ISSN: 2473-3857
v3 n4386

A Predictive Study of Learners' Perceived Performance in Higher Education Online Learning Environments

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Abstract

As higher education continues to embrace the world of online learning, a significant amount of time, effort, and money has been allocated for understanding the interaction between users and technology and how that interaction impacts student performance. The authors of this study investigated the direct and indirect paths along several variables to predict learners' perceived performance in online learning environments. In order to present the clearest picture, the authors developed six different scales to examine significant factors identified by the authors (task value, α=.868, and technology satisfaction, α= .818) in addition to a set of TTF factors (ease of use, α=.879, quality of content, α=.863, and relationship between users, α=.835) identified by Goodhue and Thompson (1995) in the TTF model to predict learners' perceived performance (α=.784). A path analysis was conducted using R software version 1.1. Model fit was inspected via TLI = 0.984, CFI = 0.995, RMSEA = 0.057, SRMR = 0.010, and RMR = 0.006 and found to be acceptable to good. For the endogenous variables, the explained variance in task value in the model is 68.6%, the explained variance in technology satisfaction in the model is approximately 20%, and the explained variance in individual perceived performance in the model is 67.6%.

Keywords: Individual performance, task value, online learning environments, LMS, TTF.

1. INTRODUCTION

As higher education continues to embrace the world of online learning, a significant amount of time, effort, and money has been allocated to understanding the relationship between users and technology, and how that interaction impacts student performance. Making the examination of

ISSN: 2473-3857
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this more complex, there have also been significant changes in technology itself. The rapid evolution of educational technology has enabled educators to enhance not only their teaching skills, but the overall experience of their students both in the classroom and in online learning environments. These more effective educational contexts have thusly led to improvements in students' academic performance. For educators to continue their success in promoting learning processes, they must identify the intersection between collaborative, communicative, and motivational learning environments using learning management systems (LMS) that also meet the needs of their students. For example, in higher education online settings, instructors can use LMSs to facilitate learning within a student's busy lifestyle by developing flexible course requirements and using systems that can be accessed anywhere by a variety of devices (e.g., computer, smartphone).

The purpose of this study is to examine how students perceive the performance of the LMS used in fully online classes at a higher education research institution. Due to their complexity, information system models are very difficult to test in their entirety (Goodhue & Thompson, 1995); therefore, this study will only focus on one segment of the Task-Performance Chain model (TPC). However, other parts of the TPC model relevant to other domains have been tested (McGill, & Klobas, 2009). With a focus on LMS, this study uses parts of the TPC model factors to predict the impact of the platform on individual performance used in a large number of fully online courses. It also investigates the contribution of each variable of the TPC model and the correlation (See table 2) between these factors and individual perceived performance. It aims to test how technology use can predict user perceived performance in online courses.

2. TASK TECHNOLOGY FIT FACTORS

Goodhue and Thompson (1995) initially identified 16 dimensions of TTF to be measured, with the final eight success factors: "(1) data quality; (2) locatability of data; (3) authorization to access data; (4) data compatibility (between systems); (5) training and ease of use; (6) production timeliness (IS [information system] meeting scheduled operations); (7) systems reliability; and (8) IS relationship with users". The focus in this paper remains on a specific set of dimensions that are documented as critical important factors when evaluating *individual* performance in online learning environments, specifically those used to measure learning purposes. We used several variables to predict learners' perceived performance. In order to present the clearest picture, we examine significant factors identified by the authors (task value and technology satisfaction) in addition to a set of TTF factors (ease of use, quality of content, and the relationship between users) identified by Goodhue and Thompson (1995) in the TTF model. Task value is defined as how the individual perceives the importance, the interest, and the usefulness of the tasks (Eccles, 1983; Wigfield, Eccles, Yoon, Harold, Arbreton, Freedman-Doan, & Blumenfeld 1997; Cole, Bergin, & Whittaker, 2008; Bong, 2004). With task value identified as a motivational component, we assume that the value of the task motivates learners to use the LMS. Thus, their performance is enhanced in proportion with the value of the task. Based on the aforementioned literature and the documented impact of those variables, the authors chose these constructs to measure the perceived performance of students with LMS in online learning environments.

Individual Performance

The fitness of an information system to the individual's task, the system's features, and the quality of the support available to the user all have an impact on individual performance (Dennis, Wixom, & Vandenberg, 2001). In addition to TTF, user attitudes serve as predictors of individual performance as well as the technology characteristics, individual characteristics, and task requirements (Goodhue & Thompson, 1995; Pendharkar, Khosrowpour, & Rodger, 2001; Staples and Seddon, 2004). Other researchers, such as Junglas, Abraham, & Watson (2008) and Mathieson and Keil (1998), tested other TTF factors (e.g., ease of use, and mobility and locatability) related to subject's use of technology and the extent to which, if any, that they affect subjects' performance. As such, researchers and practitioners strive to identify the factors that have the most impact on performance in online learning environments.

3. SIGNIFICANCE OF THE STUDY

Goodhue and Thompson (1995) state that the TTF model consists of eight factors that can be used to determine how information systems can be used for understanding the impact of technology on individuals' performance. It is critical to define which factors affect users' performance and the variability they carry in relation to perceived

ISSN: 2473-3857
v3 n4386

performance. This knowledge would allow instructors to concentrate their efforts on factors over which they have control that enhance learning and teaching outcomes. Likewise, it is critical that private firms that support higher education capitalize on this knowledge to improve service delivery. Companies may spend a significant amount of money hiring technicians and striving to enhance learning and teaching at the university.

If individuals have a positive experience with technology, there is a higher likelihood that they will use it, and consequently, improve their learning outcomes. Drennan, Kennedy, and Pisarski (2005) found that positive perceptions towards technology positively affect students' satisfaction with the course in blended learning environments. Students' perceptions are a critical factor of their success and achievement in online learning environments (Carver & Ksloski, 2015). A study conducted by Staples and Seddon (2004) suggests that future research should identify other factors that contribute to an individual's performance. In response, this study examined additional factors to determine their reliability as predictors of individual performance. This study investigates a set of TTF predictors in addition to task value and technology satisfaction and how these predictors impact learners' perceptions as well as evaluates learners' experiences in online classrooms.

Instrument and Reliability

The authors' chosen factors include: ease of use (4 items), task value (5 items), relationship between users (5 items), overall satisfaction with technology (5 items), quality of content (8 items), and finally, the perceived performance (5 items). The instrument was tested and descriptive statistics and the reliability estimates are in Table 1.

The sample

The sample, students enrolled in online courses, was recruited through Amazon.com's Mechanical Turk (MTurk), an online system for recruiting research participants across the globe. A total of 711 students responded to the survey.

4. METHOD AND RESULTS

A path analysis was conducted in R version 1.1 (R Core Team, 2016), using lavaan (Rosseel, 2012) and sempath (Epskamp and Stuber, 2017). The model converged normally after 25 iterations. Model fit was inspected via the Tucker Lewis Index (TLI = 0.984), Comparative Fit Index (CFI = 0.995), Root Mean Square Error of Approximation (RMSEA = 0.057), standardized root mean square residual (SRMR = 0.010), and the root mean square residual (RMR = 0.006) and was found to be acceptable to good. The model summary is below in Table 3 and Figure 1. For the endogenous variables, the explained variance in task value in the model is 68.6%, the explained variance in technology satisfaction in the model is approximately 20%, and the explained variance in individual perceived performance in the model is 67.6%. All of the coefficients are standardized.

Research Hypotheses

Hypothesis 1. Higher levels of quality of content will lead to stronger perceived task value.

Hypothesis 2. Higher levels of perceived task value will lead to stronger individual perceived performance.

Hypothesis 3. Higher levels of ease of use will lead to stronger technology satisfaction.

Hypothesis 4. Higher levels of technology satisfaction will lead to stronger individual perceived performance.

Hypothesis 5. Higher levels of relationship between users will lead to stronger individual perceived performance.

Hypothesis 6. Higher levels of perceived performance will positively correlate with task value

Hypothesis 7. Perceived performance will positively correlate with satisfaction with the technology.

Hypothesis 8. Quality of content will positively correlate with Perceived performance.

5. RESULTS

Hypothesis 1 is supported. Higher levels of quality of content leads to stronger perceived task value ($\beta = .927, p < 0.01$).

Hypothesis 2. Higher levels of perceived task value will lead to stronger individual perceived performance ($\beta = .360, p < 0.01$).

Hypothesis 3 is supported but it is weak. Higher levels of ease of use will lead to stronger technology satisfaction. ($\beta = .444, p < 0.01$).

ISSN: 2473-3857
v3 n4386

Hypothesis 4 is supported with a weak path in the model. Higher levels of technology satisfaction will lead to stronger individual perceived performance (β=*.051 p < 0.05)*.

Hypothesis 5 is supported. Higher levels of relationship between users will lead to stronger individual perceived performance (β =*.103, p < 0.01)*.

Hypothesis 6 is supported. Higher levels of perceived performance will positively correlate with task value. (*r =.731, p < 0.01)*.

Hypothesis 7. Perceived performance will positively correlate with satisfaction with the technology. (*r =.264, p < 0.01)*.

Hypothesis 8. Quality of Content will positively correlate with Perceived performance. (r = .774, p < 0.01). (See Figure 1 for the path coefficients).

6. DISCUSSION AND IMPLICATIONS

This study contributes to the literature in several important ways. First, the results of this study indicate that quality of content has been found as the strongest predictor of learner's perceived performance among the other predictors. The performance of learners will depend on how they perceive the quality of the content instructors design. Thus, instructors need to focus as much of their effort on the quality of the content they provide in online courses even though learners are not very satisfied with the LMS they are using in online learning environments. This finding confirms the importance of online quality of content, which includes major assessment tools (e.g., assignment) that measure learners' actual performance (Yang, & Cornelious, 2005). The quality of content also correlates highly with the value of the task as shown in table 2.

Second: the second strongest predictor of learners' perceived performance in online learning environments is the value of the task learners perceive, which is the anticipated worth of the task viewed by learners. As mentioned earlier, task value is defined as how the individual grasps three elements in the task: the importance, the interest, and the usefulness of the tasks (Eccles, 1983; Wigfield, Eccles, Yoon, Harold, Arbreton, Freedman-Doan, & Blumenfeld 1997; Cole, Bergin, & Whittaker, 2008; Bong, 2004) in relation to their own educational needs. This finding indicates that instructors are supposed to enhance the factors that lead learners to a highly perceived value of the online course tasks.

Three, information system companies and online education organizations should collaborate when designing the capabilities of the technologies and the functions of the LMS to enhance learning and teaching in online learning settings. Online instructors become disappointed when they encounter "the gap between their vision and the current reality" with the use of technology in online learning environments (Muirhead, 2000, p.7). Instructors have specific needs that fit with their designing strategies and tools when developing online course content. This is important especially since the use of technology affects the teacher's' performance. Muirhead (2000) reported that teachers' use of unfit technology led them to frustration, which is a confirmation of the TTF that states that when the task requirement and the technology characteristics align, this enhances individuals' positive performance (Goodhue and Thompson, 1995).

Four, on the other hand, the perceived ease of use by learners, relationships between users, and technology satisfaction were not strong predictors of learner's perceived performance in online learning environments. This finding indicates that the ease of the perceived LMS use, user relationships, and the satisfaction with the technology perceived by learners are not strong predictors of learners' perceived performance. The authors examined the aforementioned factors as a critical set of factors that contribute to learners' perceived performance, however, further studies are needed to investigate other critical factors that contribute to actual learners' performance instead of perceived learners' performance.

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ISSN: 2473-3857
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ISSN: 2473-3857
v3 n4386

Appendices

Construct Scales	Mean	SD	α	Number of Items
Ease of Use	4.25	.62444	.879	4
Task Value	3.97	.80257	.868	5
Relationship Between Users	3.94	.71353	.835	5
Technology Satisfaction	4.04	.8265	.818	5
Quality of Content	3.95	.65450	.863	8
Performance	4.11	.63263	.784	5

Table 1: Descriptive Statistics and Reliability Estimates for Subscales

	E_OF_U	T_V	R_B_U	TECH_S	Q_OF_C	PER
EASE OF USE	-					
TASK VALUE	.325**	-				
RELATIONSHIP BETWEEN USERS	.437**	.338**	-			
TECHNOLOGY SATISFACTION	.444**	.162**	.221**	-		
QUALITY OF CONTENT	.458**	.812**	.578**	.169**	-	
PERFORMANCE	.508**	.731**	.504**	.264**	.774**	-
**** P < 0.01 LEVEL (TWO-TAILED).**						

Table 2: Pearson Correlation Between Constructs

PATHS		ESTIMATES	STD.ERR	Z-VALUE	P(>|Z|)
QUALITY OF CONTENT ⇒ TASK VALUE ⇒ PERFORMANCE	Indirect	0.334	0.035	9.440	0.000
EASE OF USE ⇒ TECHNOLOGY SATISFACTION ⇒ PERFORMANCE	Indirect	0.023	0.011	2.127	0.033
EASE OF USE ⇒ PERFORMANCE	Direct	0.169	0.027	6.332	0.000
QUALITY OF CONTENT ⇒ PERFORMANCE	Direct	0.336	0.044	7.633	0.000

Table 3: Path Coefficients. See the graph below for more information

ISSN: 2473-3857
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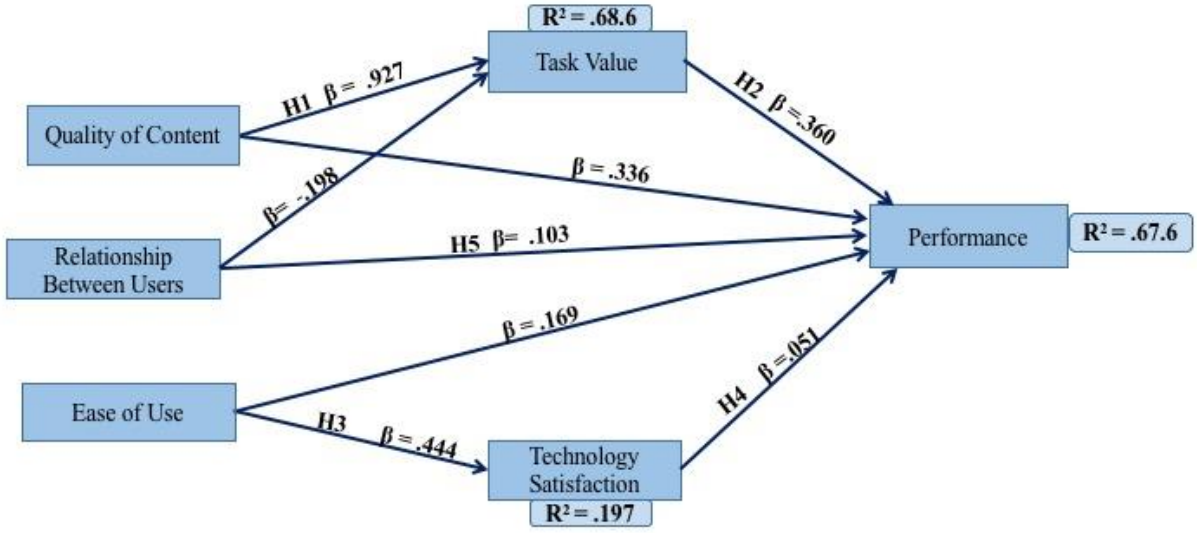

Figure 1

ISSN: 2473-3857
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Scales and Items

Performance:
I really enjoyed completing this course.
Performing well in this course made me feel good about myself.
I felt that doing well in this course was imperative for me.
Completing this course moved me closer to attaining my career goals.
I feel able to perform well in this course.

Ease of Use:
The technology is easy to use.
The technology is user-friendly.
I learned how to use the technology quickly.
The technology does everything that I would expect it to do.

Task Value:
I liked the subject matter of this course.
I will be able to use what I learned in this course in my job.
In the long run, I will be able to use what I learned in this course.
This course provided a great deal of practical information.
I was very interested in the content of this course.

Relationship Between Users:
The instructor provided feedback in a timely fashion.
I felt comfortable conversing through the online medium.
The instructor is responsive to student needs.
The instructor provides timely feedback about student progress.
There was a lot of student-instructor interaction.

Technology Satisfaction:
Technological problems hurt my participation.
I had to spend time dealing with technological problems and glitches.
My internet connection limits my access to this course.
I can't use my own device to access this course.
The website makes it difficult for me to complete my work for this class on time.

Quality of content:
This course included many interesting activities.
The knowledge I gained by taking this course can be applied in many different situations.
The quality of instruction is excellent.
I feel confident in my ability to learn this material.
I felt motivated to explore content related questions.
I can apply the knowledge created in this course to my work or other non-class related activities.
Learning activities helped me construct explanations/solutions.
I can describe ways to test and apply the knowledge created in this course.