5.967$, $p < 0.0001$). In short, we accept H1a and H2a in phase 1. However, we reject H1b, H1c, H1d, H1e, and H1f in phase 1.

After six months of the participants continuous use of the application, we used linear regression analysis to test H1a, H1b, H1c, H1d, H1e, H1f, H2a hypotheses (Table 4).

Model	R2 (p-value)	R2 Change	Beta	t-value (p-value)	Hypothesis testing result
1	0.836 (<0.0001)				
Creativity		0.110	0.400	11.458 (<0.0001)	H1c was supported
Engagement		0.726	0.627	17.963 (<0.0001)	H1f was supported

Table 4. Regression analysis for TSUGF in gamified project management in phase 2

The regression analysis indicates that the TSUGF in the gamified PM tools is significantly influenced by creativity ($\beta = 0.400$, $t = 11.458$, $p < 0.0001$) and engagement ($\beta = 0.627$, $t = 17.963$, $p < 0.0001$). Also, it suggests that the proposed model explains a significant percentage of variance in TSUGF in the gamified PM tools ($R2 = 0.836$, $F = 500.928$, $p < 0.0001$). Therefore, the results support H1c and H1f. At the end of phase 2 we conducted linear regression analysis to test H2a (Table 5)

Model	R2 (p-value)	Beta	t-value (p-value)	Hypothesis testing result
1	0.545 (<0.0001)			
TSUGF (Pomodoro)		0.738	15.402 (<0.0001)	H2a was supported

Table 5. Regression analysis of TSUGF and "number of completed projects" in phase 2

The results of the regression analysis show that the TSUGF explain a significant percentage of the variance ($R2 = 0.545$, $F = 237.222$, $p < 0.0001$). Also, it indicates that number of completed projects significantly influenced by the TSUGF in the gamified PM tool ($\beta = 0.738$, $t = 15.402$, $p < 0.0001$). In short, we accept H1c, H1f, and H2a in phase 2. However, we reject H2aH1a, H1b, H1d, and H1e in phase 2.

After nine months of the participants continued use of the application, we used linear regression to test H1a, H1b, H1c, H1d, H1e, H1f, H2a (Table 6).

Model	R2 (p-value)	R2 Change	Beta	t-value (p-value)	Hypothesis testing result
1	0.890 (<0.0001)				
Playability		0.799	0.405	8.776 (<0.0001)	H1a was supported

Usability		0.006	0.092	3.289 (<0.0001)	H1b was supported
Creativity		0.021	0.160	4.719 (<0.0001)	H1c was supported
Trust		0.002	0.058	2.037 (<0.05)	H1d was supported
Sensation		0.006	0.078	3.122 (<0.0001)	H1e was supported
Engagement		0.059	0.383	9.229 (<0.0001)	H1f was supported

Table 6. Regression analysis for TSUGF in gamified project management in phase 3

Table 6 indicates that the TSUGF in the gamified PM tools is significantly influenced by Playability (β = 0.405, t = 8.776, p < 0.0001), Usability (β = 0.092, t = 3.289, p < 0.0001), Creativity (β = 0.160, t = 4.719, p < 0.0001), Trust (β = 0.058, t = 2.037, p < 0.05), Sensation (β = 0.078, t = 3.122, p < 0.0001), and Engagement (β = 0.383, t = 9.229, p < 0.0001). The regression analysis also suggests that the proposed model explains a significant percentage of variance in TSUGF in the gamified PM tools (R2 = 0.890, F = 269.981, p < 0.0001). Therefore, the results support H1a, H1b, H1c, H1d, H1e, and H1f. Linear regression analysis was conducted to test H2a in phase 3 (Table 7).

Model	R2 (p-value)	Beta	t-value (p-value)	Hypothesis testing result
1	0.840 (<0.0001)			
TSUGF (Pomodoro)		0.917	32.295 (<0.0001)	H2a was supported

Table 7. Regression analysis of TSUGF and "number of completed projects" in phase 3

The results of the regression analysis show that the TSUGF explain a significant percentage of the variance (R2 = 0.840, F =1042.951, p < 0.0001). Also, it indicates that number of completed projects significantly influenced by the TSUGF in the gamified PM tool (β = 0.917, t = 32.295, p < 0.0001). In short, we accept H1a, H1b, H1c, H1d, H1e, H1f, and H2a.

By the end of the twelfth month we used linear regression analysis to test H1a, H1b, H1c, H1d, H1e, H1f, H2a, and H2b (Table 8)

Model	R2 (p-value)	R2 Change	Beta	t-value (p-value)	Hypothesis testing result
1	0.850 (<0.0001)				
Playability		0.696	0.252	4.732 (<0.0001)	H1a was supported
Usability		0.094	0.282	6.811 (<0.0001)	H1b was supported
Creativity		0.033	0.214	5.160 (<0.0001)	H1c was supported
Trust		0.010	0.116	3.677 (<0.0001)	H1d was supported
Sensation		0.005	0.077	2.609 (<0.05)	H1e was supported
Engagement		0.016	0.207	4.249 (<0.0001)	H1f was supported

Table 8. Regression analysis for TSUGF in gamified project management in phase 4

Table 8 indicates that the TSUGF in the gamified PM tools is significantly influenced by Playability (β = 0.252, t = 4.732, p < 0.0001), Usability (β = 0.282, t = 6.811, p < 0.0001), Creativity (β = 0.214, t = 5.160, p < 0.0001), Trust (β = 0.116, t = 3.677, p < 0.0001), Sensation (β = 0.077, t = 2.609, p < 0.05), and Engagement (β = 0.207, t = 4.249, p < 0.0001). Also, it suggests that the proposed model explains a significant percentage of variance in TSUGF in the gamified PM tools (R2 = 0.850, F = 188.399, p < 0.0001). Therefore, the results support H1a, H1b, H1c, H1d, H1e, and H1f. Table 9 presents the results of stepwise linear regression analyses and hypothesis testing for H2a in phase 4.

Model	R2 (p-value)	Beta	t-value (p-value)	Hypothesis testing result
1	0.080 (<0.0001)			
TSUGF (Pomodoro)		0.283	4.160 (<0.0001)	H2a was supported

Table 9. Regression analysis of TSUGF and "number of completed projects" in phase 4

The results of the regression analysis show that the TSUGF explain a significant percentage of the variance (R2 = 0.080, F =17.304, p < 0.0001). Also, it indicates that number of completed projects significantly influenced by the TSUGF in the gamified PM tool (β = 0.283, t = 4.160, p < 0.0001).

Model	R2 (p-value)	Beta	t-value (p-value)	Hypothesis testing result
1	0.497 (<0.0001)			
Total TSUGF (Pomodoro)		0.705	14.121 (<0.0001)	H2b was supported

Table 10. Regression analysis of TSUGF and "Annual Performance " in phase 4

The results of the regression analysis of H2b (Table 10) show that the TSUGF explain a significant percentage of the variance (R2 = 0.497, F =199.413, p < 0.0001). Also, it indicates that annual performance significantly influenced by the TSUGF in the gamified PM tool (β = 0.705, t = 14.121, p < 0.0001). In short, we accept H1a, H1b, H1c, H1d, H1e, H1f, and H2a.

Longitudinal Effects

We conducted repeated measures ANOVA on each factor applying Greenhouse-Geisser correction to understand the significance change of each factor during the study. It will explain the change of mean of each construct during the study throughout all phases and the impact of that change on TSUGF on all phases. The repeated measures ANOVA (Table 11) shows significant mean difference between phases in usability measures (F= 135.144, P < 0.01), trust measures (F = 189.373, p<0.01), creativity measures (F = 24.702, P < 0.01), engagement measures (F = 114.136, p<0.01), and sensation measures (F = 12.768, p < 0.01).

Measure	Sum of Squares	df	Mean Square	F	Sig.
Usability	501.118	3	167.039	135.144	0.000
Trust	720.764	3	240.255	189.373	0.000
Creativity	82.057	3	27.352	24.702	0.000
Engagement	480.690	3	160.230	114.136	0.000
Sensation	65.080	3	21.693	12.768	0.000

Table 11. ANOVA

Post hoc tests using the Duncan post-hoc comparison (Table 12) revealed that usability, trust, creativity, engagement, and sensation measures significantly (p<0.01) increase over time compared to the beginning of using the gamified project management tool.

Subset	Usability			Trust				Creativity			Engagement			Sensation	
Phases	1	2	3	1	2	3	4	1	2	3	1	2	3	1	2
1	2.290			1.850				3.060			2.436			3.105	

2		2.963			2.650				3.436			3.203		3.075	
3			4.075			3.120				3.789			4.272	3.005	
4			4.193				4.465			3.868			4.272		3.715

Table 12. Pair-Wise comparisons of usability, trust, creativity, engagement, and sensation among different phases

Thus, usability, trust and creativity factors would be more effective on Gamification experience over time. Spending more time using and engaging with the application gives the users more chances to go through more events and interactions with the others and the application (Kim et al. 2013). Also, the repeated measure ANOVA shows a significant difference of sensation and engagement mean over time compared to the beginning of using the gamified project management tool. Thus, we can see that they have a significant impact on TSUGF at later stages.

Discussions

At the end of the study we conducted linear regression analysis to investigate the relation between time spent using Gamification features and the number of completed projects and employee annual performance. We found a significant positive relation between time spent using Gamification features and employee annual performance. As well as, there was significant positive relation between time spent in gamification features and the number of completed projects in each phase. In addition, looking at phase 3 and phase 4 we conclude that the six factors (Playability, Usability, Creativity, Trust, Sensation, and Engagement) framework in the gamified project management tool significantly predict the time spent using gamification features on the application. Relatedness and connection would make users play toward their goals and passion (Richards et al. 2014). Also, quality of users' experience and usability develops over time (Karapanos 2013). The quality of user interaction with an application would reflect on both the usability and the meaningful use of the application (Karapanos 2013). In addition, creative employees at work usually experience positive feeling about their contribution toward the organization (Kim et al. 2009). Also, creative actions and ideas affect employees social network and status within the organization over time (Kim et al. 2009). Trust and acceptance of a new system is built on good quality interactions and the amount of time spent using the system (Venkatesh and Davis 2000). In addition, spending more time using the application would make the users interact and experience more sensational feelings while using the application (Hassenzahl 2008). Finally, engagement characteristics develop slowly over time and would remain more stable in the long-term interaction with the application (Schaufeli and Salanova 2007). Thus, the regression analysis and prior studies support that the six factors have an impact on time spent using gamification features (H1a, H1b, H1c, H1d, H1e, and H1f). Playability, usability, creativity, trust, sensation, and engagement have a significant positive relation with the time spent using gamification features on the application. Adaptability, consistency, and task conformance are some of the elements to build the basic layer of usability (Van Welie et al. 1999). Since kanbanflow.com is a new application for the users in this study, it could be affected by adaptability, consistency, and task conformance. By the end of the study, it is evident that the six-factors model is valid and effective to develop gamified systems for project management tools. Also, there is a significant positive relation between time spent using Gamification features and performance. When other studies are struggling to develop Gamification model merging entertainment and utilitarian elements at the same time, we adopted a revised lexical approach to analyze adjectives, which revealed 6 essential factors of Gamification. However, there are some external factors connected to the context of project management that could affect the Gamification experience. Many studies state that to design an effective gamified system we must understand the business context and use user-centered design approach (Kumar 2013).

Conclusion

This study presents a framework including guidelines that would benefit professionals of all levels in implementing meaningful Gamification concepts to suit their needs within project management tools. Analyzing large-scale online SMAs' reviews developed this framework. The six factors (playability, usability, creativity, trust, sensation, and engagement) of Gamification were discovered and were validated in the context of project management tools. These factors altered users experience, improved ultimate performance, and have a significant effect on managing projects in the quick service restaurants (QSR) industry. Since this model is developed based on a well-established method from personality psychology and adopted revised lexical approach on a large scale of data, it is expected to motivate a new wave and new perspective of research in Gamification. Moreover, like other Gamification research in general, there are some areas to improve this study. Future studies are needed to investigate the impact and the development of trust and sensation construct on Gamification framework on project management tools. Also, playability construct needs more investigation to understand the time effect on its measures. These future studies could add substantial value for understanding the construct of the Gamification frameworks, the research domain and related fields to game design elements studies.

REFERENCES

Amichai-Hamburger, Y., and Ben-Artzi, E. 2003. "Loneliness and Internet Use," *Computers in human behavior* (19:1), pp. 71-80.

Azhari, A., and Fang, X. 2017. "Social Media Applications Framework: A Lexical Analysis of Users Online Reviews," *Information and Communication Technologies in Organizations and Society* Springer.

Bajdor, P., and Dragolea, L. 2011. "The Gamification as a Tool to Improve Risk Management in the Enterprise," *Annales Universitatis Apulensis: Series Oeconomica* (13:2), p. 574.

Caillois, R., and Barash, M. 1961. *Man, Play, and Games*. University of Illinois Press.

Calderón, A., and Ruiz, M. 2015. "A Systematic Literature Review on Serious Games Evaluation: An Application to Software Project Management," *Computers & Education* (87), pp. 396-422.

Carroll, E.A., and Latulipe, C. 2009. "The Creativity Support Index," *CHI'09 Extended Abstracts on Human Factors in Computing Systems*: ACM, pp. 4009-4014.

Carroll, E.A., Latulipe, C., Fung, R., and Terry, M. 2009. "Creativity Factor Evaluation: Towards a Standardized Survey Metric for Creativity Support," *Proceedings of the seventh ACM conference on Creativity and cognition*: ACM, pp. 127-136.

Coonradt, C.A., and Nelson, L. 2007. *The Game of Work*. Gibbs Smith.

Deterding, S., Dixon, D., Khaled, R., and Nacke, L. 2011. "From Game Design Elements to Gamefulness: Defining Gamification," *Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments*: ACM, pp. 9-15.

Dong, F., O'Donoghue, D.P., Ersotelos, N., Wu, S., Saggion, H., Ronzano, F., Corcho, O., Hurley, D., Abgaz, Y., and Zhang, J.J. 2017. "Dr. Inventor, Promoting Scientific Creativity by Utilising Web-Based Research Objects, Fp7," *Impact* (2017:2), pp. 40-44.

Fang, X., Chan, S., Brzezinski, J., and Nair, C. 2010. "Development of an Instrument to Measure Enjoyment of Computer Game Play," *INTL. Journal of human–computer interaction* (26:9), pp. 868-886.

Fang, X., Zhang, J., and Chan, S.S. 2013. "Development of an Instrument for Studying Flow in Computer Game Play," *International Journal of Human-Computer Interaction* (29:7), pp. 456-470.

Fernandez, D.J., and Fernandez, J.D. 2008. "Agile Project Management—Agilism Versus Traditional Approaches," *Journal of Computer Information Systems* (49:2), pp. 10-17.

Fernie, S., Green, S.D., Weller, S.J., and Newcombe, R. 2003. "Knowledge Sharing: Context, Confusion and Controversy," *International Journal of Project Management* (21:3), pp. 177-187.

Greenhow, C., Peppler, K.A., and Solomou, M. 2011. "Building Creativity: Collaborative Learning and Creativity in Social Media Environments," *On the Horizon* (19:1), pp. 13-23.

Hamari, J., and Järvinen, A. 2011. "Building Customer Relationship through Game Mechanics in Social Games," *Business, Technological and Social Dimensions of Computer Games: Multidisciplinary Developments. Hershey, PA: IGI Global, Forthcoming*).

Harmon-Jones, C., Bastian, B., and Harmon-Jones, E. 2016. "The Discrete Emotions Questionnaire: A New Tool for Measuring State Self-Reported Emotions," *PloS one* (11:8), p. e0159915.

Hassenzahl, M. 2008. "User Experience (Ux): Towards an Experiential Perspective on Product Quality," *Proceedings of the 20th Conference on l'Interaction Homme-Machine*: ACM, pp. 11-15.
Järvinen, A., Heliö, S., and Mäyrä, F. 2002. *Communication and Community in Digital Entertainment Services. Prestudy Research Report*.
Jung, J., Schneider, C., and Valacich, J. 2010. "Enhancing the Motivational Affordance of Information Systems: The Effects of Real-Time Performance Feedback and Goal Setting in Group Collaboration Environments," *Management Science* (56:4), pp. 724-742.
Karapanos, E. 2013. "User Experience over Time," in *Modeling Users' Experiences with Interactive Systems*. Springer, pp. 57-83.
Kim, T.-Y., Hon, A.H., and Crant, J.M. 2009. "Proactive Personality, Employee Creativity, and Newcomer Outcomes: A Longitudinal Study," *Journal of Business and Psychology* (24:1), pp. 93-103.
Kim, Y.H., Kim, D.J., and Wachter, K. 2013. "A Study of Mobile User Engagement (Moen): Engagement Motivations, Perceived Value, Satisfaction, and Continued Engagement Intention," *Decision Support Systems* (56), pp. 361-370.
Knutson, J. 2002. *Project Management for Business Professionals: A Comprehensive Guide*. John Wiley & Sons.
Kumar, J. 2013. "Gamification at Work: Designing Engaging Business Software," *International conference of design, user experience, and usability*: Springer, pp. 528-537.
Lee, J.J., and Hammer, J. 2011. "Gamification in Education: What, How, Why Bother?," *Academic exchange quarterly* (15:2), p. 146.
Lin, K.-Y., and Lu, H.-P. 2011. "Why People Use Social Networking Sites: An Empirical Study Integrating Network Externalities and Motivation Theory," *Computers in Human Behavior* (27:3), pp. 1152-1161.
Liu, Y. 2003. "Developing a Scale to Measure the Interactivity of Websites," *Journal of advertising research* (43:2), pp. 207-216.
Mcknight, D.H., Carter, M., Thatcher, J.B., and Clay, P.F. 2011. "Trust in a Specific Technology: An Investigation of Its Components and Measures," *ACM Transactions on Management Information Systems (TMIS)* (2:2), p. 12.
Muntean, C.I. 2011. "Raising Engagement in E-Learning through Gamification," *Proc. 6th International Conference on Virtual Learning ICVL*, pp. 323-329.
Nielsen, J. 1994. *Usability Engineering*. Elsevier.
O'Brien, H.L., and Toms, E.G. 2013. "Examining the Generalizability of the User Engagement Scale (Ues) in Exploratory Search," *Information Processing & Management* (49:5), pp. 1092-1107.
Richards, C., Thompson, C.W., and Graham, N. 2014. "Beyond Designing for Motivation: The Importance of Context in Gamification," *Proceedings of the first ACM SIGCHI annual symposium on Computer-human interaction in play*: ACM, pp. 217-226.
Rogers, C.R. 1954. "Toward a Theory of Creativity," *ETC: A review of general semantics*), pp. 249-260.
Schaufeli, W., and Salanova, M. 2007. "Work Engagement," *Managing social and ethical issues in organizations* (135), p. 177.
Smith, C.A., and Lazarus, R.S. 1993. "Appraisal Components, Core Relational Themes, and the Emotions," *Cognition & Emotion* (7:3-4), pp. 233-269.
Špundak, M. 2014. "Mixed Agile/Traditional Project Management Methodology–Reality or Illusion?," *Procedia-Social and Behavioral Sciences* (119), pp. 939-948.
Van Welie, M., Van Der Veer, G.C., and Eliëns, A. 1999. "Breaking Down Usability," *Interact*, pp. 613-620.
Venkatesh, V., and Davis, F.D. 2000. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies," *Management science* (46:2), pp. 186-204.
Vivek, S.D., Beatty, S.E., Dalela, V., and Morgan, R.M. 2014. "A Generalized Multidimensional Scale for Measuring Customer Engagement," *Journal of Marketing Theory and Practice* (22:4), pp. 401-420.
Weber, R., Behr, K.-M., and DeMartino, C. 2014. "Measuring Interactivity in Video Games," *Communication Methods and Measures* (8:2), pp. 79-115.
Zhu, M., and Fang, X. 2014. "Introducing a Revised Lexical Approach to Study User Experience in Game Play by Analyzing Online Reviews," *Proceedings of the 2014 Conference on Interactive Entertainment*: ACM, pp. 1-8.