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Goal-setting theory and gamification in mobile fitness application: a measurement items analysis

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Abstract: The development of Goal Setting Theory using gamification has gotten less attention from academics, particularly in the context of mobile fitness applications. The absence of measurement analysis tools and concepts from goal-setting theory and gamification in the context of mobile fitness applications may be the cause of this gap. Therefore, the purpose of this paper was to conceptualise a scale for assessing Goal Setting Theory and gamification items. Information gathered from a survey of gyms that made use of the mobile exercise application, where 349 respondents completed questionnaires for this study. The structural equation model (SEM), specifically the partial least square structural equation modelling for the measurement items, was used to assess the data. The findings indicate that 30 of the measurement items tested for this study passed the structural model testing criterion. The study should broaden our understanding of Goal Setting Theory and gamification concepts while also giving academics and fitness professionals a tool for additional research.

Keywords: goal setting theory; gamification; mobile fitness application; structural equation model

1. Introduction

Goal-Setting Theory [1,2] has been developed inductively in industrial or organizational psychology over 25 years, based on some 400 laboratory and field studies. Previously, studies had been found on more than 88 different tasks, involving more than 40,000 male and female participants across Asia, Australia, Europe and North America since 1990 [3]. Hapsari *et al.* (2017) justified that Goal Setting Theory is most likely to improve engagement when the goals are specific and challenging [4] and Ying (2017) [5] suggested Goal Setting Theory was initially developed by Swan (2012) [6], who proposed that people will be motivated and engaged in striving towards goals. This theory is considered among powerful motivational interventions and capable across many situations and tasks while Khaleel *et al.* (2015) [7]



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found that most of the gamification included some ways of Goal Setting Theory at both the organizational level and as well as the individual level.

Gamification defined as the application of game design and principles into a non-game context, which enhancing the behavior value such as engagement [8]. Gamification has significant potential as an essential construct of individual engagement [9]. An individual with a high level of gamification knowledge will strive the engagement behavior within the activity involvement [10]. However, limited research has been conducted in the development Goal-Setting Theory with gamification items as an essential predictor of expected behavior such as engagement [11–14].

Consistently, several studies have shown that the existing of Goal Setting Theory with gamification items are not suitable for mobile fitness application context [9,15,16]. For instance, the both items were tested in different context such as airline services [5], organizational [17] and video game [14] and majority of scholars were adopted and adapted the items in various context such as e-learning [18], Mobile Learning [19] and production employees [20]. As a result, Goal Setting Theory and gamification items in various context are clearly saturated and overused of the items. In light of this point, the purpose of this study was twofold: (1) to develop a valid and reliable instrument for Goal Setting Theory and gamification and (2) to extend the knowledge of Goal Setting Theory and gamification in mobile fitness application.

2. Literature review

2.1 Goal setting theory

Locke first proposed Goal Setting Theory in 1968, claiming that when the prior objectives are accomplished, the intended behaviour should be observed. Academics have used it for decades since it helps to explicate the individual desire to improve performance in related activities and performance in a variety of circumstances via goal setting and monitoring [19]. The seminal research on Goal Setting Theory [21–23] and items development [24,25] did not specifically describe the Goal Setting Theory from individual's perspectives and focused mostly on the study at the organizational and group level. Hence, few academics further their research on Goal Setting Theory from individual perspectives and majority of scholars used adopt and adapt items instead of self-developed of Goal Setting Theory [1,2].

Aldemir *et al.* (2018) reviewed review paper analysis on the study of Goal-Setting Theory items development [3]. The authors identified that not many research focus on the self-developed items analysis from individuals impact perspectives and add the potential factors in enriching the literature and have not shown the framework that justify the Goal Setting Theory from individual perspectives. The extension of Goal Setting Theory is attributed partly to the idea as suggested by Aldemir *et al.* (2018) [3]. In 2017, Landers *et al.* [26] recommended that the Goal-Setting Theory (GST) future research should add other antecedents or external variables such as gamification that strengthen the rationale of Goal Setting Theory and developed the items since all the current items are saturated and overused [1,2,19].

2.2 Gamification

Gamification defines as the application of game principles in engaging the user in a non-game context [27]. Hofacker *et al.* in 2016 [8] described that gamification is not only motivated and engage user, but it enhances user value and creation of behavioural outcomes such as engagement, greater loyalty and product advocacy. Several groups of scholars confirmed that gamification is positively influenced engagement behaviour in technology application [28–30]. Bagozzi and Yi in 2012 [31] suggested that gamification as one of the antecedents in Goal Setting Theory application for future research that should be studied. They explained that gamification enhances user experience in terms of arousal, compelling experience and goal achievement motivation.

However, Locke and Latham (2006) [25] study found that most of the gamification items included some ways of Goal Setting Theory were focused on organizational level and group level. Furthermore, majority of scholars have used gamification items from various context but not in the behaviour study of mobile fitness application context [28,29]. Previous scholar found that the extensive usage of gamification items was only focused on the external forces (game design) and ignored the internal forces (motivation and engagement). As a result, there is an opportunity to explore the self-developed items measurement by combining with Goal Setting Theory items because it can help to extend the knowledge on how both items justify the user behaviour on mobile fitness application.

3. Methodology

This paper used a survey questionnaire to collect data from the respondents. The questionnaire comprised of items concerning Goal-Setting Theory and gamification items as well as demographic information. The items and scales for the Goal-Setting Theory (GST) construct adapted initially from Fraenkel and Wallen [32] and gamification by Hair *et al.* (2017) [33]. All of the questionnaire items were modified all adapted items through a self-developed approach to suit the research context and based on operational definition of this paper. Each item measured on a five-point likert scale whose answer choice ranges from “strongly disagree” (1) to “strongly agree” (5). All of the items submitted to academicians and experts to review it and correct whenever necessary according to items phrase to ensure consistency.

A total of 349 respondents who participated in the survey distributed among the Malaysian Gen Y group of mobile fitness application. They were selected as target respondent because Malaysia Gen Y were majority user of the application and the biggest segment user of smartphone adoption [19]. After passed the data collection, 349 valid responses were collected above the recommended level of 200 [34], achieving a final response rate of 24 percent; value considered to be adequate, assuming that mail surveys tend to produce low response rates [35]. For demographic information, 68.2% of respondents were men, 67.9 % are aged between 26 and 30 years old, and 80.5% have a bachelor's degree.

4. Results

The measurement items analysis was tested using convergent validity through redundancy analysis, the collinearity among indicators through VIF, and the significance and relevance of outer weights through AVE. The behind of justification of used this method because it addressed through the content specification method, which required the researcher to specify the domain of the content and provide a comprehensive set of indicators that fully represent the domain of formative constructs [36,37]. The accepted minimum value for the path coefficient was set between 0.7 and above which achieve the satisfactory [36], the VIF value should be less than 5 [37] to avoid collinearity problems and the AVE indicators value > 0.5 . But, if not significant, the items can be retained based on content validity [36]. Table 1 summarizes the convergent validity (Redundancy Analysis), Collinearity among Indicators (VIF), and Significance and Relevance of Outer Weights (AVE). The measure showed as below:

Table 1. Final Items Measurements Results

| Construct | Convergent validity | Items | Weights | VIF | t-value weights | Sig |
|-----------------------------|---------------------|-------|---------|-------|-----------------|-------|
| Goal Core (GC) | 0.807 | GC1 | 0.083 | 1.260 | 2.960 | 0.003 |
| | | GC2 | 0.196 | 1.332 | 4.616 | 0.000 |
| | | GC3 | 0.154 | 1.497 | 6.096 | 0.000 |
| | | GC4 | 0.295 | 1.539 | 6.464 | 0.000 |
| | | GC5 | 0.211 | 1.495 | 3.870 | 0.000 |
| | | GC6 | 0.092 | 1.512 | 3.073 | 0.002 |
| | | GC7 | 0.274 | 1.547 | 4.855 | 0.000 |
| | | GC8 | 0.239 | 1.553 | 6.210 | 0.000 |
| | | GC9 | 0.257 | 1.498 | 8.239 | 0.000 |
| | | GC10 | 0.187 | 1.281 | 5.649 | 0.000 |
| Goal Mechanisms (GM) | 0.701 | GM1 | 0.011 | 1.054 | 1.968 | 0.045 |
| | | GM2 | 0.327 | 1.256 | 6.411 | 0.000 |
| | | GM3 | 0.273 | 1.320 | 7.019 | 0.000 |
| | | GM4 | 0.179 | 1.265 | 4.780 | 0.000 |
| | | GM5 | 0.383 | 1.421 | 5.804 | 0.000 |
| | | GM6 | 0.078 | 1.422 | 4.106 | 0.000 |
| | | GM7 | 0.231 | 1.426 | 5.931 | 0.000 |
| | | GM8 | 0.112 | 1.486 | 5.215 | 0.000 |
| | | GM9 | 0.285 | 1.225 | 6.729 | 0.000 |
| | | GM10 | 0.188 | 1.189 | 5.868 | 0.000 |
| Gamification (GAM) | 0.775 | GAM1 | 0.054 | 1.018 | 1.518 | 0.050 |
| | | GAM2 | 0.054 | 1.302 | 3.836 | 0.000 |
| | | GAM3 | 0.143 | 1.282 | 4.903 | 0.000 |
| | | GAM4 | 0.161 | 1.288 | 3.988 | 0.000 |
| | | GAM5 | 0.294 | 1.257 | 4.523 | 0.000 |
| | | GAM6 | 0.142 | 1.276 | 3.671 | 0.000 |
| | | GAM7 | 0.264 | 1.468 | 5.285 | 0.000 |
| | | GAM8 | 0.324 | 1.458 | 8.859 | 0.000 |
| | | GAM9 | 0.290 | 1.272 | 6.940 | 0.000 |
| | | GAM10 | 0.307 | 1.180 | 7.626 | 0.000 |

The results of the measurement items in Table 1 above show that convergent validity assessed through redundancy analysis, as suggested by Locke *et al.* (1968) [17]. Based on Table 1, all of the tested constructs, such as Goal Core (GC), Goal Mechanism (GM), Gamification (GAM), and Engagement (ENG) yielded more than 0.70. Thus, the measured constructs have sufficient degrees of convergent validity [38]. The finding of the results shows that all indicators for the tested constructs satisfy the VIF values and consistently below the threshold value of 5 [36] and also 3.3 [39] which concluded that there is no collinearity issue occurred on the measurement model. The paper has come up with the significance and relevance of the outer weights of the tested constructs, where it found that all items accepted for the next analysis, although some of the items were insignificant. Therefore, all constructs achieved the requirements and for the measurement items.

5. Conclusion

The paper advances the knowledge regarding the self-developed measurement of Goal Setting Theory and gamification items. The findings provided by this paper may further the analysis of the structural model especially for further analysis. This paper provides a basis for further refinement of research models especially the items for future research on Goal-Setting Theory (GST) and gamification items.

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Conflicts of interests

The authors declare no conflict of interests.

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