

INTERNATIONAL JOURNAL  
ON INFORMATICS VISUALIZATIONjournal homepage : [www.joiv.org/index.php/joiv](http://www.joiv.org/index.php/joiv)Confirmatory Factor Analysis: User Behavior M-Commerce  
Gamification Service in IndonesiaAni Rakhmanita<sup>a,\*</sup>, Ratih Hurriyati<sup>a</sup>, Vanessa Gaffar<sup>a</sup>, Lili Adi Wibowo<sup>a</sup>, Bambang Widjadjananta<sup>a</sup><sup>a</sup> Economics and Business Education Departement, Universitas Pendidikan Indonesia, Bandung, IndonesiaCorresponding author: \*[anirakhmanita@upi.edu](mailto:anirakhmanita@upi.edu)

**Abstract**—Gamification of marketing is a fast-growing phenomenon and an innovation for mobile marketing. Gamification is a strategy for increasing the attractiveness of mobile consumers to encourage increased shopping behavior, loyalty, engagement, and product advocacy. Understanding the factors behind the use of gamification services in m-commerce is very interesting, and no one has done any research. This study investigates the theory of self-determination (competence, autonomy, and relatedness) and extrinsic motivation as a predictor of the use of m-commerce gamification services. Data was collected from 400 respondents who had experienced using gamification services on m-commerce. The data was then included in the analysis. Analysis of the data using confirmatory factor analysis to determine the dominant factors of gamification service users. The benefits of factor analysis confirm the dominant factors that motivate users of gamification services in m-commerce. Researchers use AMOS 18 for Windows software to assist in the data processing. The results show that extrinsic motivation is the dominant factor that motivates users of gamification services. This finding provides insight for m-commerce companies and game designers to improve gamification mechanisms based on virtual points to motivate users to be more active and continue using gamification services. For the next research, it is possible to validate the construct by using other theoretical approaches, such as adding flow theory to measure the motivational factors of gamification service users. The research object can use other applications, such as gamification services in health, education, and banking applications.

**Keywords**— Gamification; m-commerce; CFA; self-determinant theory.

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## I. INTRODUCTION

Information and communication technology is growing rapidly every year, accompanied by an increase in smartphone users. Based on IPrice data in 2021, Indonesia is in the fourth position in the world after America, with a total of 160.23 million, or reaching 58.6% of the total population for the user category. Smartphone. This number will continue to increase in the future. Therefore, many businesses take the opportunity to enter m-commerce with the tagline easy, fast, and simple in transacting. The growth of m-commerce in Indonesia is 78% and is ranked first in the world. In comparison, Mexico is ranked second in the world, with a growth rate of 59%. This shows that m-commerce has very good economic value for business use [1]. However, the competition between m-commerce consumers is faced with many choices. This must be balanced with an interesting innovation in order to compete in the market. Innovating must also be accompanied by appropriate market research, so businesses do not fail.

Business people must be able to read consumer desires in product or service innovations[2].

Gamification is an innovation in mobile marketing, which is expected to increase the attractiveness of mobile consumers by encouraging increased shopping behavior, loyalty, engagement, and product advocacy [3]. In several studies, psychology has proven that game elements can make a person bound or dependent on the games he plays. Inspired by the game elements, in the end, business people were inspired to use the concept of games in m-commerce by giving badges, points, rewards, and leader boards for achieving goals [4], [5].

Gamification is a program to improve services for a pleasant experience and create consumer loyalty [6]. In gaming and marketing literature, game design elements can be described as services and games as service systems. Game developers design Game Production seriously, starting from designing visuals, creating storylines, and building platforms with no small costs. In technological terms, gamification is a business strategy in which game elements, such as fun, competition, rewards, and voluntary participation from users,

are incorporated into applications to sell goods and services [7], [8].

Gamification is not only used by m-commerce in influencing consumer engagement. Several studies have shown that the education sector has also implemented gamification to encourage student interest in learning [9], training [10], health [11], banking [12], and tourism [13]. Can the purpose of gamification services in m-commerce as a tool to motivate customer engagement to be achieved? Do m-commerce customers use the gamification services provided by m-commerce? Moreover, what factors drive users to use m-commerce gamification services? Motivation is the force that causes people to act and persist in doing something; when interacting with new digital innovations, motivation plays an important role [14], [15]. This study aims to complement previous research [16] on the factors that influence a person to use gamification services. Previous research used the adoption theory of technology acceptance (utilitarian), pleasure (hedonic), and social.

Meanwhile, the main objective of this research is to validate the model of Self-Determination Theory (SDT) to measure the factors of a person using m-commerce gamification services. The selection of SDT to investigate the motivations of users of gamification services in m-commerce, because the theory has been applied to other contexts such as the motivation of playing video games. How well the SDT motivation theory applies to and explains the motivation of users of gamification services in m-commerce, has not been found in the m-commerce field.

#### *A. Motivation Theory*

Gamification mechanisms are being implemented in many m-commerce applications, and companies must design game mechanics into their daily business to engage generations of gamers in the gamification services offered [17]. Thus, understanding player motivation is a valuable topic for companies. Human motivation generally comes from two sources, external and internal. One of the main motivational theories, namely the theory of self-determination (SDT), was first pioneered by Deci and Ryan [18]. According to Maslow, this theory is rooted in humanistic psychology and follows the hierarchy of human needs [19]. Ryan and Deci [18] distinguish motivation into three, namely, Amotivation (no motivation), extrinsic motivation (regulated externally), and intrinsic motivation (regulated internally). Internal motivation comes from behavior that aims at its own will without external forces that affect the desire to act. This theory has been validated in research on the effects of gamification on behavior [20]. SDT suggests three main intrinsic motives: autonomy, competence, and relatedness. An action can also be motivated by external goals, such as being motivated to do activities because of financial rewards.

#### *B. Autonomous Motivation*

Autonomous motivation is a condition in which a person is motivated to perform interesting tasks that arise from the activity itself or by values and rules that have been integrated within. For autonomously motivated people, even though the activity is not fun, they will still be motivated because the values of the activity have been accepted [21]. The researcher proposes that the autonomy motive impacts the user's

intention to use gamification services. Users of gamification services engage in games of their own free will to earn more badges, rankings, and points. That is, gamification services only facilitate users to set clear goals [22]. So, the researchers propose H1: The autonomy motive impacts the attitude of users to use the service.

#### *C. Competency Motivation*

Competence motivation is the need a person feels because he or she can carry out a task [18]. Gamification service users with competency motives display skills when completing tasks [23]. This study proposes that the competency motive impacts the user's intention to use gamification services. In the gamification service, users can participate in challenging tasks, such as collecting points, earning badges, and giving advice to other users. Completing these tasks brings a sense of increased competence to the customer, which, in turn, gives rise to an attitude of continuing to use the service. So, the researchers propose H2: competence motives have an impact on user attitudes to use gamification services.

#### *D. Relatedness Motivation*

Linkage motivation is the need for a relationship or a sense of belonging to a person, group, or the vision and mission of the organization [24]. Previous research has shown that if users are satisfied with gamified services, they tend to take the initiative to perform the task more strongly [23]. This study proposes that attachment motives impact users' intention to use gamification services. When customers are allowed to freely express their opinions and seek valuable advice in the online brand community, they will perceive the community as a valuable place and form a good impression of the brand, which fosters their attachment to the brand. So, the researchers propose H3: the Relatedness motive has an impact on the user's attitude to use gamification services.

#### *E. Extrinsic Motivation*

Extrinsic motivation is a motivated state because of the provision of rewards [24]. Badges, rewards and Points can stimulate extrinsic motives and encourage customers to use gamified services. In addition to intrinsic motives, gamification may give rise to extrinsic customer motives, such as the pursuit of money and prizes [22]. M-commerce is increasingly providing badges, rewards, and points that can be redeemed and re-spent. Therefore, to make the results more holistic, it is important to examine the extrinsic motives for the use of gamification services. So, the researchers propose H3: Extrinsic motives have an impact on user attitudes to use gamification services.

#### *F. Attitude*

Attitudes towards continuous gamification services have been studied [25]. Therefore, the researchers propose H4: Attitude positively affects sustainable use. The findings of this study not only help m-commerce practitioners develop and better promote user-accepted gamification services to potential customers but also provide insights into research on gamification services.

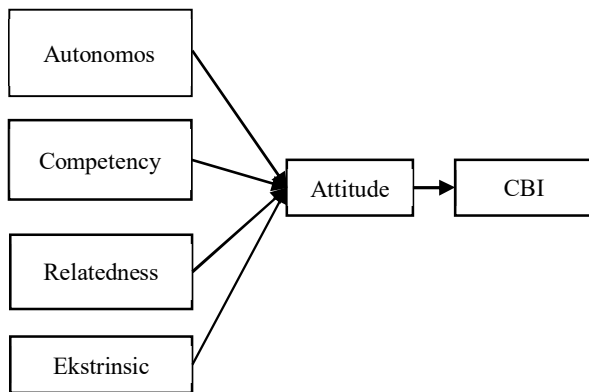


Fig. 1 Research Model

TABLE I  
MEASURING THE MOTIVATION OF GAMIFICATION SERVICE USERS

| Construction                        | Items   | Source |
|-------------------------------------|---|--------|
| Motive<br>Autonomy<br>(MO)          | Motivated to play on gamification service   | [32]   |
|                                     | Happy to use gamification service when using gamification services, feel free to express yourself |        |
| Motive<br>Competence<br>(MC)        | When playing in gamification services I feel capable  | [32]   |
|                                     | I feel competent  |        |
|                                     | I feel expert in using gamification services  |        |
| Motive<br>Relatedness<br>(MR)       | I feel connected to fellow users  | [32]   |
|                                     | enjoy spending time with other users  |        |
|                                     | I feel other people acknowledge my existence  |        |
| Motive<br>Extrinsic<br>(ME)         | Gamification services give me the opportunity to earn   | [26]   |
|                                     | Playing because of prestige gets more rewards   |        |
|                                     | Playing because of prestige gets more rewards   |        |
| Attitude (AT)                       | happy to get level up by using gamification as a wise thing                                       | [33]   |
|                                     | using gamification is a good idea   |        |
|                                     | using gamification is a positive thing  |        |
|                                     | using gamification as a profitable thing  |        |
| Customer Behavioral intention (CBI) | when I have access to gamification services, I mean to use  | [34]   |

## II. MATERIALS AND METHODS

This quantitative study aims to find the factors that motivate the use of gamification services in the largest m-commerce in Indonesia (such as Shopee games, Game farm Traveloka and Tokopedia Ceria) with 400 respondents to be used. The researcher chose the purposive sampling method in taking the sample because it represents information and answers the research problem.

Data was collected through a google form questionnaire. The questionnaire is latent variables that cannot be measured directly, so the measurement is through variable indicators using a Likert scale of 1-5 as the answer choices. To analyze

the data used, confirmatory factor analysis techniques. Confirmatory factor analysis is one of the appropriate techniques to be used in developing scales and measuring constructs that cannot be observed directly, such as a person's motivation. The benefits of factor analysis are to confirm the factors that exist in gamification service users on e-commerce in Indonesia, so that later dominant or important factors are found to be analyzed further to the structural modeling stage. Researchers used the AMOS 18 for Windows software to assist in the data processing.

## III. RESULTS AND DISCUSSION

### A. Sample characteristics

Table 2 shows that of the 400 respondents who filled out the questionnaire, 258 people (64.5%) were women, and the majority of respondents aged 18-24 were 198 people (49.5%). The largest profession is students, with as many as 254 (63.5%). Gamification services on m-commerce that are most often used are Shopee games (72.25%), Tokopedia ceria (14.25%), and Game farm Traveloka (13.5%).

TABLE II  
CHARACTERISTICS OF RESPONDENTS

| Characteristics                                  | Frequency | Percent |
|--|-----------|---------|
| <b>Gender</b>                                    |           |         |
| Man  | 142       | 35.5%   |
| Woman  | 258       | 64.5%   |
| <b>Age</b>                                       |           |         |
| 18-24  | 198       | 49.5%   |
| 25-31  | 154       | 38.5%   |
| 32-38  | 132       | 31.5%   |
| 39-45  | 16        | 2%      |
| <b>Profession</b>                                |           |         |
| Student  | 254       | 63.5%   |
| Civil Servant                                    | 12        | 3%      |
| Private employee                                 | 126       | 31.5%   |
| Unemployment                                     | 8         | 2%      |
| <b>Preferred M-Commerce Gamification service</b> |           |         |
| Shopee games                                     | 289       | 72.25%  |
| Tokopedia Ceria                                  | 57        | 14.25%  |
| Game farm Traveloka                              | 54        | 13.5%   |

Researchers use confirmatory factor analysis to determine the dominant factors that influence the use of gamification services. In measuring each construct, the researcher evaluates separately by assessing the significant factor loading, construct reliability and variance extracted. Based on table 3. it is known that the results of the suitability test between the data and the model for each construct. The statistical results of the Loading Factor estimation for all variable indicators are all valid and have a value of  $\geq 0.50$ . Thus, no indicators are omitted in the subsequent analysis. For parameter estimation values with Critical Ratio criteria, all indicators meet the requirements for CR values  $> 2.0$ . This means that the probability value is significant, and all indicators can explain each construct. Reliability can be seen from the Construct Reliability value which exceeds the cut-off value of 0.70 and the Variance Extracted which has also passed the cut-off value of  $\geq 0.50$ , it can be said that all these construct indicators have accurately explained the latent constructs studied.

TABLE III  
THE RESULTS OF THE VALIDITY & RELIABILITY SIGNIFICANCE TEST

| Variable | Loading Factor > 0,50 | Critical Ratio (C.R) | CR ≥ 0,70 | VE ≥ 0,50 | P     | Description |
|----------|-----------------------|----------------------|-----------|-----------|-------|-------------|
| MO1←MO   | 0.963                 | -                    |           |           | 0.000 | significant |
| MO2←MO   | 0.974                 | 27.180               |           |           | 0.000 | significant |
| MO3←MO   | 0.947                 | 20.874               | 0.980     | 0.978     | 0.000 | significant |
| MC1←MC   | 0.942                 | -                    |           |           | 0.000 | significant |
| MC2←MC   | 0.946                 | 25.060               |           |           | 0.000 | significant |
| MC3←MC   | 0.936                 | 23.818               | 0.932     | 0.945     | 0.000 | significant |
| MR1←MR   | 0.959                 | -                    |           |           | 0.000 | significant |
| MR2←MR   | 0.952                 | 28.178               |           |           | 0.000 | significant |
| MR3←MR   | 0.913                 | 29.471               |           |           | 0.000 | significant |
| MR4←MR   | 0.960                 | 22.964               | 0.972     | 0.969     | 0.000 | significant |
| ME1←MR   | 0.977                 | -                    |           |           | 0.000 | significant |
| ME2←MR   | 0.970                 | 36.942               | 0.979     | 0.922     | 0.000 | significant |
| AT1←AT   | 0.944                 | -                    |           |           | 0.000 | significant |
| AT2←AT   | 0.961                 | 27.694               |           |           | 0.000 | significant |
| AT3←AT   | 0.939                 | 30.784               |           |           | 0.000 | significant |
| AT4←AT   | 0.960                 | 26.771               | 0.982     | 0.979     | 0.000 | significant |
| BI1←BI   | 0.942                 | -                    |           |           | 0.000 | significant |
| BI2←BI   | 0.946                 | 30.410               | 0.946     | 0.932     | 0.000 | significant |

The most dominant indicators are ME1 and ME2, with the questions “gamification services allow me to earn” and “for the challenge of getting more rewards to get a level increase.” Thus, the responses from users of this gamification service indicate that they use m-commerce gamification services based on extrinsic motives to earn income and achieve level-ups. This finding is different from previous research [29], which proves that extrinsic motivation does not have a significant positive effect on gamification service engagement. This study uses respondents who use gamification services for running community applications, whereas those used are users of voluntary gamification services. The use of gamification in the application is voluntary, driven by a strong autonomous motivation to motivate fitness needs. Users who have strong autonomy will feel extrinsic motives as a nuisance that reduces their sense of pleasure [30] [31]. People who have an autonomous orientation act according to their own needs. External motivation is information not controlling that governs their actions [32], [33].

Meanwhile, this study investigates the motivation of users of gamification services in m-commerce, which is commercial in nature. This means that extrinsic motives such as virtual points, badges, and rewards influence the use of gamification services in the m-commerce field.

In particular, the researcher expects extrinsic elements to be improved in m-commerce gamification services by providing various points for re-spending. There are two types of gamification service users, internally and externally motivated users. This should be a concern for companies when investing in gamification services. In addition to providing bonus points that can be spent, you must also pay attention to the design of the game that is more attractive and easier to play by all ages and genders.

Everyone has different characteristics and different ways when it comes to interacting with the game. Research conducted [34] explains that when autonomy and competence are supported through gameplay, it is significantly more enjoyable and satisfying for players. A successful gamification service will consider the freedom of

experimentation for players in exploring and discovering strategies and the freedom of effort in passing the challenges of the game, being able to pause and reflect on the tasks they have completed.

These findings contribute to generating practical insights for m-commerce companies and game designers to improve gamification mechanisms from the point of view of SDT theory. Many factors dominate users using gamification services, both internal factors (autonomy, competence, and relatedness) and external factors. These two factors can be considered when making gamification services increase service users so that the ultimate goal of gamification for engagement between consumers and companies can be achieved.

#### IV. CONCLUSION

This study is unique in investigating the factors that motivate users of gamification services in m-commerce. The findings in this study related to the dominant factor that drives the use of m-commerce gamification services is extrinsic motivation which becomes their motivation. The limitation of this study is that it was conducted in a cross-sectional manner involving only one period, where the results cannot be generalized over time. Further research suggests it is better to continue estimating the structural model and adding user demographics as a moderating variable. Using a theoretical approach other than SDT can also be done for future research, for example, adding flow theory in measuring the motivational factors for gamification service users. The research object can be re-validated in other applications, such as gamification services in health, education, and banking.

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