Is the Continuance a New Buzz Word? Bibliometric and Co-citation Analysis of E-learning Continuance

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*Abstract –***Through the bibliometric and co-citation analysis, this paper offers a review of science achievements in the area of e-learning continuance, with focus on identification of the field relevance, authors and most cited and co-cited papers, as well as the identification of roots this research area is based on. Based on co-citation network, which chronologically starts with Ajzen's theory of 1975, another contribution can be drawn from this paper. That contribution leads to a conclusion that Ajzen's Theory of planned behavior is a starting and adequate basis for all identified research and creates a main recommendation for upcoming researches.**

Keywords – **Continuance, e-learning, bibliometric, co-citation.**

1. Introduction

The initial acceptance of e-learning is an important step towards achieving its success. However, the actual success lies in its continuance[1-2].Besides, phenomena of cessation of usage after the initial acceptance of this kind of learning and education is very frequent [3].Global networking society, knowledge society and economic development based on knowledge demand necessary changes, as well as

adjustments and giving direction to the education which has to respond to newly created social context. E-learning imposes itself as an adequate response to the demands of contemporary society, which became widely spread method of education in organizations as an efficient approach to improvement of knowledge and skills of the employees [4]. Along with fast development of technology and Internet, many educational and training institutions and companies investedsignificant efforts (financial, time and intellectual) into development of e-learning programs and courses for users. At the same time, users recognize the importance of e-learning and accept it as advancement in training and learning [5]. Despite the fact that e-learning if promoted and used by a large number of users at different levels, continuous usage of this mode of education and learning is still at a low point [1].

From the aspect of science, accepting new technologies was a subject of research of many authors in the last few decades [6]. Different theoretical models were used to advance the knowledge of continuance [7-11].The most used models were 1) Theory of planned behavior [13]; 2) Technology acceptance model [14]; 3) Social cognitive theory [15]; 4) Unified theory of acceptance and use of technology[12].

E-learning, although viewed as a "current" phenomenon, has a long history. It is not possible to determine the roots of the term e-learning with certainty, although it most probably showed up in the 80's [16]. However, we can find its roots as a part of the term distance learning (DL) which is used very often in literature as a synonym. Development of distance learning depended on development and accessibility of communication media and it is mentioned for the first time in distant 1883 when several initiatives were started in the USA for acquiring academic education through correspondence schools [17]. E-learning was studied in literature in different contexts. Most attention was given to identifying critical factors of its success as a

relatively new concept [18], and the relationship between acceptance of e-learning and its influence on organizations [19-21]. Besides the mentioned organizational context, i.e. acceptance and implementation of e-learning in educational institutions and companies, many authors studied e-learning from the user's perspective [22-24]. Greatest focus from the user's perspective was in domain of e-learning satisfaction [22], [24], [18], as well as acceptance and use [14].

Intention to use e-learning continuously is the main determinant of e-learning success [8]. According to literature, the initial acceptance and use of e-learning is an important first step in achieving its success. However, future of e-learning depends on it continuance use. Focus of researchers has now actually shifted to the understanding of factors that influence continuance use. Taking into consideration that this is a domain still in its inception, science papers offering bibliometric and co-citation analysis of e-learning continuance are absolutely deficient, in the context of western countries as well as the others. Through review of relevant databases (Web of Science, Science citation expanded, Social Science Citation Index, and Arts & Humanities Citation Index) we have not been able to identify not one paper offering similar or identical approach to analysis of the topic at hand. Main goal and contribution of this paper is based on that fact. Through bibliometric and co-citation analysis, this paper offers an overview of science achievements from the domain of e-learning continuance with special focus on identification of the root this research area is based on. Besides the aforementioned, this paper contributes to the discovery of available information related to domain and scope of literature in the area of e-learning continuance. The analysis encompasses the entire period of availability of concrete terms. Based on the appearance of achieved co-citation network, starting with the Ajzen's theory (1975), one more contribution can be drawn from this paper. That contribution leads to a conclusion that future research can have Ajzen's theory as starting point, with aim to create and acquire conclusions in relation to the further development in the area of e-learning continuance.

2. A new approach: bibliometric and co-citation analysis

According to [25], the idea on which bibliometric analysis is based upon is more than 50 years old, and it is defined as a "statistical analysis of written publications such as books or science articles". Within bibliometric analysis, the most common was

the content or citation analysis in order to explore the area of interest in greater detail, influence of a certain number of authors or concrete science paper. Current research and all significant compilations of science indicators are leaning on publishing and statistics related to citations, as well as other more sophisticated bibliometric techniques [26]. In this respect, this paper offers an overview of bibliometric and co-citation analysis of e-learning continuance, answering to the following research questions:

1. How did the field of e-learning continuance develop?
2. What is the degree of relevance of the field based on journal impact factor?
3. Which authors and which papers were cited and co-cited the most?
4. Is it possible, using co-citation analysis, to identify grounds on which the field of e-learning continuance stands?

First step during detailed analysis of written publications in the area of e-learning continuance was an analysis of science papers in chosen databases. For this purpose ISI Web of Science database was searched for the entire period of availability of concrete terms of interest, i.e. citation database Science citation expanded (SCI – EXPANDED), Social Science Citation Index (SSCI), te Arts & Humanities Citation Index (A&HCI). This database was chosen considering it is the leading citation database in the world, and since it contains all information related to papers (e.g. title, summary, key words, citation index, as well as references used in the paper). Approximately, we are talking about a 10 year period, taking into consideration that the oldest paper in this area was published in 2005. It should be taken into consideration that journals within the database do not contain papers published from the very beginning, although constant upgrade was recorded through availability of new paper which are being upgraded constantly.

The following terms were used for the search: "e-learning continuance" or "intent for e-learning continuance" or "continu* AND e-learning" with a goal of identifying theoretical basis in the area of e-learning continuance. By using these terms we searched the title, key words and abstracts. We combined many searches and personally studied all available papers, redacted and created an adequate set of papers for further analysis. Book reviews, dissertation summaries and publications that had no direct link to the term of interest were deleted. After analysis of available papers, 49 papers cited in 955 studies (average number of citations per paper:

19.49, h-index[1]) were chosen for detailed analysis including the citation analysis of chosen papers, analysis of the journals these papers were published in, and lastly co-citation analysis and graphs of co-citation analysis.

Second step is a descriptive analysis of chosen papers.Figure 1.represents a number of published papers per year, figure 2. represents a number of citations per year. If we look at the graph we can see that recorded papers in the area of e-learning continuance prior to 2005 are nonexistent. This is confirmed by current finding that this is a relatively new concept which just became a subject of research of many science studies [27].
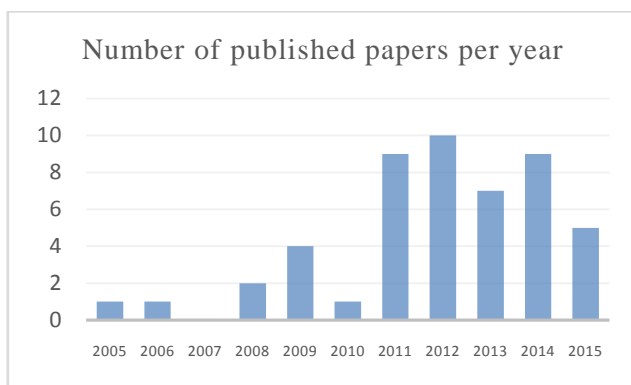

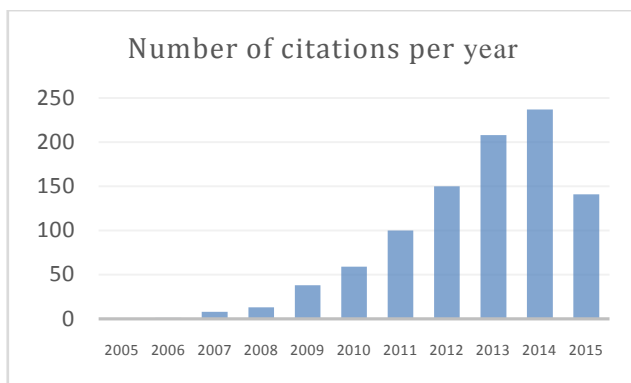*Figure 1. Overview of a number of published papers per year*

Figure 2. Overview of a number of citations per year

Images show interest of researchers in this domain, and also indicating the rise on the interest of researchers within this domain in the last five years. Attesting to that is the fact that more than 60% of the total number of citations belongs to papers published

in the last four years. Consequently, this analysis gave the answer to first research question of this paper.

Integral and mandatory part of bibliometric analysis is an analysis of representation of journals, in which papers are published, what also fits into answering our second research question: *What is the degree of relevance of the field based on journal impact factor?* Analysis of representation of a certain journal is measured by impact factor which, according to [28], represents a "measure that keeps an average number of citations to recent articles published in that journal." The goal of this analysis was to determine the relevance of this domain, based on impact factor of a journal this domain is being mentioned in. Journals with higher impact factor are more important than the ones with a lower one. Accordingly, we also graded impact factor of papers which served as a starting point of our analysis, shown in table 1. Besides the aforementioned, table also shows a number of published papers and percentage of the total number of published papers for those journals in which minimum two science papers were published within the elapsed period.

Table 1. The list of the most important journals with published publications overview

Journal	Number of published papers	F (out of 49)	Impact factor (2014)[2]
Computers & education	13	26.53	2.556
Computers in human behavior	9	18.37	2.694
Behaviour & information technology	4	8.16	0.891
International journal of human-computer studies	2	4.08	1.293
Information technology & people	2	4.08	0.784
Information & management	2	4.08	1.865
Turkish online journal of educational technology	2	4.08	0.960

Results of the analysis indicate that these are respectable journals in the area of information technologies and education. Additionally, through deeper analysis shown in table 1., few interesting facts can be identified. First one relates to the fact that papers in the area of e-learning continuance are published in journals which combine areas of education, human behavior and information technologies. Second fact potentially implies the direction of future research in which topics of interest could be studied. Part of this is certainly identification of key determinants of e-learning continuance on individual and organizational level.

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[1] H-index measures productivity and influence of the citation in research paper. Index is based on set of most cited papers and numbers of citations reached in other publications. Index was suggested by a physicist Jorge E. Hirsch in 2005 as a tool for determining relative quality oftheoretical physicists, which is also known as Hirsch index or Hirsch number (Hirsch 2005).

[2] Thompson R – Journal Citation report

Next phase of our research is the analysis of mutual citation and co-citation identified in 49 papers. Analysis is realized with the help of software tool for citation analysis Bibexcel suggested by [29]. Through this analysis we offer and answer to our third research question: *Which authors and which papers were cited and co-cited the most?* Analysis is comprised of 3 steps.

1. **Exporting 49 identified papers and citation analysis**: in this phase we came to more detailed information on frequency of citations of certain authors in all chosen papers which is shown in table 2. Results of the analysis point to [14] as an author with 360 citations within the total number of identified papers. Additionally, analysis revealed most frequently cited authors which are also key to this area. Future researchers dealing with these issues can apply specified findings during further development of mentioned domain.

Table 2. Citation analysis of publications

Citations	First author	Year	Journal
360	Davis F	1989	Mis Quart
340	Roca J	2006	Int J Hum-Comput St
321	Fornell C	1981	J Marketing Res
265	Bhattacherjee A	2001	Mis Quart
243	Venkatesh V	2003	Mis Quart
226	Davis F	1989	Manage Sci
218	Lee M	2010	Comput Educ
213	Venkatesh V	2000	Manage Sci
200	Roca J	2008	Comput Hum Behav
163	Ajzen I	1991	Organ Behav Hum Dec
160	Limayem M	2008	Inform Manage-Amster
158	Oliver R	1980	J Marketing Res
157	Chiu C	2005	Comput Educ
141	Bhattacherjee A	2001	Decis Support Syst
136	Thong J	2006	Int J Hum-Comput St
135	Lee B	2009	Comput Educ
135	Anderson J	1988	Psychol Bull
132	Chiu C	2008	Inform Manage-Amster
132	Larsen T	2009	Comput Hum Behav

2. **Co-citation analysis:** is defined as "the frequency with which two documents are cited together by other documents" [30]. For example, if in one paper two other papers are cited, that is co-citation. The same author also specifies that more co-citations two papers have, it is more likely they have the same semantic meaning. Goal of co-citation analysis is to pair the same references mentioned in different science papers in order to give clearer and more complete analysis from the analysis of individual references and citations. What is visible in table 3. is that papers most frequently cited together represent papers that are making the theoretical basis and foundation of

technology acceptance. Dominating papers are Technology Acceptance Model, TAM (founded by [14]) and Unified Theory of Acceptance and Use of Technology – UTAUT [12], Self determination theory [31] and Expectation confirmation theory [7].

Table 3. Co-citation analysis of publications

Number of co-citations	First author (1)	Year (1)	First author (2)	Year (2)
215	Davis F	1989	Fornell C	1981
215	Davis F	1989	Roca J	2006
186	Bhattacherjee A	2001	Fornell C	1981
183	Fornell C	1981	Roca J	2006
182	Davis F	1989	Venkatesh V	2003
166	Bhattacherje A	2001	Davis F	1989
154	Davis F	1989	Venkatesh V	2000
149	Bhattacherjee A	2001	Roca J	2006
149	Roca J	2006	Venkatesh V	2003
145	Davis F	1989	Davis F	1989
144	Davis F	1989	Fornell C	1981
143	Davis F	1989	Lee M	2010

3. **Co-citation network**: third step shows the relation between previously identified papers using software tool Pajek. Only the most relevant references (those cited at least 20 times) are used in further analysis. The reason for this is that the network we would create would be too complex and incoherent, had we used all other available references. Different colors indicate different periods in which a certain paper is published. Size of node marks the information about frequency of citation of a certain paper. The bigger the nods, more popular papers are. Mentioned analysis is shown in figure 3.
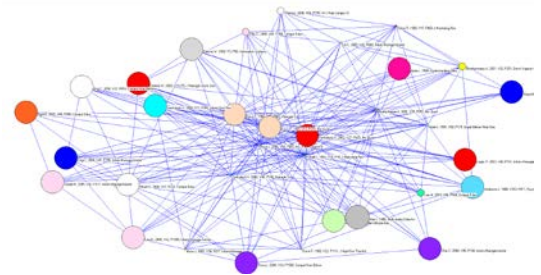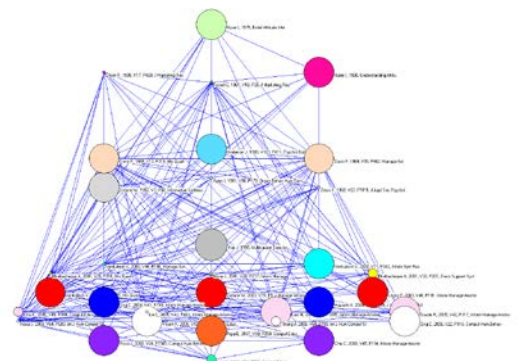

Figure 3. Co-citation network

Figure 4. Chronological co-citation network

This type of network allows us to extract knowledge in searched area through a certain time frame. Presented network, shown in Kamanda-Kawai layout, demonstrates chronological co-citation network of selected papers (image 4). At the very top of the network is the earliest dated paper, while cited papers from the newer period are at the bottom of the network. It is clear from the image that this topic became a subject of more significant interest from 2000 when the largest number of papers is published, however we cannot ignore the first paper published and shown at the beginning of the network. That paper refers to Ajzen's theory of planned behavior of 1975, which serves as basis for most of the papers published afterwards.

3. Conclusion

Relevant research treating the area of e-learning continuance is absolutely deficient [1]. Through detection of this science issue, this research offered a completely new approach within which a domain of e-learning continuance has been analyzed through a prism of bibliometric and co-citation analysis. By descriptive analysis of chosen articles (49) we noticed that research in the area of interest has not been done for the period prior to 2005. Supported by this fact we cannot only corroborate our claims, but claims from other current researchers as well, that this is a completely new and unexplored concept [27].The interest of researchers, indicated by the results of our descriptive analysis, has intensified only in the last five years. With the previous mentioned approach, first of all we offered a detailed and deeper knowledge in an e-learning continuance theory development.

Our second research question encompassed revealing the level of the field relevance, taking into consideration the journal impact factor. Regard to that, this is the main goal of this part of analysis. On the first place, results have shown that our analysis is, for sure, based on respected journals from the field of education, information technology and planned behavior. This fact implies that all directions of future researches could enforce not only information technology field, but fields of education and planned behavior. Since the analysis confirmed this research area as unexplored, we propose it is necessary to detect the main determinants of e-learning continuance. Besides technological field, upcoming studies should include determinants from behavioral and educational field, as suggested from the results of our study.

The analysis of citation gave the answer to our research question about the dominance of authors in the field of e-learning continuance as well a number of citations and co-citations of certain papers. Analysis initially pointed to Davis as the author with 360 citations out of the total number of identified papers. Besides Davis, we identified most commonly co-cited authors in this area. This data can be a supporting tool to al researchers, in a way that it makes the search of science achievements in the area of e-learning continuance easier. The existence of this tool should alleviate future science achievements, considering that this paper offers comprehensive, detailed and clear overview of realized studies within one research, which we could not identify in other studies.

With the assistance of o-cited analysis we succeeded in answering the last research question, related to the identification of grounds e-learning continuance area rests on. Ajzen's theory of planned behavior [13] is identified as the first established theory. Only 10 years later new models are starting to get developed [14], however they also are an extension of Ajzen's model of planned behavior of 1975. Co-citation network clearly indicates that the domain became more important only since 2000 by introducing and improving e-learning on individual and organizational level as well.

When we are talking about the contribution of this paper, we could divide them into theoretical-methodological and practical. Through systematic and detailed overview of literature, as well as bibliometric and co-citation analysis, which is applied to this domain for the first time, this paper offers complete insight into theoretical achievements in the area of e-learning continuance. This insight encompasses four key research questions, through which we tried to give integrated theoretical knowledge in this area. In this respect, paper offers advancement in knowledge using relevant information though chronological development in the area of e-learning continuance. Identification of this area as a domain at its inception, completing it with information about relevance of the area based on published papers is another contribution to the knowledge of this paper. Detection of the most significant authors and explanation of Ajzen's theory, as one of the oldest in this domain and the one which serves as basis for all other research on this area, is a distinctive scientific-methodological contribution of this study. Besides the aforementioned, main methodological contribution of this paper is giving mentioned contributions through use of citation and co-citation network, which is being used for the first time in this domain.

With a goal to fulfill the current void in literature, finding determinants of e-learning continuance can be a potential direction of future research, what we consider scientific as well as practical contribution of this paper. We are witnesses that business context of today cannot function without information technology and continuing upgrade of knowledge of individuals. E-learning continuance at the individual level simultaneously provides organizational success. Therefore, this research should in a practical sense emphasize the necessity of investment in discovering determinants encouraging individual e-learning continuance to satisfy conditions of participation in IT networked and complex global market. In other words, organizations should be interested in discovering the factors that influence e-learning continuance, considering that learning and constant improvement is a need, without which individuals and organizations cannot exist in the world market.

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