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USING TECHNOLOGY ACCEPTANCE MODEL TO ANALYSE THE SUCCESSFUL CROWDFUNDING LEARNING GAME CAMPAIGNS

Abstract. Due to the limited opportunities for financial supports to educators, Crowdfunding can be an effective channel to solicit funding sources for educators to develop new learning games. Understanding user perceptions of a successful learning game guided by Technology Acceptance Model (TAM) could help educators to effectively adapt Information Communication Technologies (ICT) in developing more competitive learning games and secure more funding. This study used a user survey to assess the success of Kickstarter-funded learning game projects. Guided by TAM, the study derives eight perceived assessment dimensions, including three Usefulness dimensions: Representation mode, Narrative, Interaction; four Usability dimensions: Learning provision, Skill building, Rules, Assessment; and one Acceptance dimension: Motivation. The analysis of the online assessment survey (n=115) revealed that successful funded learning game projects are focused on usefulness and usability. Users perceived a wider gap between successful and unsuccessful crowdfunding learning games in Learning Provision, Representation Mode, and Skill building. These enable game-based learning strategies by spelling out game rules that support learning provision in skill building, which is reflected in a detailed and in-depth narrative in a coherent representation layout. According to bivariate and multivariate analysis, among all eight dimensions, Representation mode, Interactivity, Skill building, Rules, Narrative and Learning provision are key factors that significantly associate with entrepreneurial success for the learning game development. A crowdfunding learning game TAM based perception evaluation model was developed based on perceived acceptance, usefulness and usability. This study examines the pedagogical aspects of using TAM to analyze crowdfunding learning games to help educators better use ICT to create new learning games that provide more customized, active, and flexible learning experiences, improve feedback and assessment, and increase involvement and access to game development.

Keywords: Kickstarter, learning game campaign, collaboration, user perception

1. INTRODUCTION

The problem statement. Since the introduction of educational video games in the 1970s, general games apply to kids regardless of gender have become increasingly reliant on video games as a means of learning [1,2]. It was estimated that over \$137.9 trillion was invested in video games, with a global sale of \$99.6 trillion [3]. Crowdfunding was used by

game developers, practitioners, educators, and entrepreneurs to raise seed funding online for a specific game-based learning project. Crowdfunding allows entrepreneurs or small groups to fund their businesses by collecting small contributions from a large number of people via the Internet [4]. Through engagement, crowdfunding project founders can also build strong relationships with backers [5].

Crowdfunding campaigns also provide a new channel for small learning game fundraisers to receive start-up funds and community support from backers, donors, and potential users [3]. Seed funding, unlike crowdfunding, represents the initial capital provided to a startup by an entrepreneur, angel investors, or friends and family. This financial support serves as the foundation for micro start-ups, enabling them to grow their businesses [3,4]. On the other hand, crowdfunding involves seeking funding from the general public. Crowdfunding is a versatile method for raising funds from the public to support small creative projects. It offers flexibility in addressing diverse funding needs and goals. Two common approaches within crowdfunding are reward-based crowdfunding, where backers receive non-financial incentives, and equity-based crowdfunding, where investors gain a share or ownership in the venture [3,4]. This broad scope allows for the participation of a wide range of individuals and caters to various funding requirements.

Even though the average amount for a start-up project is small, grassroots entrepreneurial fundraisers make full use of the opportunity to solicit financial support via crowdfunding. For example, since its inception, Kickstarter, a well-known crowdfunding social media platform, according to Kickstarter Stats, has launched nearly 60k game-related projects, asking for \$1.56 billion US dollars and successfully funding 1.45 billion dollars, ranking it as the best category to receive funding among others. However, more than half of the initial game-related crowdfunding projects were eventually abandoned. Crowdfunding platforms cater to a wide range of projects, including creative endeavors, entrepreneurial ventures, and charitable initiatives. According to [6], crowdfunding can be a valuable resource for educators, practitioners, nonprofits, and charitable organizations to raise funds for specific projects or endeavors that create something new and shareable.

There has been research into the quantitative factors that contribute to crowdfunding success, such as time period, geolocation, backers, image and word counts, and so on [7, 8, 9]. However, there is a scarcity of empirical research into user perceptions of key assessment factors for successful crowdfunding games. Game-based learning, its applications, and game development have all been extensively researched for their positive effects on skill development [10], and specific metrics for learning game assessment have been developed [11, 12]. There may have been different user expectations on funding based learning game development, and there has been little research focusing on assessing entrepreneur success in game-based learning related crowdfunding ventures. As a result, it is critical to comprehend how users perceive the characteristics of successful learning games, as well as the significance of developing a solid and appealing initial public offering crowdfunding proposal. This paper examines the factors that influence the success of game-based learning crowdfunding ventures using empirical data.

Analysis of recent studies and publications. To gain a better understanding of the nature of crowdfunding, research has been conducted on key factors affecting the success of crowdfunding game projects [4]. The development of a learning game requires a small startup capital investment, and game developers have used crowdfunding to fund the initial investment in educational applications [13]. Independent entrepreneurs can easily promote and access their projects on online crowdfunding sites due to small scale funding. Fundraising for video games was the most popular category on the popular crowdfunding platform Kickstarter, according to statistics provided by Kickstarter, with nearly 60,000 projects launched and \$1.46

billion in funding support. This will encourage entrepreneurs to join and launch projects through collaborative crowdfunding platforms.

A high-quality crowdfunding campaign or pitch is necessary and significantly helps to raise the desired funds [4]. The founders in crowdfunding are usually strongly evaluated on a personal level and a personal communication level as well as appearance, and this has a high impact on the investment decisions [14]. Game based learning crowdfunding initiatives increase content and ownership diversity [14], and work has been published to ensure that crowdfunding is successful [15]. User interface design, feedback and assessment mechanisms necessitate the implementation of ergonomic support to optimize the learning environment and materials, thereby enhancing the overall user experience [16,17]. The principle of ergonomic support can also be extended to enhance crowdfunding materials, aiming to establish a crowdfunding campaign that is centered on the user and effectively maximizes user satisfaction and engagement.

Research has also reported several dimensions such as developer credibility, reputation and social network crowdfunding experiences are related to crowdfunding success [14]. Campaign content, media elements, types of message cues used, duration of campaign, concreteness, and precision of information provided are reported to be relevant for the crowdfunding success [18, 19]. The roles of assessments often require human evaluation, rather than public data scrapping, with a few examples such as evaluations of creativity [20], innovativeness [21], quality [22] and scalability [22]. Research has shown a positive association between the use of concrete and precise language, length of campaign text, numbers of updates, video inclusion in campaign texts, and success [23]. This has indicated that the reduction of cognitive effort used in processing campaign information enhances the chance of funding [24].

Theoretical framework has been applied to explain and predict crowdfunding success. For example, The Technology Acceptance Model (TAM) is a theoretical framework, based on Ajzen and Fishbein's 1980 Theory of Reasoned Action (TRA) and first proposed by Davis in 1986, seeks to explain the determinants of software application acceptance [25]. According to Davis in 1989, TAM has cognitive responses, triggered by the external stimuli which contain two components: perceived usability to which a person believes that a system has ease of use, and perceived usefulness, which focusing on the value of use for the system [25]. Also, affective response is also related to expected enjoyment toward acceptance of adopting a system [25, 26]. These three factors impact a user's attitude and behavior toward the actual use of a certain technology. It explains user behavior through using two main predictors: perceived usefulness and perceived ease of use [27]. For instance, Lacan and Desmet in 2017 have used Technology Acceptance Model (TAM) as the theoretical framework to analyze the attitudes of contributors/investors towards crowdfunding [28]. Numerous research has reported that using TAM can explain behavioral intention to adopt crowdfunding [29, 30].

In Nielsen's information hierarchy framework (1994) [31], usability is part of usefulness which is part of practical acceptability, and finally, part of system acceptability. Usability deals with the system features for ease of use, however, measuring the usefulness and focusing on the values could include key useful features that are critical to justify investment decisions. This enables them to be much more productive.

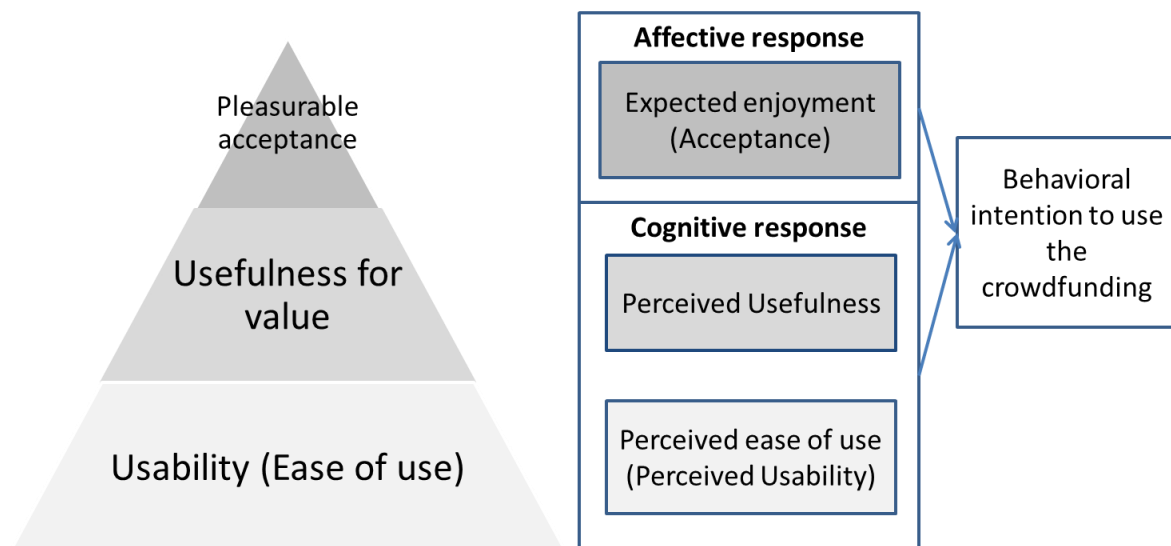


Figure 1. Technology Acceptance Model for crowdfunding adapted and modified from Davis 1993 and Thaker et al., 2018's TAM, and Neilsen 1994's framework for usability.

As for the content quality for a game-based learning application, research has reported the key assessment criteria that contributes to high quality content in educational applications [32, 33]. In Lee and Cherner 2015's work, they present a thorough list of rubrics with 24 evaluative dimensions for analyzing the educational apps [32]. These dimensions can be classified into three aspects: Education, to measure the app's educational values; Design, to assess the level of interaction and efficiency; and Engagement, for how to motivate the users. Rubrics that contained exhaustive list of evaluation items have a few categories of educational content: design, functionality, and technical characteristics [33]. Annetta and Bronack proposed an assessment rubric for educational games based on the educational principles and presented comprehensive evaluation criteria in each context where learning will take place using learning games [34].

Tricot and other scholars in 2003 proposed three dimensions for evaluating learning games based on product intention of use: usability, usefulness, and acceptability [36]. In other words, whether users are positive or negative regarding the product, their "intention" of use depends on many parameters: motivation, affects, culture, and values. Assessing dimensions were proposed based on context-based factors such as the availability of specific resources and technologies, the organization of the curriculum, the time devoted to the use of the learning game, and the use of additional resources, depending on the ease of use, utility, and acceptability [36]. Similarly, game-based learning crowdfunding campaigns can be assessed based on the representation, organization, educational content, and context of related resources in the campaign's funding proposal. Table 1 showed the assessment dimensions for learning game and related literature.

In this study, Usefulness is concerned with pedagogical effectiveness [36]. This category evaluates the learning game's impact on the learner's knowledge and skills. This category of criteria addresses the question of whether the learning game enables the people targeted to learn what they are supposed to learn. This study included four criteria: Learning provision, Skill building, Rules, and Assessment (Table 1). Usability refers to the user's ability to successfully complete the learning game tasks that the designer intends them to be able to complete. This category of criteria answers the question: is the learning game simple to use,

use, and reuse, without wasting time or making handling mistakes? There were three criteria in this study: Representation mode, Narrative, and Interactivity (Table 1). Acceptance refers to the decision to use the learning game [36]. This category is related to assessing the value of the learning game and includes attitudes and opinions about the learning artifact. This set of criteria addresses the question of whether the learning game is compatible with motivation. There was one criterion in this study: motivation (Table 1).

Table 1.

Assessment criteria selection for learning game and related literature

Criteria	Definition	Selected Literature
Usability	<i>Assessments of the ability of the user to complete successfully learning game's tasks that designer intends them to be able to complete</i>	[18,36]
Representation mode	The campaign's content is appropriate to learning objectives, and is easy to follow	[15, 37, 38]
Narrative	The campaign's storyline is clear and obvious through the entire game	[39, 40]
Interactivity	The campaign's game allows users to interact with and receive assistance from other players as the game progresses.	[18]
Usefulness	<i>Assessments of the impact of the learning game on the learner's knowledge and skills</i>	[11, 24]
Learning provision	The campaign is with learning objectives for discovery learning, creative thinking and problem solving	[41]
Skill building	The campaign offers learned skills with attainable rewards throughout the game	[6, 42]
Rules	The campaign's game defines clear, spell-out, easy-to-follow rules	[43, 44]
Assessment	The campaign's game has immediate assessment and feedback.	[43, 44]
Acceptance	<i>Assessments of the learning game's value that comprise attitudes and opinions about the learning artifact</i>	[7, 11, 24]
Motivation	The campaign's learning game is engaging, interesting and attractive	[30, 38]

Usability

The usability of a learning game focuses on how easy it is to learn and how much fun users will have while learning [45, 46]. Usability testing, according to [46], is a method of evaluating specific components in a program that affect the user's ability to effectively perform the tasks that the creator expects them to be able to complete. In terms of the crowdfunding campaign proposal, the usability evaluation of learning games primarily refers to the extension

of traditional usability engineering methods and the evaluation of proposal quality, which includes representation mode, proposal narrative, and social interaction feasibility.

Usefulness

The usefulness for learning games is related to the learning objectives. Criteria related to usefulness are to elicit cognitive reactions and improve learning [35]. The usefulness of computer applications emphasizes its importance and appropriateness in relation to the high-level objectives of the users [35]. Higher-level user goals are relevant to learning objectives in the computing learning environments [35]. In this way, usefulness assessment aids in determining the effect of learning software based on the learner's experience and skills [43]. This may also be extended to learning games to ensure that the learning objectives are met during the learning progress [47]. More specifically, assessment can focus on how users can build skills, acquire game rules for knowledge development, game feedback, and assessment mechanisms for future game improvement.

Acceptability

Learning game acceptability is linked to the mental interpretation of the learning program attribute, which includes beliefs and views about the learning artifact [35]. According to Sanchez, acceptability is decided by the user's judgment concerning the worth of the learning game's usability and usefulness [47]. Learning game acceptability is related to the exploitation context of use and concerns its relevance to available technologies and instructional curriculum [36]. Therefore, acceptability evaluation should be accomplished at an early stage of designing games, in order to check whether the available resources are suited to the learning game requirements as well as the learner's characteristics. Evaluation should verify how the learning game can enhance the learner's interest and motivation. This will ensure the development of a learning game suitable to the expectations of the learner. Because the crowdfunding campaign is the proposal rather than the final product for evaluation, motivation and interest are based on campaign content rather than actual game play.

Assessment and Feedback

The effectiveness of feedback provided to the user while using a learning game is an important consideration in judging its quality. In order to be effective, the feedback should be connected to better outcomes in users' performance. Several researchers have identified specific aspects of feedback that make it effective in improving performance. Marzano, Pickering, and Pollock (2001) reported that feedback produces the best results when it is specific, delivered frequently, and provides sufficient information on what needs improvement and how to improve [48]. The effectiveness of feedback provided to the user while using a learning game is an important consideration in judging its quality. To be effective, the feedback should be connected to better outcomes in learner performance [37, 44].

Rules

Rule design is a critical part of game development, and small alterations to game rules can have an impact on a game's overall playability and the resulting game dynamics. High quality learning games can infuse game rules that have the capability to personalize a learner's learning path, by assessing readiness, providing effective feedback, and determining the

appropriate level of challenge for the learner [49]. Clearly defined game rules allow players to naturally learn knowledge by interacting with the environment [49]. Fine-tuning and balancing rule sets in games is often a laborious and time-consuming process. Using well designed learning games with appropriate scaffolds and support built in can target a learner's zone of proximal development [12].

Representation mode

Representation for the crowdfunding campaign refers to the proposal content and is easy to follow. It consists of the internal representational world of the learning game, which in our context we use to mean the representational learning resources that may include inserted dynamic graphics, image, and video, etc. and may include metaphors [47] and narration [38]. The representational modes should be designed in a way that leads to enhanced motivation and performance [36]. No matter how rich and meaningful the information is, or how elegant the interface is, if learners cannot understand it, the game's instructional value is greatly reduced [41]. Learning game can use a clear presentation format, to deeply engage learners in its content.

Motivation

Motivation can either enhance or serve as a serious impediment for learning. It consists of the learner's engagement and implication in the game's tasks on which he becomes more involved and devotes more time and effort [34, 50]. There is a substantial research base connecting motivation with increased performance. When users are motivated, it increases the effort and energy they expend in activities that are directly related to their needs and goals and determines whether they pursue a task with enthusiasm or with apathy [51, 52]. Other researchers have demonstrated a connection between motivation and improved cognitive process, specifically what users pay attention to and how effectively they process the information [52, 53].

Narrative

Narrative-centered learning environments show significant potential for providing engaging learning experiences that are tailored to individual learners [54]. By leveraging the motivational characteristics of narrative and games along with the adaptive pedagogy of intelligent tutoring systems, narrative centered learning environments offer a promising platform for learners to acquire enhanced problem solving, strategic and analytical thinking, decision making, and other twenty-first century skills [39, 55]. Narrative-centered learning environments offer a promising vehicle for delivering experiences that are both effective and engaging and improve learning outcomes [14].

Interactivity

Interactivity addresses whether or not a game creates an engaging instructional experience for learners based on how they actively interact with the game [56]. According to constructivist learning theory, learners create deeper understandings and knowledge of the world by experiencing the phenomena they are learning and interacting with it [40, 57]. Therefore, learners who actively engage with the content by answering questions, making decisions, or performing other observable actions [58] score highly on this dimension. If a game

pattern becomes apparent too early, then immersing the player to reach form is almost certainly not going to occur [34].

Skill building

Learning games provides opportunities for learners to shape skills, such as problem solving [31]. The “21st Century Skills” dimension analyzes the types of skills learners use while engaging an apps or games, preparing them for the 21st Century, technology-enhanced, modern world. To define specifically the abilities that are considered “21st Century” skills, materials released by multiple professional organizations, including The Institute of Museum and Library Services (2014), partnership for 21st Century Skills (2009), and Assessment & Teaching of 21st Century Skills [11], identified skills building that has the ability to solve complex problems, collaborate and communicate with others, user information, effective media and technology skills, and life and career development skills. Game related 21st century skills can be assessed, and these skills can be developed through game-based design activities [11]. These guiding principles and learning games can be evaluated in terms of how they prepare learners for success using 21st Century Skills.

Learning provision

The learning game should have specific and clear goals that match with the instructional objectives describing the targeted skills and knowledge [47]. The achievement of these goals depends on a set of rules which consist of constraints the learner must fulfill [29]. According to Coughlan and Morar in 2008, an effective piece of educational software ensures that its content and activities are aligned to its instructional objective(s) [38]. Therefore, every game designed for educational purposes should have its instructional objective aligned tightly to its content.

Therefore, the **aim of the research** is to understand user perceptions of a successful learning game, guided by TAM, could help understand the pedagogical aspects in adapting effective ICT for learning game development, and assists game developers, educators, practitioners, and entrepreneurs in developing more competitive learning games.

2. RESEARCH METHODS

An assessment online survey was designed based on learning game assessment rubrics to allow online Kickstarter users to rank a learning game on the Kickstarter website. A set of eight criteria were defined as rules, learning objectives, narrative context, organization and user friendliness, engagement/motivation and fun, interactivity and collaboration, skill building, and assessment and feedback. They are scored from 0 to 2; 0= Does not Meet Expectations or Low as “Poor” (0), 1=Meets Expectations or Medium (1) as “Fair”, and 2=Exceeds Expectations or High as “Good” (2). Totally 115 participants’ randomly select a crowdfunding campaign from the sample pool of comprising sixty-four Kickstarter learning games were collected for further analysis.

The statistical analysis was conducted using STATA 15 software, College station, TX. Descriptive statistical analysis including percentage of ranking types, and criteria’s mean value was computed. Furthermore, Fisher’s Exact Test, and Wilcoxon-Mann-Whitney test was conducted for pairwise comparisons. Multivariate Logistic Regression Model was conducted by using eight criteria to predict the outcome of the success of the crowdfunding learning games.

3. RESULTS AND DISCUSSION

The research found that more than 50% of the ratings are “Good” for each participant when evaluating a successful game (See Table 2). Most of the ratings are “Poor” and “Fair” for unsuccessful games, except for the criteria, Interactivity and Collaboration. Furthermore, Skill building, Learning provision, and Rules had more ratings in “Poor” than “Fair”. Skill building should provide different levels of the game that build on prior learning skills. Learning provision requires multiple learning objectives. The rules need to be well written that all users can easily participate. The findings indicated that unsuccessful education games did poor in helping learners building skills and without well-defined game rules and learning goals. Bivariate analysis between success and unsuccess games for each criterion by using Fisher Exact Test. The result indicated that there are statistically significant differences for Representation mode ($p < 0.0001$), Skill building ($p < 0.0001$), Learning provision ($p < 0.0001$), Rules ($p = 0.0003$) and Narrative ($p = 0.008$) (See Table 2).

Table 2. Percentage of three ranking types for eight criteria grouped by crowdfunding success or unsuccess games

Criteria	Subgroup	n	Poor	Fair	Good	P
Representation mode	Success	95	4 (4.2%)	24 (25.3%)	67 (70.5%)	<0.0001
	Unsuccess	16	4 (27.3%)	12 (72.7%)	0 (0%)	
Interactivity	Success	96	7 (7.3%)	26 (27.1%)	63 (65.6%)	0.45
	Unsuccess	16	3 (18.2%)	4 (27.3%)	9 (54.5%)	
Skill building	Success	98	8 (8.2%)	28 (28.6%)	62 (63.3%)	<0.0001
	Unsuccess	16	9 (54.5%)	4 (27.3%)	3 (18.2%)	
Learning provision	Success	98	5 (5.1%)	36 (36.7%)	57 (58.2%)	<0.0001
	Unsuccess	16	9 (54.5%)	4 (27.3%)	3 (18.2%)	
Narrative	Success	96	9 (9.4%)	29 (30.2%)	58 (60.4%)	0.008
	Unsuccess	16	6 (36.4%)	7 (45.5%)	3 (18.2%)	
Motivation	Success	98	4 (4.1%)	42 (42.9%)	52 (53.1%)	0.087
	Unsuccess	16	1 (9.1%)	12 (72.7%)	3 (18.2%)	
Rules	Success	96	10 (10.4%)	29 (30.2%)	57 (59.4%)	0.0003
	Unsuccess	16	9 (54.5%)	4 (27.3%)	3 (18.2%)	
Assessment	Success	97	17 (17.5%)	25 (25.8%)	55 (56.7%)	0.149
	Unsuccess	16	6 (36.4%)	6 (36.4%)	4 (27.3%)	

*Significant level $P < 0.05$

To review the perception gaps among these dimensions for successful or failed crowd funding campaigns, pairwise comparison was conducted between these dimensional means. Figure 2 showed the gaps between successful and unsuccessful games in criteria rating. Among them, learning provision, Representation mode, Skill buildings, and these are followed by, Rules; they demonstrated larger difference gaps in decreasing order. Learning provision is about correlating multiple learning objectives. Representation Mode enables users to gain a thorough understanding of the game's various aspects while also developing an understanding of the context. Unsuccessful games, in general, lack multiple learning objectives, are difficult to understand about learning components in the game's context, and have limited levels of building learning skills.

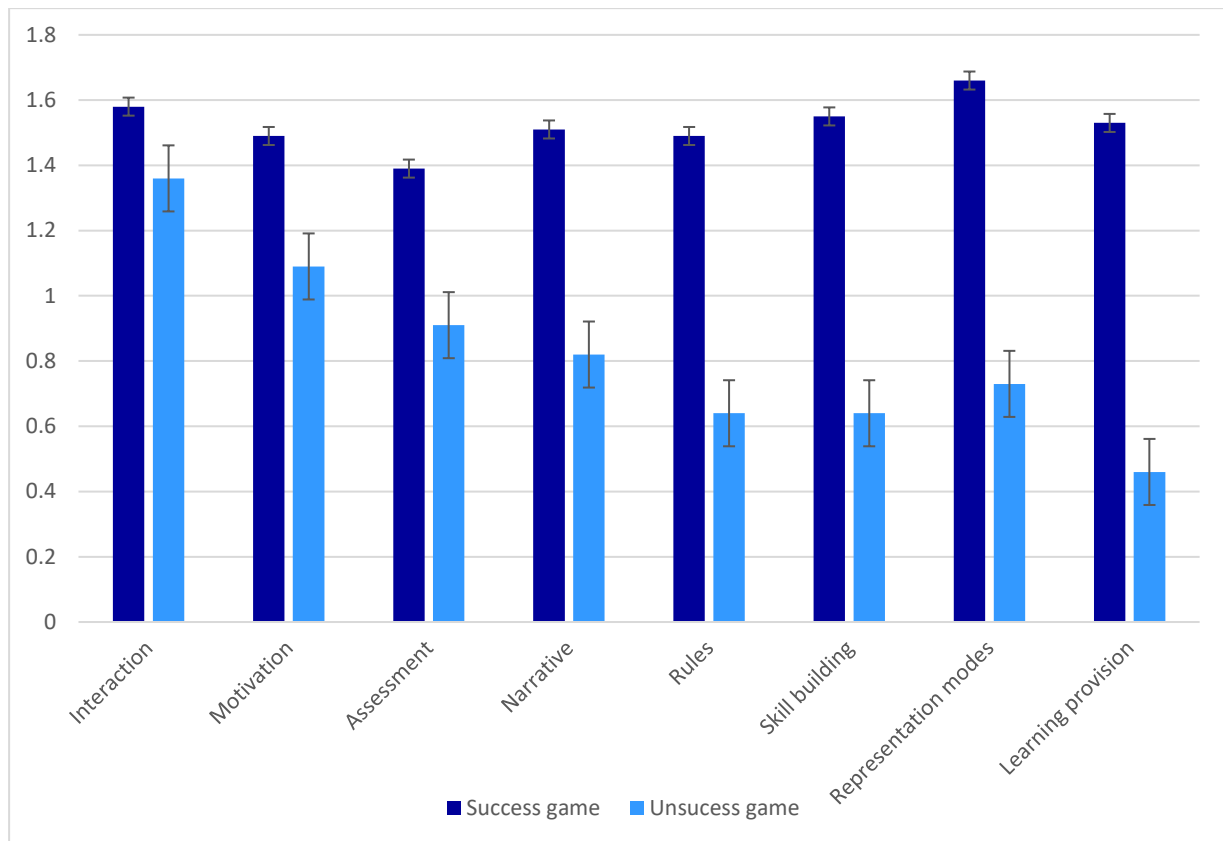


Figure 2: Pairwise comparison of sample means between successful and unsuccessful games with assessment criteria rating.

Wilcoxon-Mann-Whitney test for comparing means indicated that Representation mode ($U = 4.73$, $p = 0.0001$), Skill buildings ($U = 3.6$, $p = 0.0003$), Learning provision ($U = 3.56$, $p = 0.0004$), Narrative ($U = 2.98$, $p = 0.003$), Motivation ($U = 2.2$, $p = 0.00281$), as well as Rules ($U = 3.31$, $p = 0.003$) are statistically significant. Interestingly, Interaction, motivation, and assessment showed no differences between means of success and unsuccessful games (Table 3). This indicated that regular interaction with others and/or with the game during game play is insufficient for users to learn. The fact that the game is so engaging that it is difficult to put down does not imply that users will learn anything from it. Assessment and feedback do not always assist the player in learning from his or her mistakes. Feedback should be immediate and specific, providing assistance to the player.

Table 3. Wilcoxon-Mann-Whitney Test of eight ranking assessments based on successful or fail grouping

Criteria	Category	Obs	Mean	Std. Dev.	<i>U</i>	Sig
<i>Representation mode</i>	Success	99	1.66	0.55	4.73*	0.0001
	Unsuccess	16	0.73	0.47		
<i>Interactivity</i>	Success	98	1.58	0.62	0.86	0.389
	Unsuccess	16	1.36	0.81		
<i>Skill building</i>	Success	99	1.55	0.64	3.6*	0.0003
	Unsuccess	16	0.64	0.81		
<i>Learning provision</i>	Success	99	1.53	0.59	3.56*	0.0004
	Unsuccess	16	0.64	0.81		
<i>Narrative</i>	Success	98	1.51	0.66	2.98*	0.003

	Unsuccess	16	0.82	0.75		
<i>Motivation</i>	Success	98	1.49	0.58	2.2*	0.0281
	Unsuccess	16	1.09	0.54		
<i>Rules</i>	Success	96	1.49	0.68	3.31*	0.0009
	Unsuccess	16	0.64	0.81		
Assessment	Success	99	1.39	0.76	1.95	0.0513
	Unsuccess	16	0.91	0.83		

*Significant level $P < 0.05$

Finally, multivariate logistic regression was conducted using the success of the game as the outcome, and the eight criteria were independent variables (Table 4). The result found that Representation mode, and Skill building had statistically significant effects on the success of the game. In general, among these eight dimensions, skill building is important because it provides multiple levels of the game for learning. A good learning game in Representation mode allows users to be self-involved in a game with a similar storyline and characteristics in order to gain valuable learning experiences.

Table 4. Multivariate Logistic Regression predicting the success of the educational game crowdfunding

Criteria	Odds ratio	P Value	95% confidence interval
Rules	0.57	0.48	-1.01~2.15
Learning provision	0.61	0.47	-1.05~2.28
Narrative	0.69	0.39	-0.87~2.25
<i>Representation mode</i>	1.27	0.04*	0.11~5.10
Motivation	-0.95	0.35	-2.95~1.05
Interactivity	-0.84	0.13	-0.19~0.24
<i>Skill buildings</i>	1.68	0.04*	0.08~3.32
Assessment	-0.79	0.29	-2.26~0.68

*Significant level $P < 0.05$

4. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

Learning games can aid in the improvement of both teaching and learning. It is critical to recognize that high-quality games have a greater chance of having a positive impact in educational settings. The Learning Game Evaluation Rubric developed in this study combined several well-established principles of effective pedagogy with design principles related to technology. This study assesses the crowdfunding game successfulness using three aspects:

usability, usefulness, and acceptance, which will cover the game's content and functionality as well as support game-based learning, with a focus on campaign content, layout, and whether game-based learning concepts will be used.

In addition to the functionality of the campaign, the user's perception is influenced by the campaign's usefulness in decision making. To be successful, the game development campaign must be represented in a way that allows for recursive and transformative problem solving. The player may leave the game with a new skill set or a different perspective on the world. As they progress through the game, players have the opportunity to learn new skills. The player's ability to learn new skills determines the game's progression. Multiple learning objectives are required, as is the ability to demonstrate higher level thinking. This method also allows players to learn more about the game and gain a better understanding of how everything fits together.

Usability can be used to evaluate the accessibility of the user interface, game mechanism, and gameplay. Acceptance can be used to assess the user experience of educational games, primarily the playability of educational games, aesthetic experience, and quality of enjoyment. Usefulness is used to evaluate the effectiveness of learning, including knowledge acquisition, metacognition, social interaction, and the effectiveness of promoting learning.

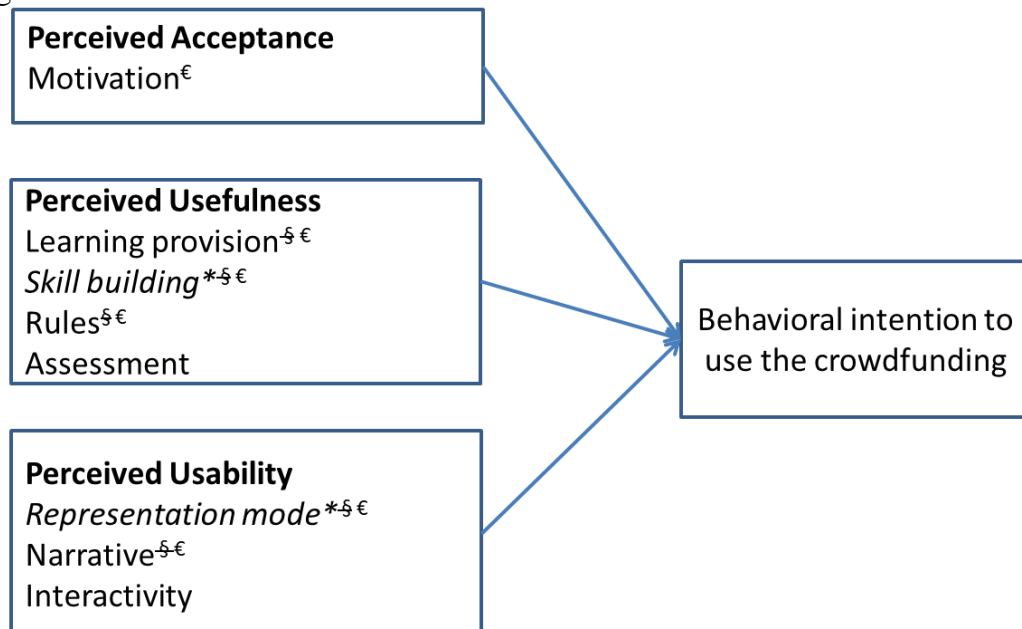


Figure 3. Perception model for crowdfunding learning game success based on TAM
^{*} multivariate statistical significance, [§] bivariate comparison statistical significance, [€] Wilcoxon-Mann-Whitney statistical significance.

In Figure 3, a perception model for crowdfunding, learning game success based on TAM was proposed. It lays out the framework for assessment based on usability, usefulness, and acceptance in learning game crowdfunding success. Among them, representation mode, demonstrates the quality of crowdfunding's proposal's content, and provides the first impression for the investor to learn the feasibility of the proposal. Compared to the narrative and interaction, these are the basic tasks for a game to complete. Focusing on the content of the game, its storyline, and whether it comprised interaction components, the game creators should pay more attention to shape the content, so that can attract individual backers. Narrative also indicates, whether the story of the game will be interesting and attractive, which will make a difference between successful and unsuccessful games.

The mode of representation reflects the quality of the crowdfunding proposal's content. When digital content in the form of learning games is selected and properly incorporated into a blended learning program, it can help to improve instructional time efficiency. The impact on learning is the most important factor in determining the success of any intervention or program aimed at improving the quality of learning available to users.

Pinelle and others believe that game usability refers to the degree to which players can learn, control and understand a game; at least three factors are included: game play, game interface, and game mechanism [59]. From the current research, game usability evaluation mostly focuses on the core content of the design and development of the game interface, game play, and game mechanics. For start-ups, usefulness can provide users with values that are most important. Rules define a clear set of explicit instructions or principles governing conduct within a particular game. The assessment and feedback provide a looping mechanism for user inputs to achieve game improvement. Skill building, on the other hand, is the benefits that users will get for self-development. Particularly, for a learning game, this turns out to be the critical benefit for determining whether the game is useful.

Motivation and learning provisions represent whether users' acceptance for the game with subjective opinions. Both showed an overall impression of whether a user would like and accept the game. Learning provision indicated whether this learning game offers true learning experiences between successful or unsuccessful games, which reflected the statistically significant differences by comparing the means. This reflects the overall learning quality impression for the learning game.

Successful projects tend to have smaller, and therefore, more realistic objectives [60]. Research has been conducted to understand crowdfunding funding goals, staff selection, shorter campaign length of Kickstarter, and whether number of days from start to finish of the project lead to the estimation of success for crowdfunding projects in the game field.

The study has some limitations due to examined user perception which is based on a limited number of user responses in a limited number of crowdfunding campaigns. Our study primarily focused on examining the technical-related success factors of crowdfunding learning games within the educational context. However, it is important to expand the analysis to encompass ethical implications and ownership rights related to game development. These considerations become particularly relevant when implementing crowdfunding initiatives in the education sector, as they could contribute to a more comprehensive and innovative approach for the success of educational games. These aspects provide potential avenues for future research and can lead to valuable improvements in the field of successful educational games. The study explored the subjective perceptions, according to eight assessment dimensions, but the reasons underlying the success of crowdfunding in learning games needs further exploration. In this study, in addition to assessing the impact of quality while using quality evaluations of campaign content and media elements, user indicators on availability and length were also assessed. Opportunities examine the effectiveness of internationally adapted campaign content, and the use of multiple languages, attracted international support for campaigns and cultural adaptability for consumer engagement in e-commerce.

Online crowdfunding sites offers new channels for engaging in creative funding ideas for educational game development and support informal learning interaction. **This study explores the pedagogical aspects of using TAM in analyzing crowdfunding learning games that help educators use ICT to create new learning games more effectively, thus providing more customized, active, and flexible learning experiences, while also enhancing involvement and access to game development, and enabling more effective feedback and assessment.** It also helps game designers and investors to better characterize and develop highly

competitive learning game that support critical thinking and offer learning potential to the community. This study provides an empirical analysis by identifying important ranking dimensions to predict the success of crowdfunding in game development.

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