DETERMINING FACTORS OF STUDENTS' PERCEIVED USEFULNESS OF E-LEARNING IN HIGHER EDUCATION

Aleksander Aristovnik, Damijana Keržič, Nina Tomaževič and Lan Umek
University of Ljubljana, Faculty of Public Administration, Gosarjeva 5, SI-1000 Ljubljana, Slovenia

ABSTRACT

Blended learning is already a strongly established way of teaching in higher education. In support of face-to-face teaching, e-courses may vary in structure, assignments, prompt examinations, interaction between students and teachers etc. In the paper, we present an analysis of factors that influence the usefulness of e-courses as perceived by students. A survey was conducted among students of the public administration programme at the Faculty of Public Administration, University of Ljubljana. Students evaluated 13 different aspects of e-courses in which they were enrolled. These aspects were assessed on a 7-point opinion scale. Results obtained in the survey were connected with certain demographic data, such as gender, high school final grade, year of study, study programme etc. A multiple linear regression was used with perceived usefulness as the response (dependent) variable and the 12 other e-course aspects as predictors (independent) variables. Further, the same regression analysis was performed on different subgroups of students based on demographical data and analysed where the impacts differ from the results for the whole sample. The empirical results showed that the general impression regarding the e-courses, their consistency with the face-to-face teaching and the teacher's responsiveness had a significant influence on the students' perception of the usefulness. On the other hand, the structure of an e-course and the variety of different assignments did not have a significant impact on perceived usefulness. Further analysis based on demographic data revealed several interesting subgroups of students where the perception of usefulness was influenced by completely different aspects compared to the results for the whole sample. The results may help teachers with managing the content and structure of an e-course and, as assumed, improve the perceived usefulness of blended learning for different subgroups of students.

1. INTRODUCTION

In the last two decades, the use of information and communications technology (ICT) in the education process has triggered many changes in teaching approaches and techniques. Teachers therefore have new possibilities to make the pedagogical process more interesting and interactive. They can offer different assignments and ways of communicating without limits (regarding the place and time of teaching and learning). In this way, they go along with the new generations of students that were 'born with smartphones' and are very familiar with the latest technologies. According to Jones et al. (2010) and Kubiatko (2013), today's young generation has a different way of thinking and functioning to previous generations.

E-learning involves the use of ICT to deliver teaching and learning and is becoming increasingly important in higher education (Penny, 2011). When talking about changes in higher education, the introduction of new ICT tools into the teaching and learning processes has to be successful in the eyes of all stakeholders – students, teachers and management of the higher education institution. Based on adequate measurements, statistical analyses of the consequences of implementing a learning management system (LMS) have to be performed regularly and improvements made in order to find out whether the results are acceptable or if any improvements are needed. When deciding on the introduction of an LMS and when measuring its effectiveness and usefulness, many factors have to be taken into account. Especially on the teachers' side, many doubts emerge when a new ICT is in question. Many aspects have to be considered, especially when deciding whether to completely replace face-to-face learning with e-learning in a selected LMS or to choose blended learning where the virtual classroom supplements lectures in traditional classrooms. The students' point of view is also important since they are the main users of the offered

teaching technique and can cooperate in implementing and improving an e-course as a very important stakeholder in the e-learning process. Therefore, both teachers and students should be regularly asked to give their opinion on the work and their feelings in the virtual classroom.

In our study, we analysed only the students' point of view on the courses in which they were enrolled. We examined the results received from students of the two undergraduate programmes at the Faculty of Public Administration, University of Ljubljana where LMS Moodle is used for e-learning. The purpose of the paper is thus to present an analysis of the factors that influence the usefulness of an e-course as perceived by the students. The paper explains how the students evaluate the usefulness of e-courses at the faculty level and discusses the variances among the different subgroups of students.

The paper is structured as follows: after the introduction, a brief literature review on various aspects of blended learning and its usefulness through a presentation of previous work in the field is given. The third part includes a presentation of the empirical research. At the end, based on the examined data, interpretations, conclusions and suggestions are offered. They are accompanied by the paper's limitations and avenues for further research.

2. LITERATURE REVIEW

The impact of the Internet on education at all levels has captured both teachers' and students' attention in recent years (Elkaseh et al., 2016). In some countries, the use of ICT in schools at all levels of education has been strongly supported by the government through initiatives for primary schools through to higher education. They have encouraged the acquisition of laptop computers for students and teachers with favourable conditions and secured broadband connections in all public establishments (Carvalho et al., 2011).

With the ever present need to demonstrate value for money and maximise efficiency and effectiveness from training and development within an often restricted time and expenditure framework, measuring the impact of enhancing knowledge management by using technology is of constant interest and importance (Smedley, 2010). The assessment of whether the implementation of an e-course is successful or not should be given by both groups of users, teachers and students. Of course, the management of the educational institution also has to discover if the introduction of blended learning leads to better student results (higher grades, fewer admissions to exams), lower costs and the satisfaction of all stakeholders (Hall, 2006; Kohang and Durante, 2003; Upadhyaya and Mallik, 2013, Yukselturk & Bulut, 2007).

Although many universities across the world have incorporated Internet-based learning systems, the success of their implementation requires an extensive understanding of the end-user acceptance process (Al-Adwan et al., 2013). Saade et al. (2007) point out that "in general, like any information system, user acceptance and usage are important primary measures of system success". The user perspective is therefore crucial to examine in the implementation of an LMS and to evaluate its success (Hall, 2006). Živic-Butorac et al. (2001) claim that students' perception of e-learning is one of the most important steps in developing and implementing a successful e-learning environment. Hrastinski (2009) provides a review of the literature in the area of online learner participation, and claims that participation and learning are intricately interrelated and that, in order for learners to take full advantage, the participation experience needs to be satisfactory.

To understand the importance of the students' point of view, in our study we focused only on them. According to Francis and Raftery (2005), we examined the usefulness of blended learning, whereas there are two other modes of e-learning engagement (1. baseline course administration and learner support, and 2. a fully-fledged online course). Blended learning is a combination of traditional face-to-face teaching and an online course. This mixes the features of virtual and real environments to provide for the holistic production of information and enhance students' learning experience (Al-Adwan et al., 2013).

When talking about blended learning, the successful implementation of e-course, in which students and teachers cooperate in both a virtual and classical classroom, depends on many factors. Vonderwell and Zachariah (2005) claim that online learner participation is influenced by technology and interface characteristics, content area experience, student roles and instructional tasks, and information overload.

The open-source Moodle LMS can be found in many segments of education and higher education is no exception. Its popularity, except for the fact it is free, is mainly based on its flexibility, adaptability and the possibility of personalisation while, on the other side, the system contains many standard features which make the learning process easy to implement. As Liao et al. (2011) stated: "Moodle e-learning platform is

easy to use and provides a good communication tool, discussion area, group space, workspace, and makes learning more interesting". When comparing some open-source LMSs, Kareal and Klema (2006) concluded that Moodle is one of the most adaptable systems and highlighted this feature as a significant element of an effective e-learning system. They also stressed that Moodle is the most user-friendly e-learning system among the systems under comparison. Carvalho et al. (2011) studied students' perceptions of Blackboard and Moodle at Portuguese universities and ascertained that all their findings "reveal a student preference towards Moodle". In their research, they also found that e-learning materials substituted the traditional courses.

The Faculty of Public Administration implemented blended learning via the Moodle LMS platform in the 2010/11 academic year. After three years of gradually introducing them, e-courses became mandatory for all undergraduate study courses (for more, see Umek et al., 2015). Until now, quite a few changes have been made and some additions introduced in virtual classrooms. Currently, each lecture is supported by e-content followed by a quiz to check understanding of the prepared content in the e-course. For the tutorial, two extensive classroom assignments are prepared during the semester and the teacher gives feedback on the correctness of the solutions.

In our study, we determined 12 factors which we assumed influence students' perceptions of the usefulness of the Moodle LMS. They are related to organisation of the e-course (goals, materials and assignments), the lecturers' activities (assessments, responses), the students' preferences regarding learning online or in the classroom, the general impression of the e-course and the degree of consistency with the lessons in the classroom. We believe that the study presented below contributes some important findings to both theory and practice in the field of blended learning.

3. EMPIRICAL RESEARCH

3.1 Methodology and Data

In our study, we analysed how different aspects of an e-course influence students' perception of the usefulness of blended learning. For this reason, we developed a questionnaire and asked students from the Faculty of Public Administration, University of Ljubljana to participate in the survey. We limited our survey to courses that were obligatory for undergraduate students. Blended learning is mandatory for these courses.

The questionnaire consisted of 13 statements (Table 1) describing the e-course and some other questions about the students (high school final grade, occupation with other activities outside of study etc.). The students expressed their opinion regarding the statements in Table 1 on a 7-point Likert scale from "totally disagree" (value 1) to "totally agree" (value 7). The statements were based on empirical findings from recent literature (Upadhyaya and Mallik, 2013, Živic-Butorac et al. (2001)). Since the primary focus of our study was to analyse factors which influence students' perceived usefulness, statement Q13 was chosen as the dependent variable.

Table 1. Statements from our survey with abbreviations Q1–Q13

Abb.	Statement about e-course
Q1	The virtual classroom of the course is organised transparently.
Q2	The goals (workload demands, grading) of this e-course were clearly stated at the start of the semester.
Q3	This e-course offers a variety of ways to assess my learning (quizzes, written work, forums, files, …)
Q4	I receive the teacher's comment/feedback on an assignment in less than 7 days.
Q5	I prefer fewer lectures in the traditional way (face-to-face) and more learning material processed in the e-course.
Q6	More tutorials in the course could be carried out in the e-course instead of in the classroom.
Q7	My general impression of the e-course is good.
Q8	The study material and tasks of the e-course are presented in a clear and understandable way.
Q9	Finding certain activities in the e-course is simple.
Q10	The prepared learning material and tasks are consistent with the lectures in the classroom and supplement them.
Q11	The prepared material and assignments supplement the tutorial in the classroom.
Q12	The teacher gives me feedback/a response on my submissions (assignment, forum posts).
Q13	Learning materials and activities in the e-course helped me to effectively study this subject matter.

Source: Survey, 2015

The questionnaire was completed by 315 students, with each student evaluating 3 to 5 different e-courses. We received a total of 1,456 e-course evaluations. Due to missing values, we removed some records from our initial data set. The final sample for analysis is contained in 1,083 records, each representing a student evaluating one e-course. We then added certain demographical data (gender, year of study, study programme etc.) to our final data set. Our goal was to relate the students' perceived usefulness of blended learning (statement Q13) with the other variables from Table 1. We built a multiple linear regression model with variable Q13 as the response variable and the others (Q1–Q12) as predictors.

In the empirical results part which follows, we report the coefficients, unstandardized and standardized, and the corresponding p-values. We highlight and discuss variables showing a significant impact on the mean perceived usefulness of blended learning. For the level of significance, we chose $\alpha = 0.05$.

Our recent studies (Umek et al., 2015) have already shown the heterogeneity of students at the Faculty of Public Administration. Regression analysis on the whole sample could therefore hide interesting patterns in our data set. For this reason, we repeated the analysis on different subgroups of students based on their demographic characteristics. For convenience, in the subgroup analysis we report just the predictor variables with a significant impact and do not report the p-values. Due to the high number of tested hypotheses, we used a Bonferroni correction to control the familywise error rate.

3.2 Empirical Results

The multiple linear regression showed that variables Q1–Q12 have a significant impact on students' mean perceived usefulness ($F_{12,1070} = 106.065$, $p < 0.001$). The model explained 54.3% of the variance in students' perceived usefulness, while the standard error of the estimate was 1.039. Table 2 shows coefficients (unstandardized and standardized), t-statistics and the corresponding p-values for all predictor variables Q1–Q12. Predictors with a significant impact on the mean value of Q13 (usefulness) are shown in bold.

Table 2. Parameters of the linear regression model with the perceived usefulness of blended learning as the response variable

| Variable | Unstandardized Coefficients | | Standardized Coefficient | | |
	B	Std. Error	Beta	t	Sig.
intercept	−0.541	0.185		−20.922	0.004
Q1	−0.002	0.043	−0.002	−0.047	0.963
Q2	−0.024	0.039	−0.021	−0.605	0.545
Q3	0.037	0.035	0.032	10.062	0.288
Q4	**−0.093**	**0.026**	**−0.095**	**−30.554**	**0.000**
Q5	**0.123**	**0.024**	**0.168**	**50.096**	**0.000**
Q6	−0.015	0.024	−0.021	−0.623	0.534
Q7	**0.252**	**0.042**	**0.222**	**60.033**	**0.000**
Q8	**0.151**	**0.040**	**0.131**	**30.814**	**0.000**
Q9	0.010	0.018	0.012	0.548	0.584
Q10	**0.252**	**0.042**	**0.215**	**60.018**	**0.000**
Q11	**0.210**	**0.041**	**0.181**	**50.155**	**0.000**
Q12	**0.180**	**0.030**	**0.164**	**60.035**	**0.000**

The strongest impact on perceived usefulness was found for variable Q7 (good general impression of the e-course) which has the largest standardized regression coefficient of 0.222. This means that an increase in the general impression of an e-course by 1 standard deviation on average increases the perceived usefulness by 0.222 of a standard deviation.

The other predictors with a very similar (yet somewhat weaker) impact on response Q13 are Q10 and Q11 (e-course supplements face-to-face learning well), Q7 (general impression of the e-course), Q5 (preference for e-learning over face-to-face learning), Q12 (teacher's response), Q8 (understandability of the study material) and Q4 (teacher's prompt feedback). The impact of all mentioned predictors (with the exception of Q4) is positive, i.e. an increase in them on average increases students' perceived usefulness.

On the other hand, the impacts of the other predictors are not significant. These predictors are Q1 (transparent structures of the e-course), Q2 (workload demands clear in advance), Q3 (a variety of activities), Q6 (e-courses instead of a face-to-face tutorial) and Q9 (simplicity of finding relevant activities).

The empirical study of the whole sample showed that a good general impression of the e-course and supplementing traditional face-to-face learning with e-learning increase students' perceived usefulness of e-course. It means that an e-course which offers additional topics to face-to-face learning and makes a good general impression on the students is more likely to be perceived as useful by students.

As already mentioned, our previous study (Umek et al., 2015) revealed that the student population at the Faculty of Public Administration is very heterogeneous. We showed that the introduction of the Moodle LMS in recent years has had different impacts on various subgroups of students. Therefore, we expected that the perceived usefulness of blended learning could also be influenced by different factors among various subgroups of students. We applied the same linear regression model (response variable Q13, predictors Q1–Q12) to 15 subgroups of students based on their demographic characteristics. These subgroups were established based on their gender, high school final grade (four groups: from sufficient (final grade 2 out of 5) to excellent), year of study (three groups, one for each year), study programme (two groups: university, professional), region (the nine regions of Slovenia from where students come) and their occupation with other regular activities besides study per week (six groups based on the amount of student work, sports training etc.). Our preliminary study suggested analysing just two 'regions' (students from the Ljubljana region where the faculty is located, and all other regions). Due to transparency, we reported just two subgroups of students based on their other activities (no other activities, more than 6 hours of extracurricular activities per day).

Table 3 shows the results of the linear regression on the 15 analysed subgroups, where each row presents the results for a particular subgroup. The first two values are the size of the subgroup (n) and its coefficient of determination (R^2) of the related linear model, followed by the impacts of predictors Q1–Q12, indicating factors with a significant impact on the mean perceived usefulness. Instead of reporting the p-values, we divided the impacts into four categories, from non-significant with an empty cell to highly significant with ***). The table allows us to see how the analysed subgroups differ (which factors are important for usefulness in which subgroup).

Table 3. Linear models on different subgroups of students. We report their sizes (n), coefficients of determination (R^2) and indicate predictors Q1– Q12 with a significant impact on the mean of Q13

	Subgroup	n	R^2	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
	whole sample	1083	0.543				*	***		***	*		***	***	***
Gender	male	284	0.514							*					*
	female	799	0.560				*	**		**	*		***	**	***
High school final grade	sufficient	442	0.530				*	***		*	*		*		**
	good	318	0.568										***		*
	very good	205	0.570												
	excellent	113	0.724							*				***	
Year of study	1st	698	0.527					*		***	*		*	***	**
	2nd	161	0.556							*					
	3rd	224	0.598										**		***
Programme	university	436	0.564				*			*			*		***
	professional	647	0.549					**		***	*		***	**	
Region	outside Ljubljana	473	0.600										**	*	
	Ljubljana	610	0.525					**		***	*		**	**	***
Other activities	no activities	71	0.522					**	**						
	more than 6 hours per day	289	0.601					*		**					*

Legend:

empty cell	Bonferroni adjusted α > 0.05
*	0.01 < α <= 0.05
**	0.001 < α <= 0.01
***	α <= 0.001

Table 3 shows that the interpretation of the results is the same for the whole sample and for female students. The predictors with a significant impact on perceived usefulness are the same. On the contrary, only two aspects are important for the male university students: the general impression of the e-course and the teacher's responsiveness. The analysis showed differences among students based on their high school grades; students with the best high school grades find the usefulness of blended learning in supplementing the tutorials. In contrast, students with lower high school grades see the usefulness in the replacement of face-to-face learning.

The factors influencing perceived usefulness also change when comparing the year of study. In higher years of study, the teacher's feedback and supplementing the tutorials have an influence on perceived usefulness. On the other side, the general impression of the e-course does not play a significant role any more. Table 3 also shows that in the first year of study many aspects are significant whereas later only a few of them remain important.

Table 3 shows differences between the two study programmes, the amount of other activities outside of study and the region of Slovenia where students come from. Students who live away from the university campus (region: outside Ljubljana) find the usefulness of blended learning in supplementing traditional learning, both tutorials and lectures. For this subgroup, only two aspects have a significant impact.

Although our sample is very mixed, some characteristics of all analysed subgroups are the same. We found no significant impact on perceived usefulness for predictors Q1 (transparent structures of the e-course), Q2 (workload demands clear in advance), Q3 (a variety of activities) and Q9 (simplicity of finding relevant activities).

To clarify our study, we presented the results from Table 3 in the form of a network (Figure 1). The network consists of two sets of nodes which represent the analysed subgroups (black dots) and statements from the questionnaire (independent variables, grey dots). Two nodes are connected if a variable has a significant impact on perceived usefulness of the analysed subgroup. Note that some of the analysed subgroups and statements are not shown in the network since they do not reflect any significant findings. Our network was plotted using the Pajek software (Batagelj & Mrvar) with a Fruchterman-Reingold (Fructerman & Reingold, 1991) drawing algorithm.
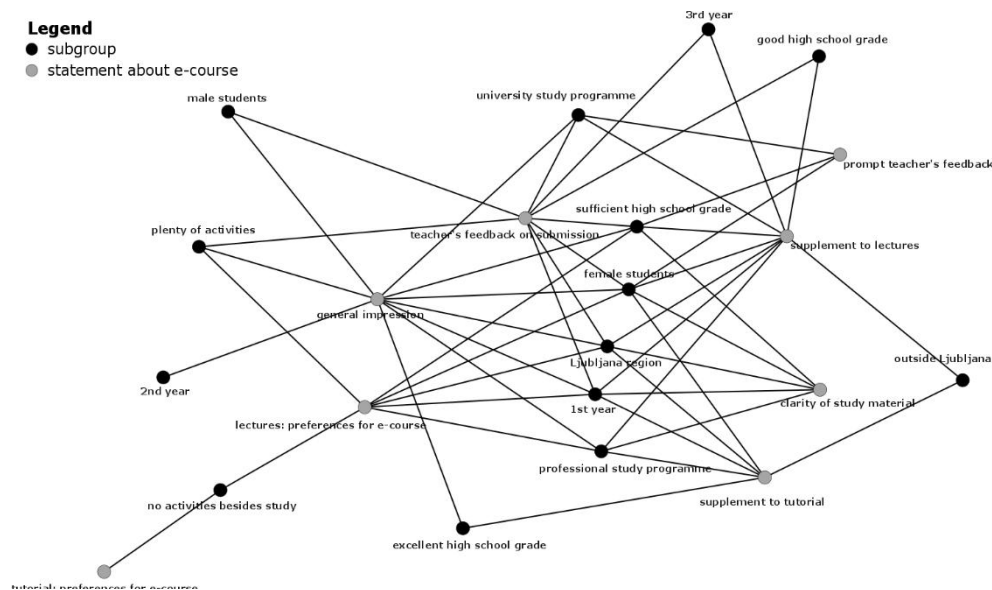

Figure 1. Network of variables and subgroups. A subgroup (black dot) and a variable (grey dot) are connected if we found a significant impact of the variable on the perceived usefulness of blended learning in a subgroup of students

We can clearly see in the network in Figure 1 which vertices have many connections. If a grey node is connected to several subgroups it means that the variable has a significant influence on perceived usefulness for different subgroups of students. We can deduce such statements from Figure 1: general impression, teacher's feedback, clarity of study materials etc. On the contrary, the nodes with less connections are

specific to fewer subgroups. Some statements from the questionnaire are missing, which means we did not find any subgroup where they play an important role regarding perceived usefulness.

Similar conclusions can be drawn for the black dots. If a subgroup is connected with several variables it means there are several factors which influence the students' perceived usefulness. Examples of such subgroups are female students, students from the Ljubljana region, students with a sufficient high school grade etc. In contrast, for students in the second year of study just the general impression plays a significant role. There are some other subgroups with only two influencing factors, such as male students, students with excellent high school grades etc. Since various subgroups are connected to different variables, Figure 1 clearly shows the heterogeneity of the population we analysed.

4. CONCLUSION

The main goal of the paper was to present an analysis of the factors that influence the usefulness of an e-course as perceived by students. We examined results received from students of two undergraduate programmes at the Faculty of Public Administration, University of Ljubljana where LMS Moodle is used for e-learning. In this respect, the paper's key contribution is explaining how the students evaluate the usefulness of e-courses at the faculty level and the discussion of the variances among the different subgroups of students.

In order to confirm theoretical expectations, we empirically analysed the influence of 12 aspects of an e-course. Four of them (structures of e-course, workload demands being clear in advance, a variety of activities and simplicity of finding relevant activities) had no significant impact on perceived usefulness – on either the whole sample or on each subgroup analysed. Our empirical results also showed that the general impression regarding the e-course, their consistency with face-to-face learning and the responsiveness of teachers had a significant positive influence on the students' perceived usefulness. More detailed analysis revealed interesting subgroups of students where the relationship between perceived usefulness and the other analysed aspects differs. We discovered that the general impression plays an important role in determining a higher level of perceived usefulness in the majority of subgroups we examined. For male students, besides the teacher's responsiveness, the general impression was the only significant aspect in relation to perceived usefulness. However, we discovered that the general impression loses its impact in higher years of study when the other aspects become important (teacher's feedback, supplement to face-to-face learning).

Interestingly, the factor "transparent organization of the virtual course" was non-significant in all subgroups we analysed. On the contrary, the intuitively similar "general impression" factor played an important role in almost all subgroups. The results therefore reflect the fact that "transparent organization" and "general impression" measure two different aspects – the e-classroom can be transparent but its general impression may still be poor. Such courses probably only provide basic information in basic colours and fonts without any additional pictures, links to multimedia sources etc. In contrast, some students may prefer a less organized structure with lots of colours in the title, funny pictures etc. Accordingly, these findings may provide useful guidelines for the structure and design development of e-courses in the future e-learning system at the Faculty of Public Administration.

However, as we focussed on the perceived usefulness of blended learning from the students' perspective, our study obviously neglects the teachers' perspective. To overcome this limitation, we plan to develop a new survey. We will ask teachers about their views on blended learning (amount of work needed for an e-course, communication with students, preferences (e-courses vs. face-to-face courses) etc.). In the next step, we will aggregate the current results to the level of an e-course and link them with the results emerging form the new questionnaire. Moreover, our recent study showed a significant increase in students' performance in the period after the Moodle LMS was introduced. Therefore, in our future research we plan to use data on students' performance and link the results with our current study. This extended study would indicate which aspects of e-courses are linked to better student performances.

ACKNOWLEDGEMENT

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