Role of Computer Self-efficacy and Playfulness as Determinants of Academic Success in Learning Spreadsheets

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ABSTRACT

The purpose of this study is to find antecedents of academic performance of university students in using Spreadsheets. Using data collected from the students of the course in which Spreadsheets are taught, we develop a model to identify the influential antecedents to their performance in the exam on Spreadsheets. Prior literature suggests the role of playfulness and Computer self-efficacy as the two most influential factors in the academic success of students. We collected demographic information, along with data on the two factors, playfulness and Computer self-efficacy. We used average of their actual performance in two quizzes in spreadsheets to determine their academic performance. PLS method used on the data revealed the following evidence: 1. Playfulness influences Computer self-efficacy. 2. The role of self – efficacy in influencing grades diminishes in the presence of playfulness, which has a strong influence on grades, 3. Experience directly influences grades.

INTRODUCTION

It is not without a reason why Spreadsheets are called the 'killer application' that brought about the personal computer (PC) revolution. Spreadsheets are to a manager what a hammer is to a carpenter and therefore it is imperative for business students to learn the necessary skills for good performance in spreadsheets. While there are numerous studies on various aspects of Spreadsheets, few studies have been done with respect to understanding the antecedents of student performance in spreadsheets. In this paper we focus on two possible determinants of success in learning Spreadsheets: computer playfulness and Computer self-efficacy.

LITERATURE REVIEW

Computer self-efficacy

Computer self-efficacy is borrowed from Computer self-efficacy to suit specific needs of computer learning experience. Computer self-efficacy (Li-shih Huang, 2003), is the belief that one has the capability to perform a particular behavior. Bandura (1986) defines Computer self-efficacy as: People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses. Computer self-efficacy is strongly related to effort and task persistence. Individuals with high Computer self-efficacy beliefs are likely to exert effort in the face of difficulty and persist at a task when they have the requisite skills (Bandura and Cervone, 1983, 1986).

Computer playfulness

The idea of playfulness has been used in IS research (Agarwal & Karahanna, 2000). The concept of playfulness draws from Flow theory (Csikszentmihalyi, 1975,1990) . Flow theory states that when people are involved in a work they can experience flow. Flow experience is characterized by sense of losing track of time, perceived control, satisfaction and intrinsic motivation. Flow experience has been found to improve learning outcomes in Business Management courses (Guo, Klein, Ro, & Rossin, 2007) and foreign language courses (Egbert, 2004). Flow experience is a separate construct from computer playfulness, however the two are based upon similar theoretical perspective. Flow experience and playfulness are also affected by communication media richness (Dennis & Kinney, 1998; Kahai & Cooper, 2003). One study investigated the relationship between two communication media (email and instant messaging) and flow experience (Chen, Yen, Hung, & Huang, 2008). Playfulness, a closely related construct, was used as a covariate. Borrowed from playfulness**,** computer playfulness explains an individual's tendency to interact spontaneously, intensively, openly, creatively, and imaginatively with computers. Dewey (1913) defined playfulness as "the capacity to draw satisfaction from the immediate intellectual development of a topic, irrespective of any ulterior motive". More recently, Barnett (1991) described playful individuals as "Individuals with playful dispositions are said to be guided by internal motivation, an orientation toward process with self-imposed goals, a tendency to attribute their own meanings to objects or behaviors (that is, to not be dominated by a stimulus), a focus on pretense and non-literality, a freedom from externally imposed rules, and active involvement" (Mehta & Bhattacharyya, 2004).

Performance

Grades were used as a proxy to performance. The final outcome measure, performance, is gathered from the grades of the students received their quizzes. The grades were taken as the average of two quizzes covering Spreadsheets. In case the students missed a quiz, the one which was taken was considered.

Experience

The amount of time devoted to Spreadsheets influences the performance in Spreadsheet related activities.

Control Variables

To control for externalities, we controlled for Gender, Age.

Artifact: Spreadsheets

Use of spread sheets has been considered as one of the most powerful tools in a manager's paraphernalia. Knowledge of spreadsheets helps students in their future career and also in many upper-level courses. It therefore becomes important to study the antecedents of good performance in Spreadsheets.

HYPOTHESIS DEVELOPMENT

Role of experience in Performance

Students with a background in Excel are more likely to do better in the quizzes. Intuitively, we believe experience in the use of spreadsheets would increase performance. Hence,

H1: Experience positively influences Performance

Role of experience in Computer self-efficacy

Using the spreadsheet over a long period will increase confidence associated with completing a given job related to use of Spreadsheets. Hence,

H2: Experience positively influences Computer self-efficacy

Role of playfulness in Computer self-efficacy

H3: Playfulness positively influences Computer self-efficacy

Role of computer playfulness in performance and learning

Potosky (2003) found that interaction between computer playfulness and performance during training was supported, suggesting that individuals with high computer playfulness who performed well during training made higher (more positive) post-training judgments. Gerber (2001) found that employees with a higher level of cognitive playfulness demonstrated higher test performance and more positive affective outcomes as compared to those with a lower level of cognitive playfulness. Hence,

H4: Playfulness positively influences performance

Role of Computer self-efficacy in performance and learning

Karl et al. (1993) found that feedback had a greater impact on the performance of high Computer self-efficacy individuals. Harrison & Rainer (1997) found a relationship between self –efficacy and performance. They found that increased performance with computer-related tasks was found to be significantly related to higher levels of Computer self-efficacy. Hence,

H5: Computer self-efficacy positively influences Performance

Model

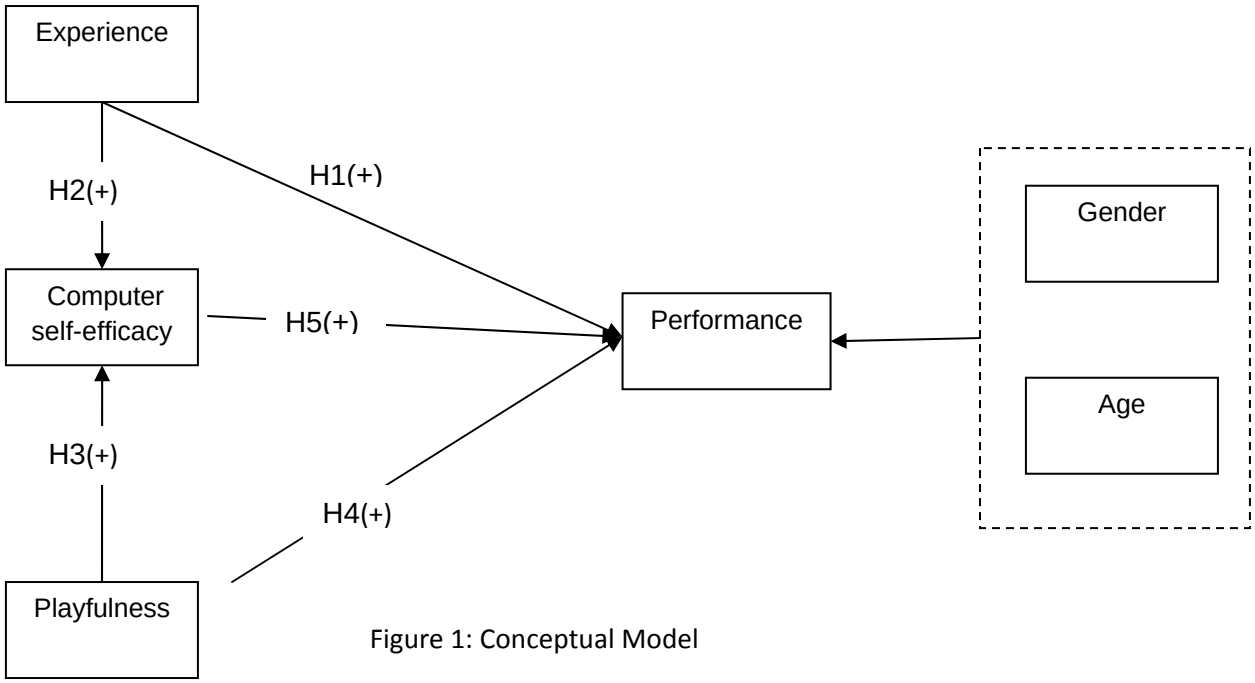

Figure 1: Conceptual Model

Scale Development

Scales for Computer self-efficacy were modified from scales by Compeau, D. and Higgins (2003) and Computer playfulness was modified from Hackbarth et al (2003) and Aggarwal and Karahanna (2000).

Methodology

The subjects were undergraduate business students taking the first course of Information Systems which included Spreadsheets as the first part. The primary statistical method employed was the PLS technique (Software: PLSGraph Ver. 3 Courtesy Dr. Wynne W. Chin, University of Houston). PLS, an SEM (Structural Equation Modeling) technique, is a second generation data analysis technique that not only assesses the structural model but also assesses the measurement model thereby enabling us to simultaneously do factor analysis with hypotheses testing (Marcoulides and Saunders 2006). It also is able to map both formative as well as reflective measures. While there are cases where PLS has been considered a good technique for small sample size, others suggest practicing caution with small sample size (Marcoulides and Saunders 2006) and have suggested a ratio of 15 respondents to one parameter to minimize problems with deviations from normality. The sample of 167 cases is significantly more than the required 90 (6 x 15) responses to satisfy the above criteria.

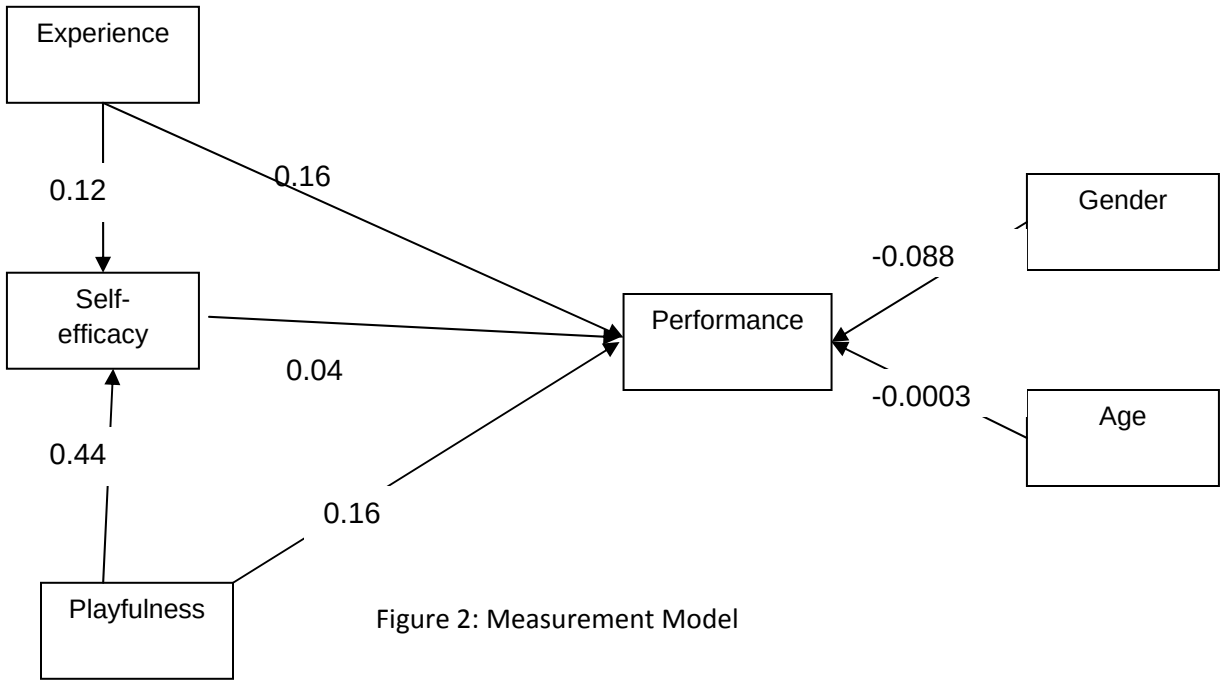

Figure 2: Measurement Model

Demographic data

Gender, age, past experience. Inculcation of these in the PLS model will control for these.

Table 1 Characteristics of Respondents

Gender	**%**
Male (32)	49 %
Female (34)	51 %
Age	
Mean	24.3
Median	22
Std. Dev.	8.1
Performance	
Mean	6.4
Median	6.5
Std. Dev	1.37
Past Experience	**%**
Mean	2.36
Median	2
Std. Dev.	2.35

Table 2 Table of Hypothesis

	Mean	Standard Error (STERR)	t Statistics	Results

Experience -> Performance (H1)	0.1539	0.0869	1.7718	Reject
Experience -> Computer self-efficacy(H2)	0.1216	0.1022	1.1903	Accept
Gender -> Performance	-0.0697	0.0991	0.703	Accept
Playfulness -> Performance (H4)	0.1606	0.1213	1.3242	Reject
Playfulness -> Computer self-efficacy (H3)	0.4421	0.1156	3.8246	Reject
Computer self-efficacy -> Performance (H5)	0.0285	0.1339	0.2125	Accept

Table 3 Latent Variable Correlation

	Experience	Gender	Grade	Playfulness	Computer self-efficacy	Age
Experience	1.00	0.00	0.00	0.00	0.00	0.00
Gender	0.04	1.00	0.00	0.00	0.00	0.00
Grade	0.22	-0.06	1.00	0.00	0.00	0.00
Playfulness	0.29	0.12	0.22	1.00	0.00	0.00
Computer self-efficacy	0.25	-0.06	0.16	0.48	1.00	0.00
Age	-0.12	-0.08	-0.04	-0.17	0.00	1.00

ANALYSIS

Discussion

Knowing the determination of good academic performance has always been an area of interest for academicians. From the latent variable scores we can see that both playfulness and experience play equally important role in student academic performance. Self-efficacy does not play a significant role in improving grades. However self-efficacy as an end to itself is significantly influenced by playfulness. The insignificance of self-efficacy to academic performance may be related to the fact that most students have used Excel at different levels before taking the class and the quizzes were not challenging enough for them to use special effort or persistence. This also explains the importance of experience in the model. If most of the Excel skills taught in the course are already known to the students or students can use their Excel

knowledge acquired from other places to pass the quizzes, they would not need to think about whether they are capable enough to overcome the difficulties in the quizzes.

Conclusion

From the conclusions from the above, instructors could challenge the students in doing day to day fun activities related to Spreadsheet. This will have a twofold effect as evidenced by the model. First, it will increase academic success in the form of good grades and second, it will improve confidence in doing Excel related activities.A survey of the students' existing knowledge of Excel may help the instructor redesign the course objectives and use more challenging materials to motive students learning. Combined with playful assignments or fun activities, students academic performance can be promoted to a new level.

Limitations and future directions

Like any other cross sectional study with data collected at one point in time, it becomes a challenge to infer causality and therefore we suggest caution when interpreting the results. This being a preliminary pilot study, we had a total sample size of 65. After further cleaning the questionnaire, we will redo the survey on approximately 120 students. In the end, more studies need to be done regarding the other antecedents like computer anxiety (Hackbarth et al. 2003), computer attitudes (Webster 1992) and feedback (Karl et al. 1993). At the dependant variable level, we could use satisfaction and learning (Webster and Martocchio 1992). Also, the same test can be applied to other courses like languages (Egbert, 2004) etc.

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