

Accounting Students' Performance in Web-Based Courses: The Case of the Hashemite University of Jordan

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Online learning has been used in accounting education for many years; arguably the subject matter lends itself to this kind of delivery. In this research the authors apply the Inputs-Environment-Outcome (I-E-O) model to investigate the ways in which students' participation in the online learning environment, their views of the use of technology and perceptions of instructor interactivity affect their performance on an intermediate accounting module. The subjects were all students at the Hashemite University in Jordan. The I-E-O model was estimated using structural equation modelling (SEM) techniques. The results suggests that the two most important variable in explaining student performance (outcome) are prior performance on the prerequisite module (an input variable) and student participation in the online learning environment (an environment module). However, the relationships between prior performance, participation and current performance are richer and more complex than a simple direct link between prior performance and current performance.

Field of Research: Accounting Education

1. Introduction

The use of web-based courses is currently popular in many fields of education, especially in business schools (Friday et al., 2006). Several factors led to this popularity among students and universities, such as flexibility in terms of time and place and the availability of a better participation environment in comparison with traditional learning (Hammoud et al., 2008).

The use of information and communication technologies is considered one of the most important elements in accounting education (Walsh, 1998) and the professional bodies have long called for the application of ICTs in accounting classrooms (see, for example, the American Accounting Association (AAA, 1989) and the Accounting Education Change Commission (AECC, 1990)). Technology developments in the field of accounting and rapid changes in the accounting context have led to the need for better methods of delivering accounting education to students (Albrecht & Sack, 2000) and an increased interest in the adoption of virtual learning to support traditional learning (De Lange et al., 2003). Nowadays, many universities and business schools are investing more in web-based learning management systems such as Blackboard™. The use of these packages by accounting educators is increasing rapidly (Watson et al., 2007). Therefore, there is a consequent need for accounting educators to design effective

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virtual learning environments using these packages to enhance student outcomes (De Lange et al., 2003).

The rapid increase in Internet use in developing countries in general and Jordan in particular led to the acknowledgement of the probable important impact of using e-learning on student outcomes (Al-Adhaileh, 2010). Most Jordanian universities, including the Hashemite University, are currently adopting e-learning due to the increased number of students and the reduction in government funding to universities (Alkhadash & Abuloum, 2005). The Hashemite University (HU) was established in June of 1991, and the teaching process effectively started in September of 1995. In 2003, the Hashemite University started to employ web-based technology in the teaching and learning processes, including the implementation of Blackboard. The Accounting Department at the Hashemite University is considered the university leader in applying web-based learning. The department has developed a collaborative pedagogy which encourages students to interact in the virtual and face-to-face meetings. Clearly it is important to identify the factors that influence the success of learners in the new form of learning (Shih & Gamon, 2001). The research reported here was conducted to provide some assurance regarding the effective implementation of online instruction through an analysis of the learning environment.

Therefore, the research design of the current study attempts firstly to answer a broad question (i.e., what factors may affect student performance in web-based courses?). This research then moved to very specific questions related to student perceptions of the interaction activities in web-based learning (i.e., Do student perceptions of the interaction of instructors in web-based courses affect their performance? Do student perceptions of the use of technology affect their performance? Does student participation in the online learning environment affect their performance?).

The results highlight some important factors affect student performance in web-based learning in Jordan. Some of these findings are consistent with the findings of the previous studies but on the other hand, other findings are contrary to the findings of more than one study.

The most important contribution of the current study is that it conducted the analysis in the context of a developing country (Jordan). Therefore, this study will fill the gap in the literature regarding the effect of using web-based learning on student performance in Jordan. The study also adds to collective knowledge of the effects of e-learning by adding a case study set in a new context to the existing range of studies. In doing so it broadens the scope of research on e-learning effectiveness. The findings of this study should help instructors and university administration to determine which factors should be considered when designing any web-based course. They will also be able to improve student performance in this type of learning.

The remainder of the paper is organized as follows. The next section provides a discussion of the relevant literature and the theoretical model of the study. This is followed by a discussion of the study methodology and data. In the section thereafter,

the results are presented and discussed. The final section contains concluding comments and suggestions for further studies.

2. Literature Review

Several studies have concentrated on student perceptions of the use of online or virtual learning in accounting education. For instance, AlKhadash and Al-Hadrami (2006) have investigated the effect of using web-based materials in teaching accounting principles in Jordan. They concluded that student perceptions toward web-based courses are positively affected by the use of the web material. They also found that this type of learning has a significant, positive influence on students' understanding of the course concepts and ideas and students' computer skills. Dowling et al. (2003) investigated 206 University of Tasmania students studying accounting information systems and taught by the same instructor to investigate the relationship between student performance, measured by the students' grades on the midterm and final exams, and students' previous performance in three prerequisite courses, age, mode of study and study location. One group of students was taught using traditional face-to-face methods whilst the other used a blended approach combining face-to-face and online instruction. Comparison of the two groups showed that the blended format was positively related to student performance. Moreover, the researcher found that in both groups previous performance in the prerequisite courses had a significant positive influence on student performance. Another study conducted by Sungkyoo et al. (2009) in the US at California State University to investigate the effect of student characteristics (i.e., GPA, age, commuting distance, gender, working hours and marital status) on their performance in online and offline accounting courses. The sample was 91 students (54 online and 37 offline) and was taught by the same instructor. The results of this study indicated that for both groups, student performance, measured by their final test score, was only affected positively by GPA, but GPA and gender influenced offline student performance more than it did online student performance.

Rainsbury and Malcom (2003) investigated student perceptions of the use of discussion boards in an intermediate accounting course. The researchers designed and evaluated a discussion board exercise that required students to discuss some accounting concepts and prepare financial statements. The results showed that student perceptions were positively associated with the use of the discussion board in improving their learning. The study also found a low positive relationship between students' evaluations of the discussion board and their final exam grades. Bradley and Carol (2006) examined student examination performance at the University of Melbourne in relation to the usage of a newly developed online learning system known as MarlinaLS™. The participants were enrolled in a second-year undergraduate accounting course. They found a direct relationship between student examination outcomes and usage of the system. They also found that students' prior knowledge was a significant factor in determining student performance.

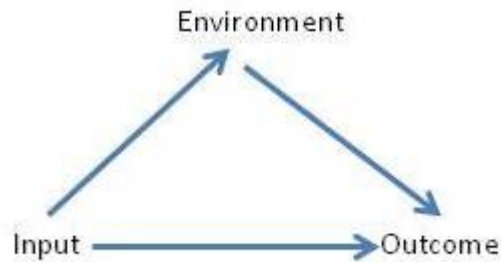
2.1 The Theoretical Model

The effect of the learning environment on student outcomes is one of the most important relationships that different theories and models have tried to investigate and explain (Stage & Dannells, 2000). Three main models have investigated the influence of different factors on different student outcomes. These are Tinto's (1975), Pascarella's (1985) and Astin's I-E-O models (1993). Tinto's model mainly aimed to investigate the factors that influence student attrition in the US. In his causal model, Pascarella examined five independent variables: student background, pre-college traits, institutional structure and organizational characteristics, interaction with socializing agents and quality of student efforts. The third, Astin's (1993) I-E-O model, questioned whether differences in students' personal characteristics (input-variables) have a major influence on their outcome or whether this is caused by other variables. This study adopts Astin's model for the following reasons: (1) this model has been used widely in previous studies. (2) this model takes into account differences in input, such as student characteristics, which reduces the possibility of omitted-variable bias in determining how other variables [environmental] affect student outcomes [output] (Thurmond, 2003). (3) the I-E-O model allows the researcher to take into consideration student characteristics, environmental factors and student outcomes. Accordingly, the process of evaluating these three elements can improve the argument regarding the causal conclusion of educational practices and student performance. (4) Astin's model is easier to understand and operationalize in research than other models (Strayhorn, 2008).

As shown by the direction of the arrows in the I-E-O model (Figure 1), input affects outcome directly and indirectly through environment. The I-E-O model has been widely used to investigate traditional learning settings (Campbell & Blakey, 1996; Astin & Sax, 1998) but less often in the context of e-learning (Thurmond et al., 2002; Thurmond, 2003). Overall, as Strayhorn (2008) notes, the model provides a useful basis for investigating the effects of learners' traits and experiences at college on their academic performance.

Previous studies have shown that a number of input variables have a significant effect on student performance. These include computer experience (Leasure et al., 2000; Muse, 2003); self-efficacy (Wang & Newlin, 2002; Liu et al., 2008); student attitudes towards web-based learning (Yu & Yang, 2006; Hammoud et al., 2008); motivation (Thompson & Lynch, 2003; Rodriguez et al., 2008) and prior performance (Dowling, 2003; Roberts & Dyer, 2005). One of the most important environment factors in learning is student interaction in the learning environment (Thurmond, 2003). Several studies have investigated interaction in e-learning and its effect on student outcomes. These include instructor interaction (Dennen et al., 2007), student participation in the online learning environment (Liaw et al., 2007; Coldwell et al., 2008) and students' perceptions of the use of technology (Billings et al., 2001; Thurmond, 2003).

Figure 1: Astin's I-E-O model



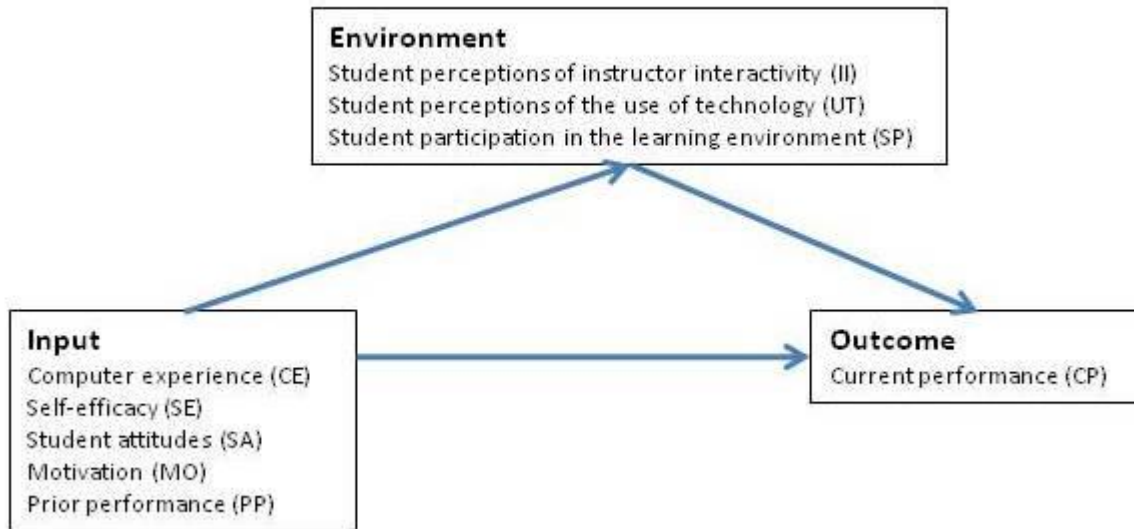
Based on the previous discussion Figure 2 expands Figure 1 to show the variables used in the current study; short names are shown in parentheses. As seen in Figure 2 student characteristics (Input) proposed to have double effects on student performance (Outcome) one that is direct and another one that is indirect through student interaction in web-based courses (Environment).

3. Methodology and Data

3.1 Methodology

The majority of studies that have used the I-E-O model have relied on surveys for data collection and this is the approach taken here. The input and environment factors in the model are unobservable (latent) variable and cannot be measured directly. However, the prior literature provides an important guide to variable development. Accordingly, the questionnaire (the study instrument) was developed that includes all of the identified indicators (questionnaire's items) from the literature. The developed questionnaire was translated into Arabic (the native language of the respondents) by two professional translators. The developed Arabic version of the study questionnaire was piloted using students enrolled in the Accounting Department at the Hashemite University in Jordan. Annex 1 shows the questionnaire items used in the study and their sources after eliminating nineteen items from the initial study questionnaire in order to derive a measurement model with acceptable model fit. Eighteen items elicited seven point scale Likert-type responses ranging from strongly disagree to strongly agree. Five items had categorical responses. Grades in the prerequisite course were used as a measure of prior performance. Current performance was measured using final grades at the end of the semester.

Figure 2: Application of the I-E-O Model



For the purpose of the current study and based on the I-E-O model and the literature review, the basic themes for each variable were defined as follows:

Computer experience (CE): the number of web-based courses a student has taken, perception of computer skills, and knowledge of electronic technology (Thurmond, 2003). Self-efficacy (SE): the students' evaluation of their confidence, ability and comfort in using the Blackboard system (Compeau and Higgins ,1995). Motivation (MO): the students' desire to perform and learn better and to earn knowledge (Sankaran and Bui, 2001). Student attitudes toward web-based learning (SA): the students' evaluations of enjoyment in the web-based courses and its attractiveness, whether the students believed that web-based learning provides new accounting knowledge, saves time and cost and allows freedom of learning (Hammoud et al., 2008; Yu & Yan, 2006). Prior performance (PP): the students' marks in a prerequisite course (Accounting II) (Dowling et al., 2003). Student perceptions of the interaction of instructors (II): student perceptions of their instructors' presence and student perceptions of their timely feedback (Thurmond et al., 2002; Thurmond, 2003; Dennen et al., 2007; Sun et al., 2008). Student perceptions of the use of technology (UT) student perceptions of the availability and reliability of the technology and Internet and the ability of technology to promote the effective use of time (Billing et al., 2001). Student participation in the online learning environment (SP): the frequency with which the course web-site was accessed and messages were posted to the discussion board as well as time spent working with course content (Billings, 2001; Picciano, 2002; Davies & Graff, 2005). Performance was defined as the final grade students obtained at the end of the web-based course. This is consistent with a number of studies (for example, Dowling et al., 2003; Davies & Graff, 2005).

3.2 Data

The study involved Hashemite University students on two courses, Intermediate Accounting and Managerial Accounting. Attendance requirements for the course oblige the students to attend three hours face-to-face per week. Participation in the research was entirely voluntary. Of 492 who were enrolled in these classes, 473 (96.1%) agreed to participate (259 from Intermediate Accounting and 202 from Managerial Accounting). Twelve questionnaires with more than 5% of the data missing were deleted. Thus, 461 (250 from female students and 211 from male) questionnaires were included in the analysis. The largest age group (222) were under 20 years old, as most of the students were fresh graduates from the high school. Two hundred and nineteen of the students were between 20 and 22. The majority of the students were single (94.4%), as they were still young. In addition, more than half of the students (53.4%) were not working; a little less than half (44.9%) were part-time workers and the remainder (1.7%) were full-time workers. The majority of the students (86.1%) owned computer and had a connection to the Internet (79.4%).

Correlation Analysis

Table 1 shows the correlation analysis among the input, environmental, and outcome variables. The results show that the strongest correlation existed between student prior performance and current performance. Followed by significant correlations between student participation and each of the current performance and prior performance. Similarly, significant correlation was found between student perception of instructor interactivity and each of prior and current performance. On the other hand student attitude toward web-based learning was the only input variable that had significant correlations with all environmental variables (SP, UT, and II) and each of prior and current performance. Moreover, a significant correlation exists between CE and each SA, MO, and SE.

Table 1: Correlation Analysis among input, environmental, and outcome variables

Variables	CE	SA	MO	SE	SP	UT	II	PP	CP
CE	1	.315*	.130*	.206*	-.068	.041	.121*	.044	.040
SA		1	.085	.030	.096*	.098*	.127*	.108*	.169*
MO			1	.035	.081	-.048	.052	.037	.028
SE				1	-.064	-.036	-.002	-.033	-.077
SP					1	.075	.074	.543*	.674*
UT						1	.092*	.047	.087
II							1	.164*	.211*
PP								1	.776*
CP									1

* P<.05

Structural Equation Modelling (SEM)

Structural equation modelling (SEM) was conducted to evaluate the extent to which student characteristics (input) and interaction (environment) affected student

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performance. SEM is defined as a “multivariate technique combining aspects of factor analysis and multiple regression that enables the researcher to simultaneously examine a series of interrelated dependence relationships among the measured variables and latent constructs (variables) as well as between several latent constructs” (Hair et al., 2010: 634). SEM is a family of statistical models that seeks to explain the relationships among multiple variables and to test a theory. A priori theory, such as that embodied in the I-E-O model, is a necessary condition to obtain useful results from SEM in order to specify the relationships in the model and estimate it. (The presentation here is a very brief summary of the detailed analysis undertaken. A full discussion can be found in Al Hadrami, 2012.)

One useful and succinct way of presenting the results is in the form of an estimated structural equation:

$$CP = 0.022CE - 0.032SE + 0.026SA - 0.001MO + 0.461PP + 0.063II + 0.015UT + 0.212SP$$

Overall the model explained 73% of the variance in current performance ($R^2 = 0.73$). The only two variables which had a significant effect on explaining current performance were prior performance on the prerequisite course (PP) and the level of student participation in online learning activities (SP). The parameter estimates (independent variable coefficients) shown here are unstandardized ones, that is they retain the scaling of the variables involved. Note from Annex 1 that the variables CE and SP are scaled differently from the others (and each other). The coefficients thus give only an indication of relative statistical importance of the variable and are not strictly comparable. However, SEM is capable of yielding much richer and more detailed results. These are summarised in Table 2. In particular, it is possible to distinguish direct and indirect effects on outcomes. The second row disaggregates the overall effect of the input and environment variables in current performance.

The input variables have both a direct effect on current performance (the bottom arrow in Figures 1 and 2) and an indirect effect via their influence on the environment variables. Obviously, only direct effects are shown for the three environment variables per se. Rows three, four and five of the table show the influences of the input variables on the environment. The R^2 figures show the proportion of the variance in each of the environment variables explained by the input variables.

The coefficients of effects shown in the table are standardized ones, that is transformations of the unstandardized estimates to remove differences in variable scaling and can be used for informal comparisons. These estimates correspond to effect-size estimates. According to Cohen (1988), values in the range 0.1 to 0.3 represent a “small” effect, those in the range 0.3 to 0.5 a “medium” effect and values greater than 0.5 a “large” effect. Values of 0.1 or greater are shown in bold.

Table 2: Direct and indirect effects

Factor (Dependent variable)	Determinant (Independent variable)	Direct effect	Indirect effect	Total effect
Current performance (CP) R ² = 0.73	CE	0.033	-0.054	-0.020
	SE	-0.039	-0.013	-0.052
	SA	0.050	0.053	0.103
	MO	-0.001	0.026	0.026
	PP	0.494	0.272	0.766
	II	0.090	----	0.090
	UT	0.023	----	0.023
	SP	0.428	----	0.428
Student participation in the learning environment (SP) R ² = 0.39	CE	-0.139	----	-0.139
	SE	-0.027	----	-0.027
	SA	0.097	----	0.097
	MO	0.060	----	0.060
	PP	0.598	----	0.598
Student perceptions of the use of technology (UT) R ² = 0.04	CE	-0.106	----	-0.106
	SE	-0.016	----	-0.016
	SA	0.171	----	0.171
	MO	-0.08	----	-0.08
	PP	-0.057	----	-0.057
Student perceptions of instructor interactivity (II) R ² = 0.06	CE	0.100	----	0.100
	SE	-0.012	----	-0.012
	SA	0.091	----	0.091
	MO	0.020	----	0.020
	PP	0.163	----	0.163

4. Discussion

As might be expected, it was found that prior performance had the strongest direct effect on student performance, which is consistent with most of the previous studies that have suggested that prior performance is the main predictor of the current performance of students (Dowling et al., 2003; Roberts & Dyer, 2005). However, the results enable us to shed some further light on the complex nature of this relationship. The results show that levels of student participation in online learning activities have a positive statistical relationship with their performance as measured by their final grades, even after taking in account their aptitude for accounting as revealed in their prior performance in the subject. This is consistent with a number of previous studies, which have suggested that environmental variables have significant influence on student outcomes (for example, Alstete & Beutell, 2004; Strayhorn, 2008).

Care must be taken before imputing causality from this result. Whilst it is appealing to conclude that students who participate more perform better, the reverse might also be true; that is good students show higher levels of participation in activities. There are several reasons why students who perform better may participate more. Firstly, they may be capable of more independent work than weaker students. Secondly, they may make greater use of the course web site to catch what they missed in class or find answers, explanations and summaries posted by other students. Thirdly, they may make

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greater use of the extra material some instructors put on the websites, for example “extension” content such as additional problems and quizzes. Students who perform well are usually more eager to access such materials in order to improve their performance as much as they can. Finally, in some courses, participation is graded and monitored by instructors and good students may participate more to boost their grades.

The results shown in Table 1 provide evidence for arguments in both directions. The second row shows a direct link between the dependent variable performance and student participation. The third row provides evidence for the idea that student participation is positively influenced by prior performance and provides an indirect link between current and prior performance. The bottom row shows a (weaker) positive relationship between students’ perceptions of instructor interactivity and prior performance; students who are better at the subject take a more positive view of their instructors. This may be because students with good prior performance are more active than students with lower prior performance. Therefore, they receive punctual feedback about their inquiries and responses from their instructors, which leads them to develop a positive perception of the interaction with their instructors unlike students who received lower grades in the pre-requisite course.

Overall the results suggest a virtuous circle comprising prior performance, student participation and student views of instructor engagement; the positive interaction of the three variables results in better current performance. On the other hand, the results did not show any significant effect of student motivation on current performance or any of the environment variables, contrary to the findings of more than one previous study (see, for example, Shih & Gamon, 2001; Roberts & Dyer, 2005). However, this finding is consistent with those of other research in the field of accounting education (Eskew & Faley, 1988; Gul & Fong, 1993). The results do not suggest that the nature of online technology has any particular relationship to performance in accounting courses. Results indicated that even if students have negative perceptions of technology, it does not inhibit performance, which is consistent with the findings of previous studies (Leasure et al., 2000; Kenny, 2002). One possible explanation for this is that the students in the current study had face-to-face contact with their peers and instructors, which helped them to acquire what they needed for their studies. Accordingly, this would minimize the effect of technology on their performance. Thus, even if students reported that use of technology is a waste of time, this would not affect their performance negatively. Moreover, Information technology has greatly improved since the early studies and many of the frequently reported barriers of slow speed limited functionality, patchy access and unreliability are no longer relevant. The current challenges are ones of designing ways of exploiting the technology’s capabilities rather than getting it to work. Neither do the results suggest any relationship between prior computer experience and student performance, contrary to the findings of Shany and Nachmias (2001) and Arbaugh and Duray (2002). However, this result is consistent with the later findings of Shih et al. (2006), which suggested that prior computer experience does not affect student outcome. Such results probably reflect the fact that today’s students all have a level of computer experience which allows them to work effectively within an online learning environment whereas, in the past, experience was much more variable.

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Similarly, self-efficacy (SE) is not significantly related to performance either directly or indirectly (via the environment factors). This finding is consistent with those of Liu et al. (2008), who found that student interaction (student logs of frequency and time spent on an online discussion forum) was not affected by student self-efficacy. This may be a product of the system used (Blackboard), as it does not require complicated skills or knowledge. In addition, students become experienced in using the system during other courses. Moreover, the use of blended learning at the Hashemite University helps students become more comfortable and confident in using the system, as they can find support from their peers and instructors. On the other hand, students who exhibit a positive attitude towards web-based learning (SA) also have a positive attitude to the use of technology (UT), with the former depending (statistically at least) on the latter. This is consistent with the findings of Hong et al. (2003), who found a significant, direct relationship between student attitudes toward using the Internet for learning and their perceptions of the online environment in promoting the learning.

A more surprising result concerns the relationship between computer experience and the environmental variables. Students with more computer experience tend to participate less in the online learning environment and take a more negative view of the use of technology for learning. Contrary to the findings of Vrasidas and Mclsaac (1999), who found that prior experience with computer-mediated communication (CMC) technology was one of the major factors influencing student participation. Zafeiriou et al. (2001) also found that students' familiarity with computers positively affects their participation in CMC. On the other hand students with more computer experience also had a more positive view of instructor interactivity. The overall effect is that there is no significant relationship between computer experience and student performance on the course. The conflicting weak relationships tend to cancel each other out.

5. Conclusions

It is important to recognize and understand factors that may affect student performance in a virtual learning environment in order to maximize the benefits from this type of learning. These factors must be taken into consideration while designing and delivering online courses (Alstete & Beutell, 2004).

The final model of this study provided support for the idea that student perceptions of the interaction activities that occur in web-based learning help directly to explain student performance (Campbell & Blakely, 1996; Astin & Sax, 1998; Thurmond, 2003; Strayhorn, 2008). The research findings indicated strong relationship between two environmental factors and student performance in web-based courses namely, student perception of the interaction of instructors and student participation in the web-based learning environment. These findings underline that it is not simply the technology used that makes a difference in student performance in web-based learning, but it is also the pedagogy used in teaching the accounting courses at the Hashemite University. This pedagogy focuses mainly on collaborative learning by presenting the subject content in a structured way and giving students the chance to discuss this content face-to-face and online with each other and the instructor. Improving instructor interactive learning is more important in promoting improved performance than improving technology.

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Integration between teaching practices and the online learning technology in blended learning at the Hashemite University is a crucial issue in fostering student performance. This is not to say that technology is unimportant or that it can be ignored. However, the functionality, usability and reliability of e-learning technology have rapidly improved to the point where questions of how it is deployed and exploited become more important than what it is capable of doing.

Therefore, instructors must keep these two factors in mind and try to develop their interactivity by providing students feedback that is timely, extensive and constructive; improving communication with students; designing an effective web-based course; and providing information about technical requirements. Moreover, several strategies could be followed to foster the students' participation, for instance the instructors could monitor the students' activities on the website using the tracking system available in the Blackboard system and encourage those with low levels of participation to participate more. This could be done, for example, by involving them in online group discussions, group assignments and peer assessments to incentivise these students to participate more. The educators need to focus on staff development to improve the integration between the technology used and the teaching practices. This could be done by providing short training courses for instructors in order to improve their skills in using the e-learning resources available at the university.

In summary, the adoption of explicit policies and strategies in web-based learning have become very important due to the rapid changes in the learning environment and the need for the university to determine how to achieve its goals and objectives. Policies related to the improvement and development of the web-based learning, staff development, students' access and attitudes might help educators to improve learners' performance.

This research provided the basis for additional research in developing countries related to student performance in web-based courses, as this study developed and validated a structural model in order to measure the main factors that affect student performance. The following some recommended areas for future researches. In the current study student participation in the online learning environment was self-reported. Future research should use a more objective measure of student participation (i.e., the student tracking tool available from the online learning system). In addition, student performance was measured using only one indicator, the student's overall grade awarded at the end of the semester. Using other measures (e.g., added knowledge, skill building, course withdrawals and successful completion of a course) may lead to more powerful results. Further research should entail a comparative study to compare student performance across all levels of study, as this may provide a better explanation of student performance. Moreover, the current study utilized the I-E-O model; other models (e.g., Tinto's model, Pascarella's model) could be used to investigate the data. Finally, the current study was applied on blended learning approach, which mixes traditional and web-based forms of instruction. Repeating the same study in a completely online learning context (Distance learning) might expand upon the results.

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Annex 1: Sources of Questionnaire Items

Factors	Questionnaire items (indicators)	Source
Computer experience (CE)	- I would rate my level of computer expertise as....	Picciano (2002)
	- At the beginning of this course, rate your knowledge of how to use the electronic communications technology in this web-based course.	Thurmond (2002)
Self-efficacy (SE)	- I am confident using the Blackboard system even if there is no one around to show me how to do it. - I am confident using the Blackboard system even if I have never used such a system before. - I am confident using the Blackboard system as long as I have a lot of time to complete the job for which the software is provided.	Compeau & Higgins (1995)
Student attitudes toward web-based learning (SA)	- Web-based learning helps me to obtain good grades. - I enjoy web-based learning.	Hammoud et al. (2008)
	- Web-based learning saves me time.	Yu & Yan (2006)
Motivation (MO)	- I expect to do well in this class. - I am interested in the content area of this course. - I prefer course material that arouses my curiosity.	Shih & Gamon (2001)
Prior performance (PP)	- Assessment grade on the prerequisite course	
The interaction of instructors (II)	- I receive comments on assignments or examinations for this course in a timely manner.	Sun et al. (2008)
	- My instructor provides extensive feedback. - My instructor establishes synchronous meeting times. - My instructor checks on students' access to course materials. - My instructor ensures availability of technical support.	Dennen et al. (2007)
Student perceptions of the use of technology (UT)	- I waste too much time communicating with others on topics that are not directly related to my coursework. - I waste too much time sorting through my messages to find the few that are useful.	Billings et al. (2001); Thurmond (2003)
	- I feel the information technologies used in e-learning have many useful functions. - I feel satisfied with the speed of the Internet.	Sun et al. (2008)
Student participation in the online learning environment (SP)	- On average, regardless of whether you posted a message or not, how often did you access the course's website each week? - On average, how often did you post a message to the discussion board each week?	Picciano (2002)
	- On average, how many hours per week have you spent on this course? (Include time spent reading, completing projects and assignments and discussing the course content with the instructor or classmates.)	Thurmond (2003); Billings et al. (2001)