Exploring gamers' crowdsourcing engagement in Pokémon Go communities

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Abstract

Purpose – With the increasing popularity of online games like Pokémon Go, a new wave of crowdsourcing communities have emerged, allowing gamers to collaborate, communicate and share useful game-related information. This paper aims to examine the factors that influence gamers' crowdsourcing behaviour.

Design/methodology/approach – A conceptual framework is developed that combines the DeLone & McLean model, self-determination theory, and different levels of engagement behaviour. The online survey collected 371 responses that were analysed using Covariance Based Structural Equation Modelling (CB-SEM).

Findings – The results show that extrinsic and intrinsic motivation positively influenced gamers' crowdsourcing engagement intention. System quality and information quality were also confirmed to be positively associated with gamers' crowdsourcing engagement intention. Furthermore, crowdsourcing engagement intention was found to be positively associated with crowdsourcing content consumption, contribution, and creation.

Practical implications – The findings of this study are useful for the owners of Pokémon Go and other gaming-related crowdsourcing platforms in devising tailored strategies to increase the crowdsourcing engagement of gamers.

Originality/value – This study provides the first empirical evidence of factors motivating online gamers' crowdsourcing intention. This study also presents novel insight into online gamers' crowdsourcing intention by combining diverse theories which offer different perspectives and a more comprehensive understanding of the phenomenon. Contribution to the research on the intention-behaviour gap by modelling three behavioural outcomes (content creation, contribution, and consumption behaviour) of crowdsourcing engagement intention, is another important contribution of this study.

Keywords Crowdsourcing, DeLone & McLean model, Self-determination theory, Engagement, Gamers

Paper type Research paper

1. Introduction

Crowdsourcing is gaining popularity as a form of online content creation and is a growing field of research (Behl *et al.*, 2020, 2021). This growth in crowdsourcing platforms, together with the increasing popularity of online games (Sharma *et al.*, 2021), has led to growth in crowdsourcing communities of gamers. These crowdsourcing communities of gamers are coming together to collaborate, communicate and share useful game-related information.

One such game that has seen large amounts of crowdsourced content is Pokémon Go. Pokémon Go is a mobile game created by Niantic and is based on augmented reality. The game has seen more than 100 million downloads, with around 800,000 active daily players since its launch in 2016 (Iqbal, 2021). The social aspects of online gaming have contributed a lot to its popularity (Sharma *et al.*, 2021d), and the COVID-19 pandemic has also led to tremendous gaming growth (Sharma *et al.*, 2021a). While studies have been conducted on Pokémon go players (Qin, 2021; Laato *et al.*, 2021; Wang, 2021; Bueno *et al.*, 2020), no prior research has been conducted on gamers' crowdsourcing engagement behaviour. As crowdsourcing platforms continue to grow, there is a need to understand such platforms related to gaming. Such understanding would be about improvements to the design and

mechanisms to assess gamers' needs and use relating to these platforms. Pokémon Go requires gamers to walk around in the real world to complete game objectives and capture Pokémon. Supporting applications and websites have emerged where gamers can share information about the location of items of rare and valuable Pokémon or items in the game. This sharing of information represents the crowdsourcing efforts by Pokémon Go gamers. Many popular supporting applications such as PokeCrew are available. PokeCrew is a crowdsourced Pokémon Go map where players can post locations in real-time of Pokémon found. Such applications show that crowdsourcing allows individuals to come together to solve problems.

Based on the above discussion, this study derives the following research questions (RQs):

RQ1. Does extrinsic motivational factors of reward, reputation, and networking influence gamer's crowdsourcing engagement intention?

RQ2. Does intrinsic motivational factors of enjoyment and intellectual stimulation influence gamer's crowdsourcing engagement intention?

RQ3. Does systems, service, and information quality of crowdsourcing platforms influence gamer's crowdsourcing engagement intention?

RQ4. Does crowdsourcing engagement intention influence consumption, contribution, and creation of content crowdsourcing platforms?

Data collected from 371 responses were analysed using covariance based structural equation modelling (CB-SEM) to address the research questions.

This study's objective is to examine the factors that influence Pokémon Go gamers' crowdsourcing engagement behaviour. Pokémon Go was selected due to the nature of the game, which requires players to move around in the real world to find and capture creatures (Pokémons). This has led to collaboration between players to share location information to capture valuable and rare Pokémon. With an average of 6.5 million active players daily, the player's tremendous crowdsourcing effort led to the emergence of various platforms such as PokeCrew, Pokémon Go Map, PogoMap, Pokévision, and Pokéradar, among others. Due to the popularity and nature of Pokémon Go, this study considers it to be the most appropriate to conduct this study. To accomplish this study's objective, the self-determination theory is adopted. This theory allows for the examination of factors that motivate gamers' crowdsourcing engagement intention. Based on this theory, extrinsic and intrinsic motivation factors have been added to this study's model. Extrinsic motivation comprises reward, reputation, and networking factors, while intrinsic motivation comprises enjoyment and intellectual stimulation factors. Second, this study incorporates the DeLone & McLean model. This model also introduces systems quality, information quality, and service quality to this study's model. The addition of these quality factors is justified as the gamer's engagement intention would also be influenced by the quality factors of the crowdsourcing platforms. Additionally, Podsakoff *et al.* (2003) highlighted that an individual's engagement behaviour ranges from low to high. Therefore, this study adds consumption, contribution, and creation behavioural outcomes to determine\ne the different levels of engagement by gamers in crowdsourcing communities.

The study is suggested to be crucial for the following reasons. First, the findings would contribute to the limited understanding of gamers' crowdsourcing behaviour. Second, as many studies on crowdsourcing behaviour have been based on case studies or conceptual work (e.g. Ye and Kankanhalli, 2015), this study provides the first empirical evidence of factors motivating online gamers' crowdsourcing intention. Third, this study provides novel insight by combining the self-determination theory, DeLone & McLean model, and behavioural engagement constructs. Combining diverse theories offers different

perspectives and a more comprehensive understanding of a phenomenon. Fourth, this study addresses the intention-behaviour gap (Hulland and Houston, 2021) by modelling three behavioural outcomes (creation, contribution, and consumption behaviour) of crowdsourcing engagement intention.

The following sections are based on the following layout: Section 2 discusses the literature on crowdsourcing, DeLone & McLean model, theory of self-determination, and Behavioral engagement. Section 3 outlines the hypotheses based on the conceptual framework of this study. Section 4 discusses the methodology employed by this study. Section 5 presents the results of this study. Section 6 discusses this study's results in comparison with the existing literature and outlines the theoretical and practical implications of this study. Section 8 provides the conclusion for this study along with the directions for future research.

2. Literature review and theoretical framework

2.1 Crowdsourcing in gaming

Crowdsourcing platforms in the digital era create networking within and across various communities to widely access information and acquire innovative knowledge from the external crowd (Ye and Kankanhalli, 2015). Crowdsourcing platforms present an exclusive medium for solving problems by diverse individuals across the geographical sphere that produces expertise, information, and ideation (Goh *et al.*, 2017). Such platforms have like-minded individuals contribute ideas, views, thoughts, and knowledge to accomplish a common aim. Crowdsourcing platforms range in different disciplines such as entertainment, healthcare. According to Geiger and Schader (2014), crowdsourcing platforms have four archetypes (crowd processing, crowd solving, crowd creating, and crowd rating) based on a 2×2 matrix that differentiates value between value originating from contributors and contributors. Crowdsourcing in gaming falls into the category of crowd creating as it allows for heterogeneous contributions from Pokémon Go gamers.

Crowdsourcing in gaming has seen tremendous growth and has spawned various applications produced for different sectors such as persuasive technology, sustainability, education, business, and health (Wang *et al.*, 2020). Gaming crowdsourcing is typically referred to as the process of enhancing a gaming service and experience using incentives such as points, levels, and storytelling (Jang *et al.*, 2018), and where gamers put in the time and effort to solve challenges and at the same time benefit from results and enjoyment (Goh *et al.*, 2017). Hence, crowdsourcing generally relies on significant numbers of volunteers. Furthermore, gamification has shown to be a successful means of attracting and engaging potential users to crowdsourcing platforms (Wang *et al.*, 2020).

2.2 DeLone & McLean models

The use of the DeLone and McLean's Model in information systems (IS) research has been deemed successful (Laureti *et al.*, 2018) in conceptualising an organisation's or person's information system use. The original DeLone and McLean Model comprised six factors: organisational impact, individual impact, user satisfaction, information system, and system quality (DeLone and McLean, 1992). The updated DeLone and McLean model (2003) included two additional factors, namely willingness to use and service quality, and the original dimensions of individual and organisational impact, which were combined into one new dimension referred to as net benefits (Delone and McLean, 2003; Jeyaraj, 2020).

Prior studies have employed this model to assess the success of various technologies such as e-commerce (B2C) (Kumar and Ayodeji, 2021), shopping online (Chen and Cheng, 2009; Sharma *et al.*, 2021c), enterprise systems at work (Ng, 2013), knowledge management system (Kulkarni *et al.*, 2006), and expert systems (Yoon and Guimaraes, 1995). Such technologies were either voluntary use (Marjanovic *et al.*, 2016) or mandatory (Jang *et al.*, 2006). Studies have examined citizens (Alarabiat *et al.*, 2021), employees (Isaac *et al.*, 2017), consumers, and students (Teo *et al.*, 2008). Notwithstanding, in this study, only three factors from the updated DeLone and McLean model (2003) relevant to this research's context, namely systems quality, service quality, and information quality, have been measured. The use of this theory is relevant to ascertain the success of Pokémon Go crowdsourcing platforms.

2.3 Theory of self-determination

The self-determination theory comprises the macro-theories relating to a person's wellbeing, growth, and motivation (Bakici, 2020). This theory contains two motivational components, namely intrinsic and extrinsic motivation. Intrinsic motivation provokes a person's psychological impulse to feel satisfied in accomplishing a specific task or objective (Bakici, 2020). In contrast, extrinsic motivation has been inferred to be the psychological impulse that drives a person's behaviour to acquire a certain value/reward externally. The theory has been used in various disciplines such as philosophy, community development, economics, sociology, psychology, information systems, and tourism (DeHaan *et al.*, 2016; DeHaan and Ryan, 2014; Buzinde, 2020; Rezvani *et al.*, 2017; Cunningham *et al.*, 2021; Ntoumanis *et al.*, 2021). This research measured the variables of enjoyment and intellectual stimulation to determine intrinsic motivation and the variables of reward, reputation and networking to determine extrinsic motivation. The theory is relevant to understanding the factors driving gamers' crowdsourcing engagement.

2.4 Behavioral engagement

Considering the context of this study, behavioural engagement is referred to as a gamer's behavioural investment (Cao *et al.*, 2021) in video games (Hollebeek and Macky, 2019). Behavioural engagement highlights a video gamers' behaviour concerning the time spent gaming, resilience, activity, and the extent of brand-related energy displayed (Tarute *et al.*, 2017) and attention to the game and money invested (Hollebeek and Macky, 2019). Fang (2017) argues that when gamers fervently engage in online gaming, they interact and support that particular gaming community and endorse online gaming to other gamers. This study measures the variables of crowdsourcing content consumption, contribution, and creation due to Pokémon Go gamers' behavioural engagement. Table 1 provides the operational definition of all the study's measures.

3. Conceptual framework and hypotheses development

A motivational component of the self-determination theory is extrinsic motivation. Antecedents of extrinsic motivation have been identified as reputation, networking, and rewards that stimulate participants to enhance their effort and intensity in accomplishing tasks in crowdsourcing communities online (Wu and Gong, 2021). A survey of mobile crowdsourcing gaming by Wang *et al.* (2020) found that the main priority for gamers was to earn points in the task sessions. Once gamers earn points, they build a good reputation through peer reviews, ratings, and continued participation (Bakici, 2020). The gamers then develop interpersonal relationships and generate social capital deemed indispensable for the gamers to function in online communities. Such networking is argued to be pervasive in gaming and has been shown to motivate greater crowdsourcing engagement (Bakici, 2020). Reward incentives can include

Measures	Description	Reference
Extrinsic motivation	It refers to Pokémon Go crowdsourcing behaviour that is driven by external rewards such as networking, reputation, and rewards	Wu and Gong (2021)
Intrinsic motivation	It refers to Pokémon Go crowdsourcing behaviour driven by inherent satisfaction such as intellectual satisfaction and enjoyment	Goh et al. (2017)
Systems quality	It refers to the quality of the Pokémon Go crowdsourcing platform as measured by usability, availability, adaptability, and response time	Veeramootoo et al. (2018)
Service quality	It refers to the quality of support that is available and delivered Pokémon Go crowdsourcing platform	Veeramootoo et al. (2018)
Information quality	It refers to the provision of relevant, up-to-date, complete, accurate, and consistent information available on the Pokémon Go crowdsourcing platform	Veeramootoo et al. (2018)
Crowdsourcing behavioural engagement	It refers to the active manifestations of the engagement concept, which include content consumption, contribution, and creation on Pokémon Go crowdsourcing platform	Cao et al. (2021)
Crowdsourcing content consumption	It refers to individuals who passively consume Pokémon go-related information by simply reading posts and reviews, clicking on posts, and viewing posts on crowdsourcing platform	Sigala (2015)
Crowdsourcing content contribution	It refers to gamers' interaction with other gamers (peer-to-peer) and the game (peer-to-content), such as liking content, sharing, commenting, and endorsement of content on Pokémon Go crowdsourcing platform	Cao et al. (2021)
Crowdsourcing content creation	It refers to co-developing, publishing, and producing content relating to Pokémon Go on crowdsourcing platform	Cao et al. (2021)

Table 1.
Operation definitions
of the study measures

virtual rewards, points' sharing, obtaining badges, and financial rewards. For example, the Pokémon Go platform rewards the top contributors with virtual rewards redeemable in the game. These incentives are all designed to keep peer-to-peer and socially networked communities engaged and extrinsically motivated. Therefore, it is hypothesised that:

H1. Extrinsic motivation shares a positive association with crowdsourcing engagement intention.

Another motivational component of the self-determination theory is intrinsic motivation, which includes enjoyment and intellectual stimulation within an individual (Bakici, 2020; Goh *et al.*, 2017). In this study's context, enjoyment is suggested to be the self-oriented behaviour where gamers actively engage in a crowdsourcing platform to promote hedonic psychological feelings of pleasure (Goh *et al.*, 2017). This hedonic behaviour has been shown to influence users' attitudes towards task-oriented applications such as information sharing online and users' desire to connect with others, which resulted in increased intrinsic motivation (Bakici, 2020). Additionally, intellectual stimulation has been shown to occur indirectly and internally when individuals share experiences and participate in more challenging, playful, and enjoyable online crowdsourcing platforms (Bakici, 2020; Goh *et al.*, 2017). Furthermore, Bakici (2020) confirmed that intrinsic motivation was positively associated with attitude towards crowdsourcing. It is thus postulated that:

H2. Intrinsic motivation shares a positive association with crowdsourcing engagement intention.

The updated DeLone and McLean model (2003) highlights systems quality as a key factor that determines successful information system usage. Systems quality has been suggested to refer to the quality of an online system as measured by usability, availability, adaptability, and response time (Veeramootoo *et al.*, 2018). Jeyaraj (2020) also reinforce this suggestion and argue that systems quality represents the system's technical capabilities in providing reliable, secure, speedy, and accessible information to users. A study by Veeramootoo *et al.* (2018) highlighted the positive relationship between systems quality and the continuous intention of students' participation in an open online course. A more recent study (Jeyaraj, 2020) has also identified that system user engagement was conditional upon the system quality (user-perceived usefulness and ease of navigation). Therefore, this study proposes that:

H3. Systems quality shares a positive association with crowdsourcing engagement intention.

Service quality is another factor from the updated DeLone and McLean model (2003). Service quality has been referred to as the quality of support that is available for an information system and delivered by the service provider or the systems department staff (Petter *et al.*, 2008). Studies conducted previously have confirmed the positive association between the quality provided by an information system and an individuals' usage intention (Tam and Oliveira, 2016; Veeramootoo *et al.*, 2018). Furthermore, systems that have good service quality have been shown to create value for and engage users. Studies relating to crowdsourcing have also derived similar results. Service quality has also been identified as a significant factor impacting the loyalty of users on crowdsourcing platforms (Guan *et al.*, 2020) and users' participation intention on crowdsourcing platforms Liu and Liu (2019). Based on this discussion, it is expected that the service quality provided to gaming crowdsourcing communities would influence gamers engagement intention. Therefore, it is hypothesised that:

H4. Service quality shares a positive association with crowdsourcing engagement intention.

The third factor of the updated DeLone and McLean model applied in this study is information quality. According to Veeramootoo *et al.* (2018), information quality refers to the provision of relevant, up-to-date, complete, accurate, and consistent information. Goh *et al.* (2017) argue that information quality in crowdsourcing platforms is essential to engaging and maintaining users. In addition to this, these researchers also identified that in gaming crowdsourcing, gamers who enjoyed games and rewards were more likely to demand higher quality information and were more likely to contribute significantly towards information quality (Goh *et al.*, 2017). Published knowledge relating to the interrelationship between information quality and crowdsourcing engagement intention has been further extended by Harrison and Johnson (2019) when they concluded that the credibility of information was essential to crowdsourcing engagement intention. Based on extant literature, the following hypothesis is developed:

H5. Information quality shares a positive association with crowdsourcing engagement intention.

Concerning the behavioural engagement theory, content consumption has been suggested to refer to individuals who passively consume game-related information by simply reading posts and reviews, clicking on posts, and viewing posts (Sigala, 2015). Notwithstanding, content consumption is reputed to be the most popular activity of individuals in accessing both firm-created and user-generated content (Muntinga *et al.*, 2011). Also, well-implemented gaming platforms have been shown to provide extrinsic motivational incentives such as

virtual rewards, points' sharing, obtaining badges, and financial rewards and promote viewing of content (Sigala, 2015). Researchers (Jang *et al.*, 2018) further identified that gamers' crowdsourcing engagement increased due to intrinsically motivating gaming experiences, as did crowdsourcing content consumption. Therefore, this study proposes that:

H6a. Crowdsourcing engagement intention is positively related to crowdsourcing content consumption.

Another behavioural outcome of crowdsourcing engagement is the content contribution which encompasses gamers' interaction with other gamers (peer-to-peer) and the game (peer-to-content), such as liking content, sharing, commenting, and game endorsement (Cao *et al.*, 2021). Content contribution is the most popular of the three engagement levels and refers to the gamers' participation in games previously created by the gamer or another source (Cao *et al.*, 2021; Morschheuser *et al.*, 2017). For instance, content contribution includes social interactions with other gamers on social media platforms through online word-of-mouth and user reviews (Cao *et al.*, 2021). In the context of Pokémon Go, gaming crowdsourcing engagement has been shown to increase the content contribution by gamers (Morschheuser *et al.*, 2017). Thus, the following is proposed:

H6b. Crowdsourcing engagement intention is positively related to crowdsourcing content contribution.

Content creation is the third behavioural outcome of crowdsourcing engagement examined in this study and relates to co-developing, publishing, and producing content relating to gaming that includes hashtags, uploading pictures, and posting of reviews (Cao *et al.*, 2021). The content created by gamers has been identified as a motivator for further engagement by those gamers and their peers and results from the highest level of game-related engagement (Muntinga *et al.*, 2011). User-generated content creation has also been shown to result from gamer empowerment and co-creation of content (Cao *et al.*, 2021). It is therefore postulated that:

H6c. Crowdsourcing engagement intention is positively associated with crowdsourcing content creation.

Figure 1 presents the six hypothesised relationships of extrinsic motivation (reward, reputation and networking), intrinsic motivation (enjoyment and intellectual stimulation), systems quality, service quality, and information quality on crowdsourcing engagement intention, and the resultant influence of crowdsourcing engagement intention on crowdsourcing content consumption, contribution and creation.

4. Methodology
4.1 Procedure and participants
Data collection for this study was conducted using an online questionnaire. As this study's objective is to understand Pokémon Go gamers' crowdsourcing behaviour, the target population for this study consists of Pokémon Go gamers. Pokémon Go is a mobile game created by Niantic that is based on augmented reality. This game is playable on mobile phones that use iOS or Android operating systems. To increase the generalisability of the findings, this survey was open to gamers of both operating systems.

A pilot study was conducted using 25 postgraduate university students. These students were Pokémon Go gamers. Using students was due to convenience and their ability to examine the survey instruments and provide recommendations critically. Prior studies have used university students during pilot tests (Sharma *et al.*, 2020, 2021d; Singh *et al.*, 2021d). The pilot test results led to minor changes to the wording of the survey items to improve the

Figure 1.
Conceptual framework
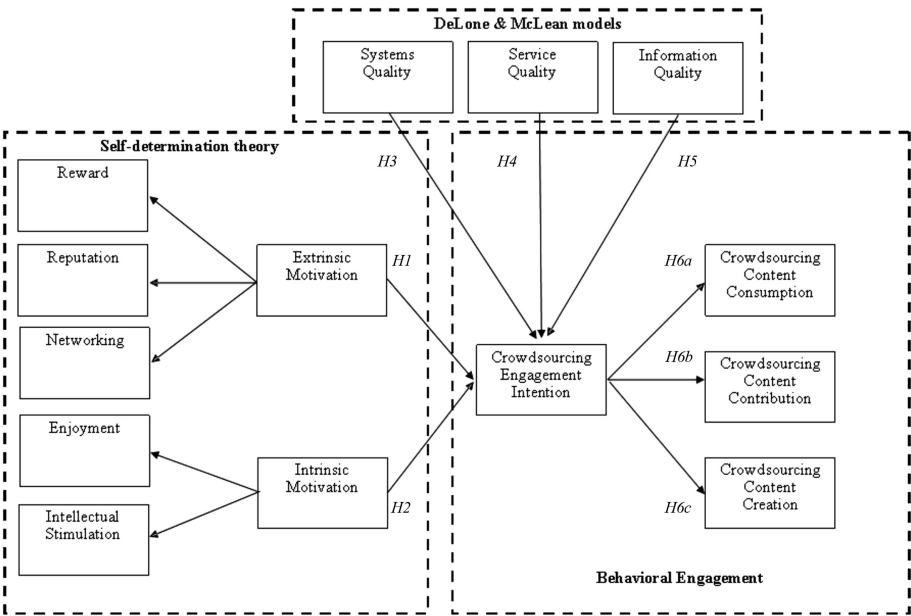
readability. Subsequently, the link to the online questionnaire was administered on Facebook, as Facebook has the most members compared to other social networking sites in Fiji (Singh *et al.*, 2021c). The biggest online gamers on Facebook in Fiji is "PSxPC Gamers Club - Fiji", with more than 6,800 members. Permission was obtained from the administrators of this group to run a survey with 1,500 members of this group. Then, using a list of all members in the group, 1,500 members were randomly sampled, and invitations (including the survey link) were sent to the sampled members using Facebook messenger. A similar method of data collection was employed by Sharma *et al.* (2021). The online data collection methodology adopted in this study has also been confirmed to reduce the likelihood of social desirability bias (Chang and Vowles, 2013). To further reduce this likelihood, the survey invitation assured potential respondents of the confidentiality and anonymity of their responses (Singh *et al.*, 2021c).

4.2 Measures
The variables and constituent items utilised in this study were sourced from prior published studies and included: enjoyment (Amabile *et al.*, 1994); intellectual stimulation (Pedroni *et al.*, 2007); reward (Amabile *et al.*, 1994); networking (Wu, 2009); reputation (Wasko and Faraj, 2005); information quality, service quality, and system quality (Veeramootoo *et al.*, 2018); crowdsourcing engagement intention (Venkatesh *et al.*, 2003); consumption behaviour, contribution behaviour, and creation behaviour (Cao *et al.*, 2021). A 7-point Likert scale was used due to the high reliability typically achieved. SPSS (25.0) and AMOS (25.0) were used to analyse the data. The analysis process involved testing the model fit of this study's measurement model by using confirmatory factor analysis. Thereafter, the hypothesised relationships were tested using Covariance Based Structural Equation Modeling (CB-SEM). Structural equation modelling (SEM) is useful when multiple relationships among variables are examined (Singh *et al.*, 2021a, b; Sharma *et al.*, 2021b). The two variants of SEM are

variance-based SEM (VB-SEM) and covariance-based SEM (CB-SEM) (Talwar *et al.*, 2021). The section of the most appropriate variant is based on data-related restrictions. VB-SEM is more appropriate for theory building as the sample size, and data requirements are more lenient. With theory-based models, it is more appropriate to use CB-SEM despite requiring a larger sample size and conformance to multivariate assumptions and the absence of outliers (Talwar *et al.*, 2021).

This study collected 380 responses from gamers located in Fiji. Based on the 1,500 invitations sent out, a response rate of 25.33% was achieved, which met the minimum benchmark suggested by Malhotra and Dash (2016). The average completion time for the survey was 6 min and 41 s. The data screening procedure included the following tests. First, the data were examined for unengaged and missing responses. As such, nine responses were removed from the dataset. Second, the kurtosis and skewness values were determined and indicated normal distribution of the data (Hair *et al.*, 2010). This result is shown in Table 2. Third, the absence of multicollinearity issues was confirmed based on the variance inflation factors (VIFs) and tolerance values. That is, the VIF values were less than three while the tolerance values were more than 0.1. The remaining 371 responses were used for subsequent analysis.

4.3 Respondents' profile

Table 3 presents the respondents' demographics. Of the 371 final responses used for data analysis, 77.63% were males, 21.29% were females, while the remaining 1.08% did not wish to indicate their gender. This data was skewed towards males and was in accordance with the findings of other gaming studies, where the majority of the respondents were found to be males (Liao *et al.*, 2020). The distribution by age findings shows that 72.24% of the respondents were between the ages of 18–25, 19.95% were between the ages of 26–30, 3.5% were between the ages of 31–40, 1.08% were between the ages of 41–50, 0.81% were more than 50 years of age while the remaining 2.43% did not wish to indicate their age. Sharma *et al.* (2021) also found that most of the respondents in gaming studies were less than 25 years of age. The majority of the respondents (59.57%) earned an annual gross income of under USD 2,398 followed by 26.42% that earned between USD 2,399- USD 4,796.

5. Results

5.1 Results of common method bias test

Harman's single factor test was employed to assess common method bias in this study. The result from this test revealed a variance of 30.71%, which is well under the threshold limit of 50% outlined by Podsakoff *et al.* (2003). This result confirmed that the findings of this study were not influenced by common method bias.

Construct	Skewness	Kurtosis
ENJ	−0.13	0.55
ISM	−0.14	0.06
STQ	0.03	−0.16
SVQ	0.19	0.80
IFQ	−0.16	0.70
CEI	−0.15	0.04
CNB	0.63	0.02
CTB	0.02	−0.15
CRB	−0.15	0.60

Table 2.
Skewness and kurtosis

Demographic	N	%
Gender		
Male	288	77.63
Female	79	21.29
Do not wish to include	4	1.08
Age		
18–25 years	268	72.24
26–30 years	74	19.95
31–40 years	13	3.5
41–50 years	4	1.08
50 years and above	3	0.81
Do not wish to include	9	2.43
Income (USD$)		
Do not earn an income	9	2.43
Under $2,398	221	59.57
$2,399–$4,796	98	26.42
$4,797–$9,592	18	4.85
$9,593 +	25	6.74
Note(s): Income has been converted from Fijian dollars to United States dollars at 1 USD = 2.08 FJD		

Table 3.
Demographics

5.2 Measurement model

This study used Cronbach's alpha values to confirm the scales' internal consistency. The results were: enjoyment (0.88), intellectual stimulation (0.86), reward (0.92), networking (0.90), reputation (0.83), system quality (0.87), service quality (0.89), information quality (0.85), crowdsourcing engagement intention (0.84), consumption behaviour (0.86), contribution behaviour (0.83), creation behaviour (0.85). In Table 4, the discriminant validity was also confirmed as the maximum shared variance, and average shared squared variance was below the average variance extracted for all variables. The confirmatory factor analysis results show a good model fit [x^2/df = 2.69, Comparative fit index (*CFI*) = 0.92; Goodness-of-Fit statistic (*GFI*) = 0.91; Tucker–Lewis index (*TLI*) = 0.92; Root mean square error of approximation (*RMSEA*) = 0.032], as all these values met the cut-off values suggested by Hair *et al*. (2013) (see Table 5).

5.3 Structural model

Good model fit of the structural model was confirmed [x^2/df = 2.81, Comparative fit index (*CFI*) = 0.94; Goodness-of-Fit statistic (*GFI*) = 0.92; Tucker–Lewis index (*TLI*) = 0.91; Root mean square error of approximation (*RMSEA*) = 0.037], as all these values were compliant with the cut-off values suggested by Hair (2009). Following confirmation of the good fit of the structural model, all relationships hypothesized were tested. Despite the results not supporting this study's hypothesis which predicted a positive association of service quality with crowdsourcing engagement intention (β = 0.01, $p > 0.05$), our results did confirm the positive associations of extrinsic motivation (β = 0.38, $p < 0.001$), intrinsic motivation (β = 0.55, $p < 0.001$), system quality (β = 0.24, $p < 0.001$) and information quality (β = 0.32, $p < 0.001$) with crowdsourcing engagement intention. Further, crowdsourcing engagement intention was found to be positively associated with content consumption (β = 0.46, $p < 0.001$), content contribution (β = 0.30, $p < 0.001$), and content creation (β = 0.21, $p < 0.001$). To sum-up, and as displayed in Figure 2, this study's results support all hypotheses (H1, H2, H3, H5, H6a, H6b and H6c) except for H4.

	CR	AVE	MSV	MaxR(H)	ENJ	ISM	STQ	SVQ	IFQ	CEI	CNB	CTB	CRB
ENJ	0.91	0.79	0.51	0.87	0.74								
ISM	0.90'	0.79	0.55	0.93	0.34***	0.85							
STQ	0.92	0.71	0.52	0.85	0.11***	0.31***	0.81						
SVQ	0.95	0.78	0.53	0.86	0.47***	0.17***	0.11***	0.82					
IFQ	0.96	0.71	0.56	0.64	0.45***	0.18***	0.56***	0.33***	0.87				
CEI	0.96	0.71	0.51	0.88	0.26***	0.24***	0.41***	0.21***	0.57***	0.88			
CNB	0.93	0.76	0.53	0.87	0.38***	0.36***	0.27***	0.34***	0.44***	0.35***	0.79		
CTB	0.92	0.74	0.54	0.92	0.22***	0.38***	0.36***	0.23***	0.38***	0.19***	0.29***	0.80	
CRB	0.92	0.73	0.53	0.89	0.58***	0.29***	0.13***	0.21***	0.42***	0.35***	0.53***	0.38***	0.81

Note(s): ENJ = Enjoyment; ISM = Intellectual stimulation; STQ = System quality; SVQ = Service Quality; IFQ = Information Quality; CEI = Crowdsourcing engagement intention; CNB = Consumption behaviour; CTB = Contribution behaviour; CRB = Creation Behaviour; CR = Composite Reliability; AVE = Average Variance Extracted; MSV = Maximum Shared Variance; MaxR(H) = Maximum Reliability. Significance of Correlations: †$p < 0.100$; *$p < 0.050$; **$p < 0.010$; ***$p < 0.001$

Factor and item description	Model and item indices SL	SMC
Enjoyment		
ENJ1	0.94	0.72
ENJ2	0.89	0.69
ENJ3	0.81	0.65
Intellectual stimulation		
ISM1	0.88	0.68
ISM2	0.85	0.65
Reward		
RWD1	0.93	0.72
RWD2	0.91	0.71
RWD3	0.83	0.66
Networking		
NTW1	0.97	0.73
NTW2	0.96	0.72
Reputation		
RPT1	0.92	0.7
RPT2	0.86	0.68
System quality		
STQ1	0.92	0.78
STQ2	0.94	0.79
STQ3	0.92	0.77
Information quality		
IFQ1	0.93	0.71
IFQ2	0.92	0.92
IFQ3	0.92	0.71
IFQ4	0.89	0.69
IFQ5	0.88	0.68
Service quality		
SVQ1	0.89	0.67
SVQ2	0.92	0.72
SVQ3		
Crowdsourcing engagement intention		
CEI1	0.92	0.72
CEI2	0.93	0.72
CEI3	0.88	0.68
CEI4	0.94	0.72
Consumption behaviour		
CNB1	0.82	0.61
CNB2	0.87	0.63
CNB3	0.92	0.72
CNB4	0.89	0.69
Contribution behaviour		
CTB1	0.83	0.66
CTB2	0.92	0.72
CTB3	0.87	0.68
CTB4	0.84	0.67
Creation behaviour		
CRB1	0.89	0.7
CRB2	0.84	0.64
CRB3	0.82	0.62
CRB4	0.89	0.68

Note(s): SL = Standardized Loading, SMC = Squared Multiple Correlation
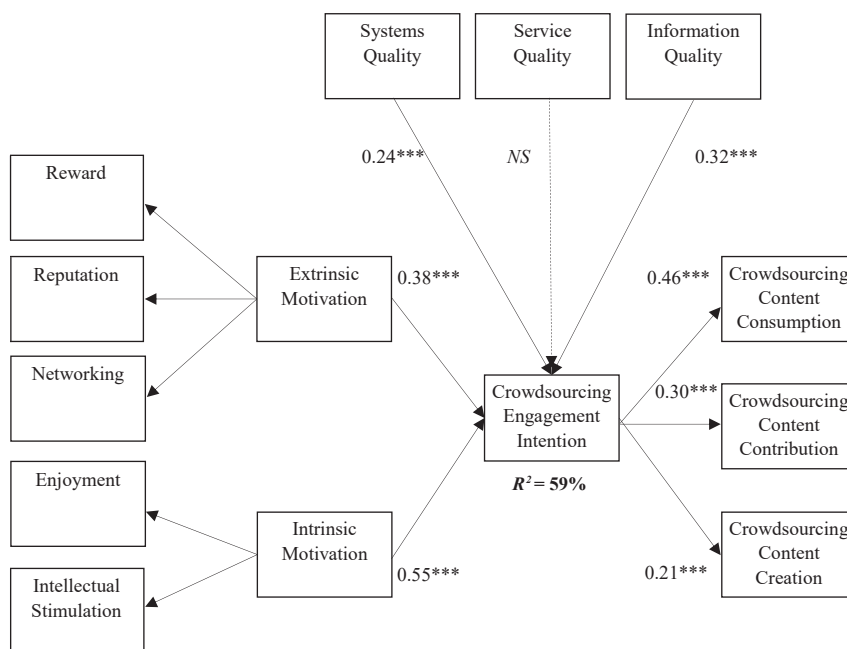
Table 5.
Measurement of study variables

5.4 Predictive power of the model

The explanatory power (R^2 value of 0.59) for crowdsourcing engagement intention was above the 40% minimum benchmark (Straub *et al.*, 2004), implying that this study's model explains 59% of the variance in crowdsourcing engagement intention. Further, because the R^2 value was above the 0.50 benchmark recommended by Hair *et al.* (2013), it suggests that this study's model has a moderate predictive power (Hair *et al.*, 2013). Thus, it is further suggested that this study's results confirm that this model is suitable for predicting crowdsourcing engagement intention.

6. Discussion

6.1 Results discussion

This study's findings confirm that intrinsic motivation (comprising enjoyment and intellectual stimulation) is the strongest antecedent of gamers' crowdsourcing engagement intention. This finding is consistent with prior studies. Enjoyment and intellectual stimulation have been found to arouse intrinsic motivation for an individual (Bakici, 2020; Goh *et al.*, 2017). As such, it is reasonable to suggest that Pokémon Go gamers are more likely to engage in Pokémon Go crowdsourcing communities that are enjoyable and offer interesting discussions relating to the game. Also, Pokémon Go crowdsourcing communities that offer gamers intellectual stimulation to solve challenging issues in the game, such as finding rare and valuable Pokémon would have a higher degree of engagement.

The findings also confirm that extrinsic motivation (reward, reputation, and networking) is another key factor influencing gamers' crowdsourcing engagement intention. This finding is similar to the results achieved in prior studies, under different contexts. According to Wu and Gong (2021), extrinsic rewards stimulate participants to increase their intensity and efforts when completing tasks in an online community to achieve a superior reputation.

Also, networking is pervasive in gaming and has been shown to motivate greater crowdsourcing engagement. As such, Pokémon Go crowdsourcing communities are likely to have higher engagement that reward gamers for their contributions. This can be in 'upvotes' or 'likes' from other members Pokémon Go crowdsourcing communities to a user's contributions. Linking the number of 'upvotes' and 'likes' to a gamer's reputation in the Pokémon Go crowdsourcing communities would increase engagement in such platforms. Pokémon Go crowdsourcing communities allowing for effective networking between players would also increase engagement in such communities. For instance, finding other Pokémon Go in gamer's proximity that they can add as friends in the Pokémon Go games.

Results pertaining to the quality of crowdsourcing communities confirm that information and systems quality are significant antecedents of gamers' Pokémon Go crowdsourcing engagement intention. These findings are consistent with previously conducted studies in various contexts. Goh *et al.* (2017) found that systems quality influenced participation intention in crowdsourcing contexts. Also, studies have shown that gamified crowdsourcing was increasingly integrated into marketing strategies to increase participation and consumption through intrinsic motivation (Jang *et al.*, 2018). This result confirms that the likelihood of gamers engaging in Pokémon Go crowdsourcing communities would be higher when such platforms offer valuable, accurate, and timely information. For example, information about the location of a Pokémon posted in Pokémon Go crowdsourcing communities should be posted early enough to allow other gamers to locate and capture the Pokémon before they disappear. Ensuring that the Pokémon Go crowdsourcing platforms are well designed would increase gamer's engagement. However, this study confirmed service quality was not a significant antecedent of Pokémon Go gamers' crowdsourcing engagement intention. This finding is inconsistent with prior literature. This study's finding could be because members of crowdsourcing communities were aware that Pokémon Go developers did not own the systems this game was operated on, and therefore that it would be reasonable to expect that system quality issues would occur from time to time.

This study also reveals that crowdsourcing engagement intention has the strongest association with crowdsourcing content consumption behaviour, followed by crowdsourcing content contribution and crowdsourcing content creation behaviour. Despite all these hypotheses being confirmed, these findings reveal that crowdsourcing platform users are more likely to be passive consumers of content than active contributors and creators. Members of Pokémon Go would consume the information posted by others rather than participate in the discussion or create new content such as sharing information pertaining to the Pokémon Go game they perceive would be valuable to others.

6.2 Theoretical implications

Six theoretical contributions emerge as a result of this study. First, this study answers the calls to address the limited literature on crowdsourcing behaviour (Wang *et al.*, 2020; Bakici, 2020). Many previous studies of crowdsourcing behaviour have been based on case studies or conceptual work (Ye and Kankanhalli, 2015). However, this study provides the first empirical evidence of factors motivating online gamers' crowdsourcing intention. Second, novel insights are generated by combining the self-determination theory, DeLone & McLean model and behavioural engagement constructs. Combining different theories with different perspectives makes it possible to derive a more comprehensive understanding of a phenomenon. As such, the combination of these theories offers unique insights into gamers' crowdsourcing behaviour. Third, this study is the first to use the DeLone & McLean model to understand crowdsourcing behaviour. The findings show that information quality and systems quality significantly influence crowdsourcing intention, while service quality was found to have no significant influence. Fourth, this study contributes to the crowdsourcing

literature by examining contextual intrinsic and extrinsic motivation factors. Typically, studies have conceptualised intrinsic and extrinsic motivation as a unidimensional factor (Yang *et al.*, 2020). However, this study provides additional insight by conceptualising intrinsic and extrinsic motivation factors as second-order constructs. Other studies have reinforced the cruciality of identifying contextual intrinsic and extrinsic motivation factors (Wu and Gong, 2021). Fifth, this study's findings help address the intention-behaviour gap (Hulland and Houston, 2021). This was achieved by modelling intention behaviour (crowdsourcing engagement intention) to three distinct outcome behaviours (creation, contribution, and consumption behaviour). The findings show that crowdsourcing engagement intention was positively associated with online gamers' content consumption, content contribution, and content creation on Pokémon Go crowdsourcing platforms. Sixth, this study addresses the intention-behavior gap (Hulland and Houston, 2021). By modelling three behavioural outcomes (creation, contribution, and consumption behaviour), this study is among a few that have investigated the impact of intention on more than one behavioural outcome (Cao *et al.*, 2021).

6.3 Practical implications

Those who own crowdsourcing platforms aim to attract and retain as many participants as possible. Increasing the number of engaged members will further aid in attracting more participants to join and use these platforms. Therefore, the findings of this study are insightful to owners of Pokémon Go and other gaming-related crowdsourcing platforms who wish to increase the engagement levels of participants by understanding the antecedents.

This study confirms that intrinsic motivation is the most influential antecedent of gamer's crowdsourcing intention. This result reveals that crowdsourcing platforms must offer challenges of varying difficulty levels, use graphics, and structure the platform so that members can derive enjoyment while contributing to the community, for example, including questions related to completing challenging quests or findings legendary Pokémon in Pokémon Go. Due to gamers' competitive and thrill-seeking nature, ensuring that the Pokémon Go crowdsourcing platforms are enjoyable and offer intellectual challenges would increase member engagement.

The findings also confirm that extrinsic motivation influences gamers' crowdsourcing intention. Thus, owners of such crowdsourcing platforms need to ensure that members' contribution is valued and rewarded. However, these rewards do not necessarily need to be monetary. Ensuring such crowdsourcing platforms recognise and reward member contributions through 'thumbs up' or 'likes' by other member would be a motivator. The total number of 'likes' and 'thumbs up' received by a member of the outsourcing community could be tied to their reputation score that allows members to get badges such as gold, silver, and bronze can also act as a motivator for engagement. These reward and reputation systems would make gamers feel valued, while other members of the crowdsourcing platform would value the suggestions and contributions made by members with high reputations.

The results from this study confirm the importance of the quality of crowdsourcing platforms. Therefore, owners of such platforms must ensure the credibility and reliability of members' information posted on such platforms. Also, gamers should only be able to post content after creating an account on such platforms. Such a registration process would ensure that non-members could not post inaccurate information. Additionally, there should be negative implications (such as membership suspension or a complete ban) for posting false information or personally attacking another member. Apart from these strategies to ensure information quality, the owners of such crowdsourcing platforms should ensure that the websites are fast, easy to access and operate, and always available for use. It is suggested that

gamers would not be willing to be part of crowdsourcing platforms that were unreliable and continuously 'down'. Finally, this study has shown that levels of engagement by a member can vary. Therefore, for crowdsourcing platforms to be successful in attracting and retaining members, active participants are needed. Accordingly, owners of such platforms should continuously make improvements to remain competitive over competing platforms.

7. Conclusion, limitations and directions for future research

By combining the DeLone & McLean model, self-determination theory, and different levels of engagement behaviour, this study confirms that extrinsic motivation and intrinsic motivation positively influence gamers' crowdsourcing engagement intention. Systems quality and information quality were also confirmed to be positively associated with gamers' crowdsourcing engagement intention. Furthermore, crowdsourcing engagement intention was found to be positively associated with crowdsourcing content consumption, content contribution, and content creation. Despite this study making a valuable contribution to the literature on crowdsourcing behaviour, this study's limitations have to be emphasized. First, this study employed a cross-sectional design to collect data. It examines perceptions behaviour in the context of Pokémon Go crowdsourcing platforms. Therefore, generalisations of the findings should be made with caution. Future studies could address this limitation by adopting longitudinal or experimental survey designs. Additional insights obtained by replicating this study with other game-based crowdsourcing platforms. Second, this study only investigated Pokémon Go players, which is played on mobile phones. Therefore, these findings could not be generalised to other games and gaming platforms such as PlayStation, Xbox, and PC games. Future studies could examine the impact of gamers' crowdsourcing behaviour on different gaming platforms. Third, this study did not examine the personality factors of gamers. Future studies could examine how the personality and culture of gamers could influence crowdsourcing behaviour. For instance, a comparative analysis of gamers from collectivist as opposed to individualistic cultures. Despite this study making a meaningful contribution to literature, crowdsourcing studies relating to gaming remains; thus, more studies are needed to gain further insights.

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