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Kingsley Ofosu-Ampong  
*University of Ghana*, [kingofosu11@gmail.com](mailto:kingofosu11@gmail.com)

Richard Boateng  
*University of Ghana*, [richboateng@ug.edu.gh](mailto:richboateng@ug.edu.gh)

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### Recommended Citation

Ofosu-Ampong, Kingsley and Boateng, Richard, "Motivation and Information Affordances Towards User Engagement in a Gamified System" (2020). *SAIS 2020 Proceedings*. 31.  
<https://aisel.aisnet.org/sais2020/31>

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# MOTIVATION AND INFORMATION AFFORDANCES TOWARDS USER ENGAGEMENT IN A GAMIFIED SYSTEM

**Kingsley Ofosu-Ampong**  
University of Ghana  
kingofosu11@gmail.com

**Richard Boateng**  
University of Ghana  
richboateng@ug.edu.gh

## ABSTRACT

Gamification is a growing phenomenon, and educational institutions have begun incorporating it into their existing information systems (IS) curriculum. This study seeks to examine how motivational affordances and information quality contribute to student engagement within gamified IS education. Drawing on the frameworks of affordances, information quality, and engagement, this study develops a conceptual model to explain motivational affordances and information quality and its satisfaction effects on students' engagement in IS education. Our preliminary results show a contrary view that despite the challenges or competition evoked by gamification, it is more satisfying for students to continue using the gamified system. This research-in-progress paper is theoretically important because there are currently no widely accepted theoretical models linking motivational affordances, information quality, and engagement to gamified outcomes, and test the effect on students' learning behaviours.

## KEYWORDS

Motivation, gamification, engagement, enjoyment

## INTRODUCTION

In the gamified learning environment, motivation has been considered a significant factor affecting learning behaviours. Motivational factors such as achievement unlock, retention, information quality, satisfaction in course materials, and persistence have been associated with learning consequences to the learner (Chen & Jang, 2010). With the proliferation of online platforms for learning, prior research acknowledges the importance of a gamified learning environment in higher education due to its increased flexibility. Gamified learning refers to the use of game design elements to make learning more engaging and enjoyable in a non-game context (Deterding et al. 2011).

Despite its importance on the learning behaviour of students, motivation, engagement, and the quality of information have received less research attention. Prior research has attributed the reason for the neglect of the socio-emotional process of students by educators and emphasis on the cognitive behaviours of students (Jones & Jochems, 2005). Since gamification is a new concept, educational researchers have recommended that designers and educators should focus on the high attrition rates associated with online learning which includes online learner motivation, antecedents and outcomes (Chen & Jang, 2010; Ofosu-Ampong et al. 2019). Thus, this study is important as it seeks to investigate the motivational and information quality antecedents and outcomes within gamified information systems (IS).

Further, empirical research investigating gamification and affordances, user enjoyment, and engagement (Koivisto & Hamari, 2019) has dramatically increased. However, little research has examined the relationship between them and their associated effect on students' learning outcomes. Motivational affordances are the fundamental properties of the IS that determine how the gamified IS can support motivational needs (Deterding, 2011); information quality is the output the IS produces (DeLone and McLean, 1992); user satisfaction or enjoyment is the perceived enjoyable use of the IS (Nah et al. 2014), and engagement is the enhanced experiential and instructional outcome (Liu et al. 2017). Drawing on the frameworks of affordances, information quality (Wixom & Todd 2005), and user engagement (Liu et al. 2017), this study develops a theoretical framework explaining motivational affordances and information quality (Ghasemaghaei & Hassanein, 2019) and its enjoyment effects on students' engagement within a gamified system.

This study will contribute to gamification education research by conceptualizing new information quality, affordances, and engagement in examining the effectiveness of user-side gamified IS strategies to leverage gamification in education. Also, this study will open up a new stream of questions on affordances, quality dimensions, and enjoyment enabled by gamification information systems that have not been examined systematically in IS education. The research is organized as follows. First is the review of theories related to gamification. Second, the study conceptualizes and explain motivational affordances, information quality, and enjoyment outcome and its relationship to engagement.

Third, the paper provides a methodology for conducting the study. The research-in-progress paper concludes with a summary of the expected findings.

## **THEORETICAL FOUNDATIONS AND RESEARCH HYPOTHESES**

One of the fundamental goals of gamification is to make a boring activity more game-like and sustain user engagement. Prior research has prioritise the use of motivation as a theoretical lens (Davis et al. 1989) in studying users' continuous engagement of IS, however, studies that use gamification to motivate first-time users focus on the motivational affordance as the theoretical basis (Kampker et al. 2014). Therefore, integrated motivational theories and information quality is essential to the user learning engagement with a gamified IS in sustaining their continual use. Hence, integrating these two interesting theories to enhance learning with a gamified IS.

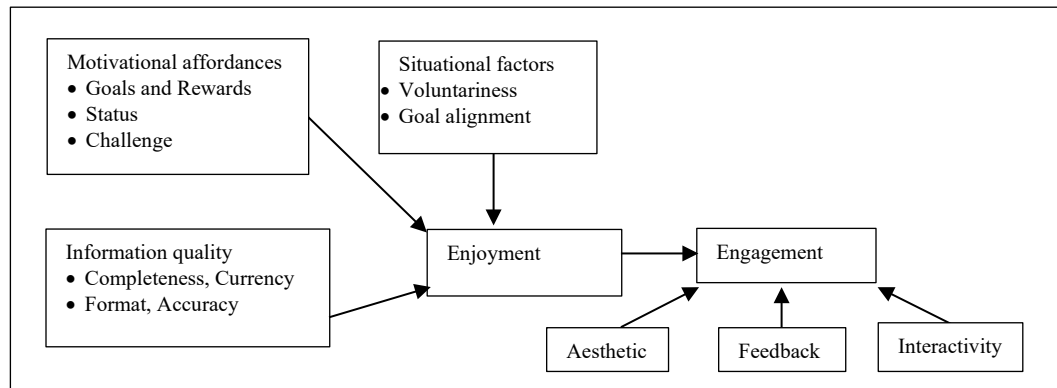
### **Motivations for Learning Engagement via Gamification**

The reasons associated with playing games has been studied widely (Kankanhalli et al. 2012) in many contexts with different theories and frameworks and can provide motivational insight for student's engagement in a gamified IS in education. Games have been considered an enjoyable activity and generally considered as an intrinsically satisfying task; hence self-determination theory (SDT) which explains intrinsic motivation (Deci and Ryan 1985) may be important in understanding user learning engagement with a gamified IS. Therefore, the overarching theory underlining the research model for this study is SDT. SDT relates to student's inherent tendencies for growth and psychological needs and forms the macro theory of human motivation in the learning process. In promoting student's basic psychological needs, Deci and Ryan (1985) propose these three motivational needs: autonomy, competence (self-efficacy), and relatedness. "Autonomy refers to the freedom to choose the game activity to perform and the way in which to perform the activity. Competence is defined as a feeling of being capable and effective in the game, while relatedness is a sense of connection to other people through the game" (Deci and Ryan 1985). Also, of importance is the concept of flow which relates to competence for experiences in games. Ryan et al. (2006) conclude that people experience autonomy, competence, and relatedness during gameplay due to the attractiveness to video games. Further, the other theoretical foundations underlying this study like motivational affordances, information quality and user engagement are explained in their respective sections to give an overview of the research model.

Directed by the principles of gamification and engagement (Liu et al. 2017), situational and artefactual affordances (Deterding 2011), SDT (Deci et al. 1985) – research-based theory for scrutinizing motivation especially in education context, and information quality (Wixom & Todd, 2005), in this section a research model is proposed for this study (see figure 1).

### **Motivational Affordances**

Koivisto and Hamari (2019) summarized and classified various works on motivation that were used from 2011 to 2015 in motivational information systems. They discussed affordance concepts with other literature on motivation theories. Affordance refers to the combination of the "actual and perceived properties of the thing, primarily those fundamental properties that determine just how the thing could be used" to help learners acquire needed skills, knowledge, and abilities (Gibson, 1977). The affordances in this study are classified into two groups, as conceptualized by Deterding (2011): gamification artefacts and situational factors. Various forms of scoring, points, and badges are common gamification artefacts within an IS domain. Other forms include challenges, levels, achievement, and leaderboards used in inducing and engaging game-like dynamics. Achievements, leaderboards, and points are considered as the goal metrics for student feedback on performance on learning tasks (Liu et al., 2017). Also, the most common ways to gamify activities are to apply achievement and progression techniques and to provide social elements (e.g., status updates, liking) used to indicate affordances.



**Figure 1. Research model**

In this study, the motivation factors for learning include the goal or rewards, challenge, and status offered to students. Prior studies have shown that gamified IS goals that are specific, clear, and challenging can enhance performance and produce greater persistence. Such behaviour is in line with the behaviourist theory of the goal-gradient, which predicts that subjects expend more effort as they approach a reward (Hamari, 2013). As such, rewards enable users' performances to be visible to other people through badges and trophies, which induces social awareness and interactions, thereby increasing a sense of connectedness. Also, providing users with a status affordance enables them to capture and track their performances free from consequences (autonomy and competence), as well as foster social awareness by incurring reflective processes based on information collected for the self and others (relatedness). Research suggests that challenges motivate individuals toward improved performance, thus increasing the feeling of competence (Deterding et al. 2011) in a gamified context. This study, therefore, hypothesizes the following:

*H1: Motivational affordance (goal, rewards, challenge, status) is positively related to enjoyment outcomes within a gamified IS.*

Situational affordances explain why a gamified IS motivates individuals differently (Deterding, 2011). To this end, based on motivational literature, the study identified voluntariness and goal alignment as having the potential to affect artefactual affordances. Voluntariness is the degree to which an act (use of a gamified IS) is perceived to be voluntary or of free will (Vehring et al. 2011). The self-determination theory explains the likelihood of an individual performing an activity at a particular time when the activity fulfils his/her motivational needs of autonomy, relatedness, and competence (Ryan & Deci, 2000). Hence, voluntariness supports the SDT assertion that individual motivational needs can be fulfilled when subjects perform their activities in an autonomy-supportive environment of enjoyment.

*H2: The relationship between motivational affordances and enjoyment is positively moderated by voluntariness, such that high voluntariness leads to high enjoyment.*

SDT explains that the autonomy-supportive environment is subjectively constructed in social meaning rather than objectively constructed. Since individuals display varying voluntariness when using the gamified IS under the same conditions, IS scholars refer to voluntariness as the connection between the gamified features and user perception of the game elements (IS) (Vehring et al. 2011). Goal alignment emphasizes the importance of defining the gamified task about users' personal goals. However, these goal alignments are complex in the way they promote and align individual motivation, educational goals, and technology affordances. Prior research in gamification has prioritised individual experiences over organisational objectives (Morschheuser et al. 2018). This prioritisation may not work for institutional or educational contexts where less engagement exists, resulting from the heavier emphasis on experiential goals over instructional goals (conflicting goals) (Liu et al. 2017). Thus, for better alignment, the gamified IS should not only align goals (individual and educational goals) but design systems that consider multiple conflicting goals and help users resolve these conflicts. This study, therefore, formulates the following hypothesis:

*H3: The relationship between motivational affordances and enjoyment is positively moderated by goal alignment such that high goal alignment leads to high enjoyment.*

Beyond game element artefacts and situational factors, goals, and intentions are other forms of learner motivation sequence and are considered beneficial to student welfare. Goals are the applications of values studied in the goal-setting theory (Locke et al. 2002) that provide individuals with measurement of performance (best) to make a judgment on the task performed. With an emphasis on the different levels of goals, the theory seeks to provide answers to why an individual performs better on a gamified task than the other given equal capabilities, knowledge, and resources.

Hence, to reduce the inconsistency between the performance and the goal, the learner can alter his or her behaviour; this makes the goal-setting theory influential in motivational intervention for tasks and situations (Locke et al. 2002). Goal-setting affects gamification artefacts by providing users with several potential goals or milestones to achieve. Until the goal is attained, the user is motivated to regulate his or her behaviour to reduce the inconsistency between the desired goal and the actual performance. Prior studies indicate that learners who set challenging but specific goals are more committed to attaining the goals and more likely to perform at a high level (Bowman et al. 2019).

The performance and actions of learners in the gamified IS are controlled by intentions, as suggested in the theory of reasoned action (TRA) (Ajzen & Fishbein, 1977). The core tenets of TRA posit that the individual is a sensible being who considers the available information and tacitly considers the implication of his or her actions, which are direct antecedents to behaviours. Hence, behavioural intentions operate as a salient belief about the possibility that performing a particular behaviour will result in a specific outcome (Ofosu-Ampong et al. 2019). A learner's evaluation of the outcomes and strengths of associated behaviours determines the attitude toward the behaviours (Ofosu-Ampong et al. 2019). Thus, salient beliefs affect intentions through attitudes.

### **Motivational Principles of Gamification for Engagement**

Since the study aims to encourage students in behavioural change towards learning, the study draws on the principles of gamification to make the task engaging (Liu et al. 2017). To ensure engagement takes place in the educational environment, this research studied the principles of gamification that ensure students are intrinsically motivated towards learning tasks. From extant literature, this study identified feedback or task congruence, personalization, and dynamism principles as important integrated elements that foster the task at hand. The first principle relevant to the task (a desirable outcome) has been rarely applied to gamification, compared to other contexts. In the field of gamified IS, learning outcomes or feedback need to be consistent with the task assigned to students. Self-determination theory and the job characteristic model (Deci and Ryan, 1985) provide theoretical support for the central role of feedback in motivation. Prior research focusing on gamification in education has emphasized the importance of game elements (e.g., rewards, score) and paid little attention to interactive feedback. Few studies that focus on feedback criticize the level of engagement (Nah et al. 2014) with the instructor, the students, and the IS.

Personalisation is an important engagement tool in increasing personal relevance (Liu et al. 2017) and results in leveraging data of specific users in developing clusters modelled on the user. This model customisation uses user-specific information to personalise the system. Prior studies indicate the receptive nature of users toward the personalised gamified IS and rank the system as higher quality (Tam & Ho, 2006). Likewise, adopting personalised principles to gamification in learning would be effective in engaging and matching user characteristics. Lastly, the dynamism principle suggests the importance of desired user-system interactions (Liu et al. 2017) among learners. This call lies with educational institutions to determine the extent to which they want challenge or collaboration to be promoted among students (user interaction) (Neeli, 2012). Such interaction exists between the student, and the gamified IS and assumes individual or social levels. For personalised learning, this study focuses on the individual level of system interaction, which has been the widely used approach to matching skills with the requirements of intended tasks. However, social interactions present a variety of opportunities for system engagement, cooperation, and design.

### **Information Quality and Use Behavior**

Building an engaging gamified IS for learning entails successful models. One of such models is IS success, which proposes that studies in IS should “systematically combine individual measures from I/S success categories to create a comprehensive measurement instrument” (Freeze et al. 2019; DeLone & McLean, 1992). Based on the foundational works of Mason (1978) and insight from Ghasemaghaei & Hassanein (2019), information is defined as the IS output or communication, which is measured at different levels (technical, effectiveness, or semantic) of system use (DeLone & McLean, 1992). The technical level refers to the efficiency and accuracy of information produced by the system; the semantic level measures success about the intended meaning of the information, and the effectiveness level relates to the effect of information on the receiver (Strong et al. 1997).

Earlier studies assessing educational institutions' incorporation of digital games in learning highlighted the focus on investment in these educational technologies (Culp et al. 2005). Digital game *usage* became an important area of gamification research after prior studies on investment found mixed effects on digital game performance (Mishra and Agarwal 2010). Beyond the acquisition of gamification resources and the use of game elements, related studies have recognized gamification design as a precursor for engagement and superior performance (Setia et al. 2013). A different aspect of design in IS has been studied, notably, information technology support, IT infrastructure flexibility, and

information management capability (Wang and Haggerty 2009). Consequently, further recent research has identified information quality as an important aspect of digital design for engagement. User loyalty and enjoyment, trust, and enjoyment in online games, gamification adoption, and knowledge sharing behaviour (Setia et al. 2013) are examples of outcomes influenced by information quality.

Although information quality has several characteristics, the study proposes its importance to educational digital game design in four dimensions (Wixom & Todd, 2005). These dimensions are completeness, format, accuracy, and currency. Completeness is the extent to which the gamified IS provides the required essential information for the learner to perform the assigned task in the learning process. Format presents the information provided by the gamified IS. Accuracy is the correctness of the information provided by the gamified IS to encourage user behaviour. Currency relates to how recent or updated the information provided by the gamified IS is (Wixom & Todd, 2005). These four dimensions form the quality of the information provided to the students across the educational setup. For instance, a gamified orientation process for first-year students may provide information about academic, social, campus activities or groups, and personal support for students to motivate their engagement at university. Information inaccuracy may occur due to instructor sloppiness in designing a well-formatted (meets user queries), appealing system (Liu et al. 2017) that follows a systematic gamified course materials approach based on user preferences and capabilities. Likewise, the currency of information may distort the quality of information for the students. For example, a gamified syllabus for students of the previous academic year may not have the most recent information on course materials for current students. Hence, this study hypothesizes that:

*Hypothesis 4: Information quality (completeness, format, accuracy, currency) is positively related to enjoyment outcomes within a gamified IS.*

### **User Engagement**

User engagement is an important dimension for students' education as behaviorally engaged students achieve higher performance and participation than disengaged students. Use behavioural engagement is defined as "the displayed student behaviours of engagement that are associated with a student's effort towards learning and the learning process, for a single task or their overall learning experience" (Anderson 2019). Further, one can observe these behaviours to infer students' engagement with the gamified IS or their involvement and participation level.

Given the essential components and determinants of gamified systems, feedback, interactivity and aesthetic appeal were identified as positive elements for maintaining and inciting user engagement (O'Brien & Toms, 2007). This study suggests that once a student is engaged, his or her interest and attention should be maintained. Consequently, the student must be made to feel part of the interaction through system awareness (feedback) and feel connected to the system (interactivity) or feel the beauty of the system to appeal to the user (aesthetic appeal).

A gamified IS can improve the quality of learning and academic performance of students and educational institutions, provided they are used. This study proposes that the use of gamified IS is predictable when the user's interest aligns with the developer, and the gamified IS is engaged through artefactual motivation affordances (incentives, challenge, and rewards). Use behaviour is defined as the favourable or unfavourable response to a computed mediated task (Laurel, 2013) and students are likely to engage the gamified IS if they perceive it as enjoyable (Cognitive evaluation theory). In reviewing the literature on user behaviour, the level of engagement with a gamified IS can be categorized according to the level of system use, such as duration (Cheung et al. 2015), frequency and enjoyment with outcome behaviour (Deterding, 2011). Thus, this study formulates the following hypothesis: *H5: Enjoyment outcome is positively associated with engagement within the gamified IS.*

### **METHOD**

This study is a research in progress, and a survey method of collecting data would be used to test the proposed research model. Thus, an online survey (questionnaire) would be used to solicit views from undergraduate students in a large university in Ghana after completion of chapter one of the research methods course on a gamified IS. Since the study's primary concern is on user engagement, only students who have had an experience with a gamified system like Kahoot would respond to the questions. Instructors recommended the use of the Kahoot system to their students, and some instance, assignments were uploaded to test the students' depth of knowledge in the course. Kahoot! is a "game-based learning platform", used as educational technology in schools. As of the time of this study, the Kahoot was the only gamified system used by instructors. Thus, the Kahoot awards game elements (points, badges) to students at every stage of the learning process. This enables students to know their level of progress in in-class online activities.

The gamified IS was adopted purposely for systematic learning of research methods, collaboration, and engagement between and among students and instructors. Students, on successful completion of tasks, receive points, badges, and

scores as acknowledgements visible to other students on the leaderboards (to encourage challenge and add social aspects to badges and points).

The items used to operationalize the variables (motivational affordance, information quality, enjoyment, and engagement) in the conceptual model were adapted from previous studies. For example, the scales for the items for engagement were adapted from Schaufeli et al. (2002), information quality from Wixom and Todd (2005), motivational affordances from (Vehring et al. 2011), and enjoyment from Hamari (2013).

### **SOME PRELIMINARY INSIGHTS**

Data from 85 students from the year three group have been collected after they completed chapter one of Research Methods and used the gamified IS as a practice. Data collection is currently underway from the remaining students. The preliminary analysis from the current gamified users reveals some interesting results and raises questions that will be addressed after the remaining data is collected.

The results show that goals, rewards, and status as evoked by the dynamics of game design elements positively influence enjoyment; three dimensions of information quality also influenced enjoyment while there was a positive association between situational factors and artefactual affordances. Further, there was a positive association between Enjoyment and engagement. In all, ten of the dimensions revealed a positive, while challenge and format were negatively associated with enjoyment (significant at  $<0.5$  for ten dimensions and  $<0.1$  for two dimensions). The result is contrary to the belief that challenges evoke by games will be more satisfying for students to continue using the system and challenge for the leaderboard or progress bar.

### **EXPECTED CONTRIBUTIONS**

This research is theoretically essential because there are currently no widely accepted theoretical models linking motivational affordances, information quality, and engagement to gamified outcomes. Prior studies did not approach the connections of user experiences in education and engagement with gamification. Furthermore, information quality has been examined from more sophisticated viewpoints based on firms' capabilities and customer service performance rather than in education. The research will also add knowledge by treating engagement as an emerging measure from experiential and instructional outcomes in educational gamified systems (Liu et al. 2017). This will foster the outcome pairings to enhance the emergence of motivational information systems in contrast to other earlier theoretical models, such as the affordances theory (Deterding et al. 2011). The expected outcomes from the study will include: (a) constructing a novel theoretical model based on motivational affordances, information quality, and engagement views of gamified IS education; (b) employing improved instruments for examining student learning behaviours in the gamified IS, and (c) systematic testing methods for examining the dual purpose of students' engagement with the gamified IS and its leverage to educational institutions' view of gamification in learning. In summary, with the increasing importance of games in our activities, this study responds to a call to advance knowledge in gamification research (Liu et al. 2017) and is the study's hope it has motivated readers to conduct further investigation in this area.

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