Devising a New Model of Demand-Based Learning Integrated with Social Networks and Analyses of its Performance

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Abstract— **The focus of the research study is to devise a new model for demand based learning that will be integrated with social networks such as Facebook, twitter and other. The study investigates this by reviewing the published literature and realizes a case study analyses in order to analyze the new models' analytical perspectives of practical implementation. The study focuses on analyzing demand-based learning and investigating how it can be improved by devising a specific model that incorporates social network use. Statistical analyses of the results of the questionnaire through research of the raised questions and hypothesis showed that there is a need for introducing new models in the teaching process. The originality stands on the prologue of the social login approach to an educational environment, whereas the approach is counted as a contribution of developing a demand-based web application, which aims to modernize the educational pattern of communication, introduce the social login approach, and increase the process of knowledge transfer as well as improve learners' performance and skills. Insights and recommendations are provided, argumented and discussed.**

*Keywords— **demand-based learning, web application, e-learning, social login***

1. Introduction

The study focuses on analyzing demand-based learning that integrates social networks and investigating how it can be improved by devising a specific model.

New technologies and developments are pushing educational institutions to react and become accustomed [12]. One of the outcomes is that these institutions are elevated from traditional ways of teaching towards new teaching models [8], [17]. In this research, an argument is put forward for academics to take a practical role in the development and use of technology in the teaching process. The new reforms developed in education and mass use of social networks, prompt in finding new ways for including the students in the education process, knowledge transfer and increase of the ability for independent work. This study presents the demand-driven learning model (DDLM) as one answer to this need. Moreover, it intends to create an application, which helps Universities implement demand-based learning and thus increase the quality of education. The issue this thesis aims to solve relies on the implementation of demand-based learning and introduction of e-learning models in educational institutions, more precisely in higher education institutions where e-learning systems are still not applied. It resulted from researching the current situation in different higher educational institutions in Macedonia, based on a personal experience and lack of such solution based on the literature in this field. Statistical analyses of the results of the questionnaire through research of the raised questions and hypothesis showed that there is a need for introducing new models in the teaching process.

2. Literature Review

The reviewed literature analyzes the published researches on demand-based learning and e-learning tools with the purpose of gaining insights into the

issues, gaps and problems currently faced; it also analyzes the state-of-the-art in the field.

In order to achieve its aim, the research starts out with defining what e-learning is. However, in our country, it is still very much in an experimental phase and the concept is on the agendas of several Macedonian educational institutions. Not much literature has been written on this topic. As the literature review demonstrates, most literature is concentrated on e-learning and technology-based learning approaches.

According to the Report of the European Commission [5] on new modes of learning and teaching in higher education, one of the main recommendations of this report was that the integration of digital technologies and pedagogies should form an integral element of higher education institutions' strategies for teaching and learning [12], [8]. Clear goals and objectives should be defined and necessary organizational support structures should be established to drive implementation.

According to another study carried out by the NGO Metamorphosis with students [18] through phone interviews regarding the use of Computers and the Internet in Education in the Republic of Macedonia, only 16% of the interviewed claimed that they used computers on daily basis for educational purposes. On the other hand, as regards to computer games, based on a survey [16] every student spends over five hours on their personal computer. A significant number of students have stated that they even do not step outside for several days.

However, according to [7] different educational institutions in the Republic of Macedonia are at different stages in implementing new learning models. Therefore, in 2011 the Ministry of Education and Science of the Republic of Macedonia [7] presented the Electronic diary (E-Diary) project, which aims to improve communication between teachers and parents, to enable quick and simple review of information from the school dairies, and enable rapid statistical analysis [13]. We also need to point out the government project "A computer for every child", based on the National Program for the Development of Education [7], with the purpose of supplying primary and secondary schools in the Republic of Macedonia with 17,818 personal computers. These computers will be used as tools for the realization of the educational program and as tools for accessing the educational digital contents, which are available on the global network – the Internet.

The aim of the ImpaCT2 study in the UK [1] was to analyze the relationship between pupils' use of ICT and their performance in National Tests [15]. This Program was the Government's key initiative to stimulate and support the use of ICT to improve

standards and to encourage new ways of teaching and learning. The ICT can exert a positive influence on learning, though the amount may vary from subject to subject, no doubt reflecting factors such as the expertise of the teaching staff, problems of accessing the best material for each subject at the required level, and the quality of ICT materials that are available. A questionnaire survey was conducted in the National Physical Laboratory, New Delhi University [9] in order to investigate the level of satisfaction with the information accessed by the scientists through the available e-resources and various challenges faced by them in their field. The survey followed the guidelines from [8] found that institutions should develop their own portals and data archives to provide access to materials and to focus on present research trends in order to move towards a brighter future. A research paper in the Nigerian context [4] emphasized that the majority of teachers and research scholars are dependent on e-resources to get the desired and relevant information. Moreover, infrastructure and training programs are essential for better use of electronic resources campus-wide.

The figure below shows the results of a survey conducted in September 2014 by the Pew Research Center [3]. The number of participants in the survey was 1,597 adult internet users. It found out that Facebook remains by far the most popular social media site. Based on this and other researches done on the social Media, it appeared that Facebook was the most frequently used network; therefore, we decided to use it in our application as well because it would be beneficial for a web application to have it. In the last few years, Social Login [10] was introduced as a solution for the need to remember a large quantity of user ids composed of username and password to connect to Websites. Social networks, such as Facebook and Twitter, developed the possibility to allow users to register and login to different third party Websites using a single account, based on their social networking identification [6]
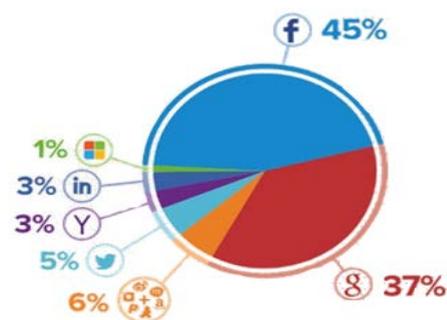

Figure 1. Social Login Preferences

Seen from the aspect of the social media, according to [10], Facebook saw increases in share across several key verticals, including Media,

Entertainment, Consumer Brands and B2B. Q1 of 2015 showed that Facebook is holding 45% market share of the social login industry. This means that majority of customers prefer Facebook login. While both identity providers (IDPs) enjoy little overall competition from other large social networks like Twitter (5%), Yahoo (3%) and LinkedIn (3%), vertical volatility continues to reflect shifting consumer preferences, as different IDPs offer different advantages across different types of sites. Researchers all over the world have made different studies associated with the impact of application of new technologies in the learning process by using e-resources as described by [11]. Nevertheless, in our country, when it comes to implementing new changes, difficulties appear. Higher education institutions worldwide use learning applications such as Blackboard, Moodle, Sakai, Google Classroom, Teletop and many others [2]. [14] alleges that while in primary and secondary schools the computer is used as a tool for increasing the knowledge and the essential skills, in higher education institutions besides this purpose, it is also used with complex, sophisticated software dedicated for students and professors. [18] also agrees that higher education institutions are highly involved into knowledge creation, diffusion and learning. University's competitive ability depends on institutional opportunity to share, spread and adapt knowledge.

Related to higher education institutions in Macedonia, the first-ranked public University "Ss. Cyril and Methodius" [13] has no unified electronic learning management system for e-learning. However, it uses a software named "iKnow" which supports student services only, mostly exam enrolment, but does not include professor-student communication side. Another example of an institution that uses e-learning concept is the public University "Goce Delcev" in Shtip [14]. The implementation of e-learning in this institution began in 2007 by using Moodle platform. According to a study [14], more than 400 courses have been created in this platform. The courses are available to professors and students. The course creators keep proper attention and control to the content, activities and the students enrolled into it.

The private-public university "South East European University" [13] uses Google Classroom. Another private University in Macedonia, "FON" uses an e-learning system, which is closed for broader use, and respectively is limited only to the employees and the students who log in with their university email address [13]. The University Mother Teresa, public University in Skopje, also uses Google Classroom and integrates it with e-index system from the University of Shtip. The "University of Tetova", public University, currently does not use any kind of learning management systems and the whole process of learning activities is made manually and therefore used as case study to devise, test and implement the devised model.

3. Research Methodology

The research methods that will be used in this thesis are as follows: Fundamental Research with Comparative approach - which will enable us to do an analysis of the institutions by comparing the current and the proposed system.
Empirical Research – statistical data analyses, presenting positive possibilities and advantages. Action Research using Case study method - the study of a concrete solution for a particular institution and research application for adjustment and possible uses for other purposes. In order to get clear information about the requirements, a survey has been done and the results were analyzed using SPSS statistical software.
The actors concerned with our application are admin (administrator), professor and student. Whereas the cases are use registration, update, search, verification, add professor or student, modify and delete data, and upload files.
This research started out with four raised research questions and hypothesis that aimed to contribute to the goal of the study, which was to setup a web application for electronic learning that could be used by academic staff and students, based on their demands. Within the study, the scope that was chosen was restricted to higher educational institutions.
Research questions and hypothesis in the thesis are as listed below:
RQ1: What is the impact of the electronic system to improve the quality of learning, compared with the so far systems about class organization?
H0: The application of e-learning proposed model will have a positive impact, in terms of both methods and teaching, by including: class organization, planning and teachers' role.
The null hypothesis combines two variables that have to be tested, COP and TR. The questionnaire included questions measuring the participants' agreement with statements based on the five scale level of agreement (Strongly Disagree, Disagree, Undecided, Agree and Strongly Agree).
Class organization and planning (COP)
- The current learning model does not meet my personal and professional goals, so an e-learning model is needed
- The courses are not arranged in a clear, logical and orderly manner
- My professional learning objectives have not been achieved with the existing model of learning

- E-learning model will facilitate class organization

Teachers' role (TR)

- Communication teacher-student is easier by sending and receiving e-mails
- Teachers will easily provide helpful information and explanations
- E-learning model improves involvement among students in the course
- Instructions and assignments during the course will be very clearly understood

RQ2: Which elements should be considered before the implementation of the application?

Variable called Resources of information (ROI) will help us in testing the first hypothesis H1, which claims, "This kind of model shall enable rapid access to resources and different educational information". Its veracity is verified based on the allegations:

- Online course materials are available at any place and at any time
- Learning materials will be provided to students promptly
- E-learning allows easy accessibility to the sources of information of the course
- Submitting assignments through e-learning model will save time and effort

RQ3: What does demand-based learning imply for the institution, students and learning processes?

The second hypothesis H2 "The proposed software model with the help of interface will facilitate the students to remember easier and encourages them to work independently" will be tested based only on the student's opinion. A variable named REAWI-Remember Easier and Work Independently is created and tested via those statements:

- As a student, I enjoy working independently
- I believe a good design of an online application will assist me to remember the materials better
- E-learning helps me to examine issues, to evaluate new ideas, and to apply what I have learned
- An interactive and well-designed e-learning system will have a significant impact on the successful result of the classes

RQ4: What is the ultimate goal for acquiring and using the technology?

The user must clarify which are his demands and the elements that have influence increasing the outcomes and knowledge transfer (IOKT). We assume the third hypothesis – H3, by stating that "The use of this model in the teaching process shall increase the learning outcomes of the specific knowledge transfer".

- An interactive and well-designed e-learning system will have a significant impact on the successful result of the classes
- I possess sufficient computer skills for doing online work

- Electronic system of learning will encourage me to communicate and exchange ideas with other colleagues
- Social networks login as a demand-driven model should be part of the e-learning application.

4. Conceptual Design

The conceptual design of the Demand based e-learning system helps professors establish direct communication with students.

Figure 2. Application's Sign in Form

Figure 3. Interface Upload Files Form

It represents the process of implementing a new model by using e-learning developed application. It also explains the main functions of user roles that an administrator, professor and a student has. The operations that the application can perform, including the login through social media, in our case Facebook login, as a demand driven model, are clarified in detail.

5. Data analyses

The study used questionnaire as research method and used SPSS to investigate the impact of different variables. The questionnaire was composed of thirty-three questions and is divided into nine groups, including one demographic and other eight groups that respond to the hypotheses that were raised. The questions in this survey expressed the participant attitudes on a scale of 1 to 5 (1: Strongly Disagree, 2: Disagree, 3: Undecided, 4: Agree, 5: Strongly Agree).

Since the questionnaire is integrated in the web, the same was distributed and filled electronically; all the results will be presented in graphs and tables. The link of the questionnaire has been sent to professors and students of different study degree, and was distributed through social networks or e-mail addresses. This research is based on data collected using a questionnaire. The independent variables, (also referred to as a factor) that were computed during this analysis are: Class organization and planning (COP), Teacher's role (TR), Resources of information (ROI), Remember easier and work independently (REAWI), Increase the outcomes and knowledge transfer (IOKT), Demand-based learning imply for the institution (DBLII), Elements considered before implementation of e-learning application (ELCBIMEL), and the Ultimate goal for acquiring and using the technology (UGAUT). There were 108 responses to the online survey, where two couples of answers were totally identical (we assume that it happened by double clicking the Submit button on the online survey), therefore we removed the duplicates by leaving 106 records available.

6. Results

Primarily, to use data, one first has to make sense of it. As related to demographic data, 24 professors (22.4 %) and 82 students (77.6 %) participated in the survey. The responses were analyzed through the SPSS statistical software version 21.0, whereas the methods were descriptive, reliability and ANOVA. The mean score or the arithmetic average of the variable is the sum of the values divided by the total number of the values. As shown in Table 2.2, it has ranges from 3.8388 to 4.6129.

Table 1. Occupation of the participant

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	professor	24	22.4	22.4	22.4
	student	82	77.6	77.6	100.0
	Total	106	100.0	100.0	

In order to be valid, the value of the mean score for a variable should be greater than 3.50. In all the cases it is accomplished. For each variable, the mean score is calculated separately.

Table 2. Mean score for 8 variables

N	COP	TR	ROI	REAWI	IOKT	DBLII	ELCBIMEL	UGAUT
Valid	106	106	106	82	106	106	106	106
Missing	0	0	0	24	0	0	0	0
Mean	3.8388	4.2150	4.6051	4.4512	4.3551	4.2780	4.5794	4.6129

The importance of choosing scales in research relies on finding the reliable values that a variable can take. In the survey, we will focus on measuring the scale's internal consistency, indicated by the Cronbach's Alpha coefficient. Usually, reliability is perceived as the correlation of the test with itself. Its value is expressed as a number between 0 and 1, but the ideal value is above .7.

George and Mallery (2003) provide the following rules of a thumb: a > .9 – Excellent, > .8 – Good, > .7 – Acceptable, > .6 – Questionable, > .5 – Poor, and < .5 – Unacceptable.

Further, reliability analysis was computed on the 33 questions and the 8 variables as well. Based on tables 2.3 and 2.4, on both cases the value was above .7, therefore it can be considered as reliable. The reliability of the survey variables is shown in Figure 2.3.

Table 3. Reliability of the survey's variables

Cronbach's Alpha	N of Items
.767	8

6.1. Results from the ANOVA test

Analysis of variance - ANOVA was performed in order to analyze the impact of class organization and planning (COP) as well as teacher's role (TR) in terms of methods and teaching. Other components, such as resources or information (ROI), remember easier and work independently (REAWI) and increase of the outcomes and knowledge transfer (IOKT) were also analyzed in this study.

If H0 is true and the assumptions listed below are valid, the mean square ratio (MSR) has an F-distribution with k – 1 and N – k degrees of freedom (see Landau & Everitt 2004). It is known as a technique for seizing the differences along with several population means. The null hypothesis states that "The application of e-learning proposed model will have a positive impact, both in terms of methods and teaching, by including: class organization, planning and teacher's role". Based on the SPSS results, the significance value for two variables is

.046, respectively .034 and in both cases, the values are less than .05. Here we can clearly accept this null hypothesis for F (1,105) = 4.078 and F (1,105) =4.591 for p = .05.

Table 3. H0 ANOVA Analysis

		Sum of Squares	df	Mean Square	F	Sig.
COP	Between Groups	2.543	1	2.543	4.078	.046
	Within Groups	65.488	105	.624		
	Total	68.032	106			
TR	Between Groups	2.895	1	2.895	4.591	.034
	Within Groups	66.209	105	.631		
	Total	69.104	106			

Table 3. shows the ANOVA output related to the second hypothesis, the new developed e-learning model shall enable rapid access to resources and different educational information. As shown in this table, the significance value is .029, and the value of F ratio is F (1,105) = 4.928.

Table 4. H1 ANOVA Analysis

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.870	1	2.870	4.928	.029
Within Groups	61.141	105	.582		
Total	64.011	106			

H2: The proposed software model with the help of interface will facilitate the students to remember easier and encourages them to work independently. In addition, this hypothesis has been accepted based on the survey answers and the ANOVA analysis. F (1,105) = 7.476 with significance .007

Table 5. H2 ANOVA Analysis

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.206	1	4.206	7.476	.007
Within Groups	59.067	105	.563		
Total	63.273	106			

The last tested hypothesis has been accepted as verified. Its statement was that the use of this model in the teaching process shall increase the learning outcomes, specifically the knowledge transfer. F (1,105) = 6.689 with significance .011.

Table 6. H3 ANOVA Analysis

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.796	1	3.796	6.689	.011
Within Groups	59.594	105	.568		
Total	63.390	106			

7. Conclusions and Recommendations

The research study aim was to devise a new model for demand based learning incorporating social network inclusion. Therefore, four hypotheses were raised and by means of survey, questions were proven. 106 participants took part in the survey, including students and professors. However, analyses showed that they both agree that e-learning will have a positive impact in their learning environment and will facilitate the educational process. Data were analyzed through the SPSS statistical software. It indicated that the mean score value of each factor is significantly above the average value. The questions and the independent variables underwent the test of reliability. In both cases the values were greater than the reliability coefficient (a > .7), and therefore the questionnaire results may be counted as reliable. Finally, Analysis of Variance (ANOVA) test was used in order to accept or reject the hypotheses. It resulted that No significant difference between COP and the other variables such as TR, ROI, REAWI, and IOKT was detected. Therefore, all of them were accepted, namely indicating that there is a need for e-learning system, which will improve learning methods, and class organization, will increase the knowledge transfer, will encourage students to work independently, and shall enable access to different educational information.

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