Flow and the Art of ERP Education

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Abstract. As ERP systems have become a part of most organizations, universities have responded by incorporating these systems into their curriculum. This research looks at how the use of a simulation game can be used to enhance student learning through student engagement and learning intentions. Drawing upon flow literature and expectation-confirmation theory, this study presents an Attitude Change Model of game-based ERP Learning. In particular, this study focuses on how student immersion influences satisfaction and attitude change in ERP learning.

Keywords: Enterprise resource planning (ERP) · Flow · Attitude change

1 Introduction

The adoption and use of ERP systems has become a common way for firms to optimize efficiency [1, 2]. Universities and corporate training programs have realized the importance of ERP systems in the business world and have incorporated such systems (e.g., SAP or Oracle) into their curricula and training [3, 4]. As ERP system implementations normally encompass a substantial redesign of business processes [5, 6], the use of such systems as a learning environment provides an superb chance to allow students to gain understanding into the integration and functionality of business and IT [7].

While there has been an extensive body of ERP research on specific topics such as adoption and implementation [8, 9], assimilation [1], job characteristics and satisfaction [10], and ERP upgrades [11], extant research remains relatively scant in examining flow-based ERP learning. Given the significance of ERP learning this study poses the following research question: how does flow influence satisfaction and attitude change? Using the lens of expectation-confirmation theory (ECT) [12] the proposed study presents an attitude change model of flow based ERP learning. To address this research question a survey of students participating in an ERP simulation game will be used to test the research model.

2 Conceptual Background

The conceptual background in this paper draws on expectation-confirmation theory (ECT) and flow [12, 13]. These two concepts are used to from the research model which seeks to examine how subjects perceive the use of a simulation game to enhance their

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learning outcomes. The model proposed here looks at how flow immersion influences a student's attitude change and intention to learn material presented to the student through a business simulation.

2.1 Expectation-Confirmation Theory

The expectation-confirmation theory (ECT) is a theory which describes how preconditions to a stimulus are used to measure a pre and post behavioral attitude [14]. The ECT comprises four primary constructs: expectations, perceived performance, confirmation, and satisfaction [3]. The ECT posits that an individual's expectations and perceived performance affect positive or negative disconfirmation after an event takes place (like training). If a service beats expectations (positive disconfirmation) post-procurement satisfaction will be increased. If a service fails to meet initial expectations (negative disconfirmation), the consumer is likely to be dissatisfied. Individuals who had a positive experience will be likely to repurchase a product or service, while, at the same time, an individual who is dissatisfied would be less likely to buy the service again [2, 15]. IS researchers have applied the theory to IT usage [12, 16, 17] and web consumer satisfaction [18]. In the context of this study the theory will be applied to flow based learning.

Research also has demonstrated that ECT has a strong relationship with individual's attitude formation and future behavior intention [19]. In particular, ECT emphasizes external influence and information processing of consumer/users in attitude formation and modification. The aforementioned research streams have distinctive perceptions in examining attitudes. This study is in line with influence focus stream and examines the role of flow in a team based environment and a learners' attitude towards this learning.

2.2 Flow

Flow is a psychological concept of human behavior where one would be completely absorbed and engaged in an activity that nothing else seems to matter [20]. Drawing on past conceptions of flow, Nah et al. [21] characterize common flow characteristics as including the following elements: (1) a challenging activity that requires skills, (2) merging of action and awareness, (3) clear goals and immediate feedback, (4) concentration on the task at hand, (5) a sense of control, (6) loss of self-consciousness, (7) transformation or distorted sense of time, and (8) self-rewarding or autotelic experience. Flow, as a behavioral state, has been found to positively influence learning, attitudes, intentions, and behaviors [13]. A popular extension to flow literature is the impact this state has on game participants. As individuals engage in a game activity they immerse themselves into the context of the game and ignore all other distractions. When a game is used to facilitate ERP learning it provides an ideal context to study flow and how it influences attitude change in individuals.

Learning intention describes a future state of the learner to engage in more learning related activities [9]. The greater the individual feels there to be a benefit to learning the ERP material the greater they should be induced to want to learn the material. This attitude perception of the learning activity (a simulation game in this context) the better they will be inclined to continue to learn about ERP systems.

We rely on ECT to examine the role of flow in satisfaction and attitude change of the ERP simulation game, a tool used to facilitate ERP learning in higher education. The proposed research model can be found in Fig. 1.

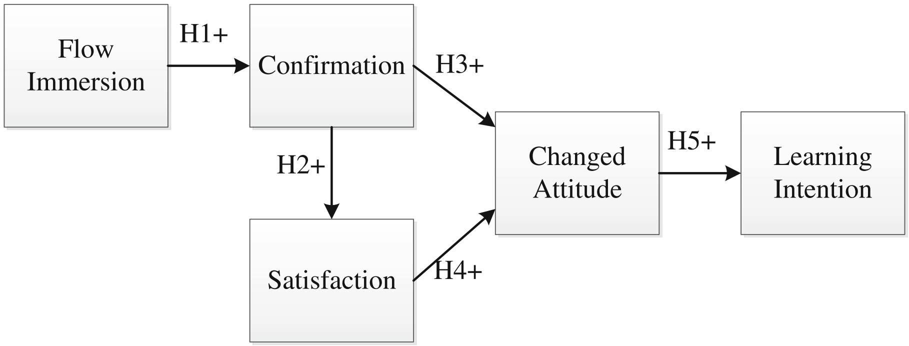

Fig. 1. Research model

2.3 Flow Immersion

Flow immersion is seen as an individual's sense of being in a complete state of concentration and focused attention to the event taking place [13], in this context ERP learning through a simulation game. In the context of this study flow is seen as being the result of two factors: telepresence and focused attention. Telepresence can be thought as a sensation of being a part of the phenomenal environment created by a medium (simulation game here) such that it induces the user of the medium to react directly with the items in the environment as if they were physically present objects [21]. Telepresence can also be referred to as the facilitated perception of an environment or the extent to which one feels present in a mediated situation [21]. Focused attention is achieved when one is focusing attention on the task/environment to the point where other thoughts are removed and distractions are ignored while attending to the task [22]. For flow to occur, the user needs to be immersed into the gaming situation such that complete focus is achieved. This also implies that the task is the focus of attention and the technology used is not that big of a deal. This focused attention will allow individuals to concentrate and achieve their goals in the context of a simulation game.

With this sense of immersion, individuals would focus on the game and its outcome all while performing tasks associated with an ERP system. With this strong sense of flow immersion the individual is motivated to perform tasks well to achieve the goal of winning the game. In the long run, the individual will feel that they learn more about the ERP system. At the same time, confirmation can be positive or negative depending on whether the individual perceived game engagement is above or below initial expectations before participating in the ERP simulation game [17]. This leads us to the following hypothesis:

H1: Flow immersion positively influences confirmation of learning the ERP simulation game.

Confirmation is defined as a learner's awareness of the comparison between the expectations of the ERP simulation game use and perceived learning outcome [12]. The difference between a learner's preliminary expectations of the ERP simulation game and his/her perceived learning outcome is captured in the confirmation construct and it is also viewed as a deviation from the initial anticipations [16]. Many ECT research studies have directly linked confirmation to satisfaction (e.g. [2, 3, 12, 16, 19]. Following these previous studies the expectation is that a learner's confirmation would increase satisfaction, leading to the following hypothesis:

H2: Confirmation of the learning outcome positively influences satisfaction of learning the ERP simulation game.

Confirming the expectations of the ERP simulation game outcome proposes that individuals are able to understand the potential benefits of understanding ERP systems (e.g., gaining IT knowledge and understanding complex business process). Validation (i.e., confirming a belief) would increase attitude change [3]. Individuals who strongly confirmed the ERP simulation game outcome would have a more positive post-attitude than pre-attitude assessment of the game as a learning action. For those individuals who do not experience what they expected they are likely to have a negative attitude toward the ERP simulation compared to their pre-attitude. Hence, we hypothesize:

H3: Confirmation of the learning outcome positively influences changed attitude toward learning the ERP simulation game.

Satisfaction is defined as an individual's affective feelings about the learning achieved through the ERP simulation game [12]. In the context of IT usage multiple studies have found a significant link between the association of satisfaction and attitude towards IT artifacts [3, 14]. Thus an individual's high satisfaction of learning the ERP system would result in increased feelings toward it. Thus, we have the following hypothesis:

H4: Satisfaction of learning the ERP system positively influences changed attitude toward learning the ERP simulation game.

Changed attitude refers to individual learners' altered (increased or decreased) assessment from the experience of the ERP simulation [2, 23]. The purpose of the ERP simulation game is to engage individuals in a learning act in a flow inducing environment with a focus on ERP functionality and business process. These individuals as learners engaged in flow, would increase their appraisal toward the ERP simulation experience and be induced to learn about ERP systems.

H5: Changed attitude toward learning the ERP simulation game experience positively influences intention to learn ERP systems.

3 Method

The proposed research model would be evaluated using a survey of students engaged in an ERP simulation game [4]. Established scales for the constructs are found in the appendix and come from existing literature. The model would be tested using SEM as the data analysis choice.

3.1 Subjects and Procedure

Subjects for this study will be both graduate and undergraduate students at a Midwestern public university in the United States. The students will be enrolled in an ERP class which uses the ERP simulation game as a method to facilitate student learning in the classroom. Students will be assigned to a team of four to run a fake company. Students will be introduced to the game and get an understanding of how the game operates. After the students have finished participating in the game students will be asked to fill out the survey.

3.2 Measures

The potential measures and their sources are shown in the appendix. These measures are consistent with how past studies have measured and analyzed ECT [24]. The measures will use a 7-point Likert-type scale. Items regarding the background and demographics of the students such as gender, academic standing, and prior experience with ERP systems will also be part of the questionnaire.

4 Expected Contributions and Discussion

This study has the potential to validate how individuals enter a state of flow when they participate in a game to enhance student learning. By systematically investigating flow in a team-based learning situation, we will extend the theoretical boundaries of the ECT with a focus on attitude change. This state of flow induces them to participate in the game more thoroughly than the standard lecture approach of instruction. The results will show how attitude changes their approach to learning.

There is no single way for education about ERP systems to be delivered. One of the keys to long term success in education is to change your approach and continuously improve the course content and delivery. This study seeks to support the assumption that inducing students into a state of flow will positively impact their task performance and enhance their learning outcomes. The results are expected to be of value to instructional designers and instructors so that a state of flow can be induced while still engaging students in a playful activity. It should also be pointed out that inducing flow might not enhance learning for all students. Some students might react negatively to the stress associated with being asked to run a simulation game. Other students might not like the team dynamics of the simulation game.

A future study might expand this work and look at how other factors interact with flow and its impact on learning. For example, individual difference (need for cognition or student skill levels) might impact the ability of students to enter a state of flow [22]. Gender might also influence how students perceive the simulated competition or its related stresses [3, 22]. These differences in each student are a part of every course delivery and should be studied to determine which might need to be addressed in course design.

Appendix: Measurement Items

Telepresence - The following items are answered on a 1–7 scale of strongly disagree to strongly agree [13].

I forgot about my immediate surroundings when I was engaged in the ERP simulation game.
When the simulation game ended, I felt like I came back to the "real world" after a journey.
During the simulation game, I forgot that I was in the middle of a course assignment.

Focused attention - The following items are answered on a 1–7 scale of strongly disagree to strongly agree [21].

When going through the simulation game, I am not distracted.
When intruded by someone while going through the simulation game, I am annoyed.
When going through the simulation game, I don't surf the Internet or things like that.
When going through the simulation game, I have a feeling of concentration.
When going through the simulation game, I am unaware of what is going on around me.

Confirmation of learning the simulation game.
Seven-point scales anchored with "strongly disagree" and "strongly agree" [3].

Learning via the SAP simulation game was better than what I had expected.
Overall, most of my learning expectations regarding the learning SAP simulation game were verified.
Overall, most of my learning expectations regarding the learning SAP simulation game were confirmed.

Satisfaction of learning the simulation game [3].
Seven-point semantic scales: How do you feel about your overall experience with the SAP simulation game:

Very dissatisfied/very satisfied.
Very displeased/very pleased.
Very frustrated/very contented.

Attitude toward learning the simulation game [3].
Seven-point semantic scales: For me, learning the SAP simulation game is:

A bad idea/a good idea.
Foolish/beneficial.
Undesirable/desirable.

Intention to learn ERP systems [3].
Seven-point scales anchored with "strongly disagree" and "strongly agree".

I intend to learn about ERP systems.
I predict that I will learn about ERP systems.
I am willing to learn about ERP systems.

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