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A Review of Empirical Studies on MOOC Adoption: Applying the Unified Theory of Acceptance and Use of Technology

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Despite the increasing number of empirical studies on MOOC development and utilization, significant gaps still remain in the available literature. Little is known about which factors promote MOOC adoption in certain teaching and learning contexts, and which impede its successful application from a theoretical perspective. This study aimed at examining empirical studies on MOOC adoption and clarifying factors affecting MOOC adoption/non-adoption by applying the Unified Theory of Acceptance and Use of Technology (UTAUT). Firstly 40 empirical research papers on MOOC, which were published in 10 selected journals between 2007 and 2016, were reviewed. Secondly, 12 articles that investigated factors promoting or hindering MOOC adoption were critically analyzed. The study revealed that among four constructs of the UTAUT, "Performance Expectancy" was the most important factor in influencing MOOC adoption, while "Facilitating Condition" was the major barrier. It also revealed that while the UTAUT was a useful framework with which to analyze MOOC adoption, it needed to consider the inclusion of "Learner Variables" and "Language Competencies" as two additional constructs. In conclusion, limitations of the study were discussed, and recommendations for future research were made.

Keywords: Adoption, MOOCs, Unified Theory of Acceptance and Use of Technology, UTAUT.

Introduction

Massive Online Open Courses (MOOCs) are open-licensed courses which are delivered completely online to large cohorts of learners. Coursera, edX, Udacity and jMOOC are just some of MOOC providers. Every year, MOOCs attract a large number of learners with a wide variety of cultural backgrounds, experiences, knowledge and skill levels. Data collected in 2016 by Class Central (www.class-central.com) showed that Coursera, the largest MOOC provider, reached 23 million registered users followed by edX with 10 million. Despite the rapid growth of MOOCs (taking into account the dropout rate) little research has been found on determining influential predictors for learners' intention to adopt MOOCs. Understanding the nature of learners and their adoption of online education is crucial to the success of any MOOC provision, especially those in which learners are expected to be self-motivated and self-directed in their learning (Milligan, Littlejohn, & Margaryan, 2013). To identify and categorize key factors that are useful for the prediction of learners' intention to adopt MOOCs it is important to analyze what has been learned from previous studies conducted with empirical data, employing a theoretical framework.

To help us understand MOOC adoption, from a theoretical perspective, two well-known technology adoption models were considered in this study. The Technology Acceptance Model (TAM), and the Unified Theory of Acceptance and Use of Technology (UTAUT). The TAM model makes the assumptions that the user's *perceived usefulness* and *perceived ease of use* are two major factors for technology acceptance. Despite numerous studies (e.g., Teo, Lee, Chai, & Wong, 2009; Venkatesh & Davis, 2000) having tested TAM with a wide range of new technologies and proved that these two factors explain about 40% of the variance in intention to use a technology, it has been criticized for focusing mainly on personal factors (Lee, Kozar, and Lasen, 2003) often disregarding social influence, such as schools,on technology adoption . Addressing these criticisms, Venkatesh, Morris, Davis, and Davis (2003) proposed the UTAUT model and asserted that both personal and social factors were tightly connected in explaining technology acceptance. The UTAUT (See Table 1) proposes that performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) are direct determinants of an individual's intention to adopt a technology. These four determinants have been validated in several studies, in various contexts (e.g., Im,

Hong, & Kang, 2011; Jung & Lee, 2015). Based on these, the UTAUT was considered a suitable framework to critically review and classify the findings reported by previous studies in the field of MOOC adoption.

The purpose of this study, therefore, was to provide a better understanding of the reasons for MOOC adoption by teachers and learners. The study used the UTAUT as a framework for analyzing and classifying reasons for MOOC adoption reported in previous empirical studies.

Table 1:
Four Constructs of the Unified Theory of Acceptance and Use of Technology

Construct	Description
Performance expectancy (PE)	"The degree to which an individual believes that using the system will help him or her attain gains in job performance" (Venkatesh et al., 2003, p. 447)
Effort expectancy (EE)	"The degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450)
Social influence (SI)	"The degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451)
Facilitating condition (FC)	"the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453)

Methodology

Selected Journals

Ten well-known international journals in the fields of education technology and distance education– six online and four paper-based - were selected for this study: *International Journal of Educational Technology in Higher Education* (IJETHE); *European Journal of Open, Distance and E-Learning* (EURODL); *International Review of Research in Open and Distance Learning* (IRRODL); *Journal of Interactive Media in Education* (JIME); MERLOT's *Journal of Online Learning and Teaching* (JOLT); *Journal of Educational Technology & Society* (ETS); *British Journal of Educational Technology* (BJET); *Educational Technology Research and Development* (ETR&D); *Computers & Education* (C&E); and *Distance Education* (DE). Among these journals, EURODL, IRRODL, JIME, JOLT, BJET, and DE published one or more special issues on MOOCs.

Selecting Papers on MOOC Adoption

From the above-listed journals, published between 2007 and 2016 (ten years), abstracts and methodology sections were initially reviewed followed by an identification of all papers containing empirical data that consisted of qualitative, quantitative or mixed research methods in addressing issues related to MOOCs. In total, 40 research articles were found under these criteria. The 40 articles were then reviewed, and those found to have no empirical data and to be on topics other than 'reasons for MOOC adoption' were excluded from the study. In the end, only 12 studies were found to discuss reasons and difficulties in adopting MOOCs for teaching and learning. The full texts of these 12 articles, containing both qualitative and quantitative data, were used as the main source of analysis. Table 2 shows the overview of the 12 articles selected for the study.

Examining and Classifying Factors Affecting MOOC Adoption

The 12 selected studies were critically reviewed, with special focus on key factors that promote or inhibit MOOC adoption reported in their results. Subsequently, based on the UTAUT constructs (Performance expectancy; Effort expectancy, Social influence; and Facilitating condition) the authors developed four codes (PE, EE, SI, FC) and classified the findings reported by each article. Qualitative data analysis software in this case QDA Miner, was used to assist with coding, classifying and analyzing the 12 articles. To increase the reliability of the coding results, the researchers met face-to-face to discuss their findings and draw inferences from qualitative and quantitative results in the studies. The following sections discuss the results of this investigative process.

Table 2:
Twelve Articles Selected for the Study.

Journal/ Author and Year	MOOC	Variables analyzed	Data collected	Method of analysis	Main findings
JOLT *1)Milligan, Littlejhon, & Margaryan (2013)*	cMOOC	Patterns of engagement. Factors affecting engagement	Online survey. Interviews (n=29)	Quantitative Transcripts analysis of interview data	Key factors affecting engagement: Confidence, Prior knowledge and Motivation
C&E *2) Rosell-Aguilar (2013)*	iTunes U	Personal data. Use of podcasts. Opinions of the downloaded materials, use of iTunes U	Online survey (n=1891)	Quantitative Descriptive statistics	Personal interests, relevance to user' studies and profession, and language learning.
C&E *3) Alraimi, Zo, & Ciganek (2014)*	Coursera, edX, Udacity	Perceived openness, reputation, usefulness, and enjoyment; Satisfaction	Online survey (n=316)	Quantitative Partial Least Squares (PLS) and Confirmatory factor analysis	Perceived reputation. Perceived openness was not related to satisfaction. Significant relationship between perceived usefulness and satisfaction.
IRRODL *4) Radford, Robles, Cataylo, Horn, Thornton, & Whitfield* (2014)	Coursera, edX, Udacity	HR professionals' and employers' awareness, usage and perceptions of MOOCs	Structured interviews (n=103)	Qualitative Answers coded and analyzed using NVivo software.	MOOCs were considered as something "extra" or "additional" to continue learning. MOOCs were considered useful for jobs that require a broad range of skills and experience.
EURODL *5) Pundak, Sabag, & Trotskovsky (2014)*	Coursera, edX, FutureLearn, OpenupED, Udacity	Chosen course, Academic background, Experience with online courses, Expectations from the course.	Questionnaires and Interviews (n=9)	Data were recorded and analyzed using the interpretative phenomenological approach	Course content stimulated users' personal interests. Opportunity to study a fascinating subject not offered by their educational institution. Opportunity to get supplementary and deeper knowledge in a previously studied material.
BJET *6) Liyanagunawardena, Lundqvist, & Williams (2015)*	FutureLearn	Demographic variables	2013 pre- and post- surveys (n = 3606 and n = 210) 2014 pre- and	Quantitative Descriptive statistics	Learners' goals were based on their knowledge/experience Beginners wanted a glimpse of

			post-surveys (n = 2657 and n = 96)		programming. Experienced programmers wanted to learn specific topics or refresh their programming skills. Others joined the course to explore online learning.
RUSC *7) Yousef, Chatti, Wosnitza, & Schroeder (2015)*	cMOOCs, xMOOCs	Open-survey	Open-question survey (n = 158)	Qualitative Inductive category development method	Lifelong learning. Learning new instructional design and learning methodologies. Personal development. Career advancement. Receive high-quality content from top universities' professors. Networking learning.
EURODL *8) Farrow, de los Arcos, Pitt, & Weller (2015)*	iTunes U OpenLearn Saylor Academy	Patterns of use. User profiles. Attitudes towards OER. Types of materials used. Popularity of different subjects	Online survey (n = 3,127)	Quantitative Data refined and compiled before being analyzed via SPSS and Excel.	Personal interest in the subject. Professional development. Study related to their work. Relevance to a specific need in knowledge/ skills. Reputation of the developer, Clear learning objectives, Ease of download/ access. A chance to study at no cost, the flexible and online nature of the resources. A chance to try university level content.
BJET *9) Chang, Hung, &*	MOOCs	Learning styles	Index of learning styles questionnaire	The K-means clustering technique	As part of a course requirement

Lin (2015)			for undergraduate students (n=184)		Students' personal habits Cultivation of own professional skills.
C&E *10) Zhou* (2016)	MOOCs	Perceived behavioral control. Attitude. Subjective norms. Intention	Online survey for university students in China (n = 400)	Quantitative A confirmatory factor analysis and a path analysis (using the maximum likelihood estimation method)	Three constructs (attitude, subjective norms and perceived behavioral control) of the Planned Behavior Theory accounted for 64.1% of the variance in students' intention to use MOOCs. Perceived behavioral control is the strongest predictor, accounting for 55% of the variance of intention, while the small variance was explained by attitudes in intention, and the direct link between subjective norms and behavioral intention was missing.
C&E *11) Barak, Watted, & Haick, (2016)*	Coursera	Intrinsic motivation, Self-determination, Self-efficacy, Career, Motivation	Pre- and post-surveys (n = 325) Posts of English and Arabic forums (1289 and 329 posts), 23 e-mail messages	Quantitative ANCOVA tests, Repeated measures, ANOVA, Spearman's correlations, Scatter plots, Curvilinear regressions, The inductive analysis method	Five types of MOOC "completers" were found: problem-solvers, networkers, benefactors, innovation-seekers, and complementary learners.
C&E *12) Zhang (2016)*	MOOCs	Students' evaluation. Students' regulatory foci. Teachers' advocates	2 by 2 full factorial design Online survey (n = 158)	Quantitative MANOVA, ANOVA, Post hoc analysis	A match between students' regulatory foci and teachers' advocates would result in students having a greater intention to learn from an MOOC. Students would perceive the MOOC to be more helpful if teachers' advocates matched the students' regulatory foci.

Literature Review of Twelve Empirical Studies

Factors Promoting MOOC Adoption

Among the major factors that affected MOOC adoption found in the literature review, *improving skills and deepening knowledge in specific areas, professional* and *personal development* were those that influenced individuals the strongest in using MOOCs, as evidenced in several articles (Chang, Hung, & Lin, 2015; Ciganek, 2014; Farrow et al., 2015; Radford et al. 2014; Liyanagunawardena, 2015; Rosell-Aguilar, 2013; Yousef, et al., 2015). Requests from the users' instructors or employers to use MOOC to fulfill the requirements of a project or course played an important role in learners' adoption. Instructors attempted to promote active learning among their students and employers' encouraged their employees to find solutions for problems encountered in the workplace (Barak et al., 2016; Chang, Hung, and Lin, 2015).

Other factors such as interests in *lifelong learning* and *personal development* stimulated users to adopt MOOC for teaching and learning purposes (Farrow, et al., 2015; Pundak, Sabag, & Trotskovsky, 2014; Rosell-Aguilar, 2013). During this adoption process, gender played a role in the selection of a specific type/content of MOOCs. For example, MOOCs in the fields of engineering and technology were more appealing to males than to females (Liyanagunawardena, Lundqvist, & Williams, 2015; Rosell-Aguilar, 2013). Age was also an important factor in selecting certain MOOCs. Some MOOCs such as iTunes U reported a much lower users' average age profile (below 35 years old), while other MOOCs such as OpenLearn attracted users aged 35 or above (Farrow et al., 2015).

Trying something new was another reason for learning with MOOCs. For instance, the participants in a study conducted by Pundak, Sabag and Trotskovsky (2014) saw, in MOOCs, a chance to learn a fascinating subject not offered by their college curriculum. Yet for other learners, *learning foreign language skills* was an important reason to take MOOCs. Yet foror others, *expanding their social network,* by learning through interactions with other users from different parts of the world, was the important motivator for taking MOOCs (Barak et al., 2016; Yousef et al., 2015). Those who successfully built networks, connected well with others, either through social media or face-to-face meetings, and through carrying out collaborative learning were able to overcome many challenges during the courses (Chang, Hung, & Lin, 2015; Farrow et al., 2015; Milligan, Littlejhon, & Margaryan, 2103). *Networking* was not only seen as useful while taking MOOCs, but it was also considered an activity that could persist even after the course had ended (Zhou, 2016).

The *institution's reputation* was a strong predictor for selecting a certain MOOC (Alraimi, Zo, & Ciganek, 2014). It was mainly associated with receiving high-quality content from top institutions and well-known professors (Yousef et al., 2015). Other factors that influenced the users' decisions to choose MOOCs were: 1) Clarity of the learning objectives, 2) Easy access to download learning materials, 3) High-quality content (Farrow et al., 2015), 4) A clear course introduction, 5) The number of assignments and 6) The number of hours required weekly to succeed in the course (Pundak, Sabag, & Trotskovsky, 2014).

Barriers to MOOC Adoption

In addition, several barriers that inhibit MOOC adoption were revealed in the studies. In the current study, these barriers were broadly categorized into three areas: *Environmental*, *personal* and *design*.

Environmental. Some barriers align to environmental aspects of MOOC use. Espinoza et al., (2015) and García Espinosa et al., (2015) discovered that these environmental conditions consisted of 1) a slow and unstable Internet connection, 2) a lack of attention to learners' personal needs and, 3) the lack of workplace understanding and support. Taken as a whole, these factors impeded online learning. Learners without a steady network connection, needs-based support, and employer understanding tend to not finish online courses and have difficulty in acquiring new knowledge (García Espinosa et al., 2015).

Personal. Other barriers to MOOC adoption align to personal variables such as learning styles, anxiety levels and learning abilities. Chang, Hung, and Lin (2015) revealed that personal learning styles affected non-adoption of MOOCs. According to them, a learning style can be decided by the combination of four determinants, "active or reflective," "sensing or intuitive," "verbal or visual," and "sequential or global". They found that those who had high reflective learning styles had a low possibility of using MOOCs. Among the top five reasons for not using MOOCs, three were related to the learners' preference for traditional delivery methods.

In addition to learning styles, the level of anxiety is found to be important in explaining the non-adoption of MOOC. The anxiety over unfamiliarity with online environments (Chang, Hung, & Lin, 2015; García Espinosa et al.,

2015) and the fear of utilizing new technology (Chang, Hung, & Lin, 2015; Pundak, 2014) tend to prevent learners from adopting and/or successfully utilizing and completing MOOCs.

Moreover, a lack of essential abilities for learning with MOOCs, not surprisingly, appears to be an important barrier to their adoption. These essential abilities include language proficiency (especially English since most MOOCs are offered in this language), time management skills and communication skills (Chang, Hung, & Lin, 2015; Farrow et al., 2015; García Espinosa et al., 2015; Pundak, 2014).

Design. The poor design of MOOCs is yet another barrier. Unclear syllabi led learners to misunderstand the courses. For example, Espinoza et al. (2015) indicated the lack of clear pre-course information such as course objectives, language requirements, and learning tools impeded effective learning by increasing anxiety levels throughout the course. Learning support was another factor related to design. It was found to be a challenge to open online learning in two studies. Farrow et al. (2015) highlighted the lack of support from tutors and teachers and García Espinosa et al. (2015) pointed out deficiencies in feedback and monitoring as a barrier to MOOC use in learning. In addition, these studies indicated that complexity in navigating and locating MOOCs, along with difficulty in utilizing technology were additional barriers to MOOC adoption.

Applying Four Constructs of UTAUT

As specified in the methodology section above, the factors promoting the adoption of MOOCs reported by the 12 selected studies were classified using the UTAUT model.

Performance Expectancy

The most powerful factor promoting MOOC adoption was "Performance Expectancy (PE)". That is, users tend to believe that MOOC adoption (for teaching and/or learning) would help improve their performance. Within the PE category, "development of personal interests," "improvement of specific skills in work/study related areas," "career development," and "opportunity to learn something new" appeared to be more specific reasons. The majority of those taking MOOCs were employed in an organization and showed high interest in their personal and career development. However, to confirm this argument, future research with different types of MOOC adoption with different users is called for.

Social Influence

The second most important factor for MOOC adoption was "Social Influence (SI)." That is, users tend to adopt MOOC when they perceive their teachers, colleagues and/or friends believe they should use MOOCs. Within the SI category, "perceived need to receive high-quality content from top universities and well known professors," "request from instructors and employers as parts of projects and course requirements" and "perceived need to expand one's networking" were the most prevalent reasons for adopting MOOCs. Regarding networking expansion, findings by Barak, Watted, and Haick (2016) indicated that small group communications via online forums had a positive impact on users' motivation to learn with MOOCs and stimulated users' commitment to learning.

Effort Expectancy

"Effort Expectancy (EE)" appeared to be less important than PE and SI in adopting MOOCs. This may be explained by the fact that many users do not perceive MOOCs as particularly demanding in terms of skill, effort and time and therefore did not consider EE a significant factor affecting their decision to adopt. The finding that ease of use impacts new technology adoption is supported by Im, Hong, and Kang (2011) and Jung and Lee (2015).

Facilitating Conditions

As expected, "Facilitating Conditions (FC)" appeared to be least linked to promoting MOOC adoption and was in fact frequently mentioned as a barrier to MOOC adoption. In particular, slow network speed, unstable connection, and lack of support at the workplace made it difficult for users to adopt MOOCs and complete online learning. Nevertheless, MOOCs were perceived as being helpful to access free, high-quality educational content while affording a flexible online environment where learning could occur without time or place restrictions. In the case of MOOCs, short media files with clear learning specifications, the use of transcripts from a multi-disciplined curriculum, and links to resources of mainstream events were all factors supporting students' learning (Rosell-Aguilar, 2013).

In addition to the four constructs of UTAUT', two new constructs emerged during the coding and classification process, *Learner Variables* and *Language Competencies*. MOOC adoption was closely related to learners' preferred methods of learning and their level of prerequisite knowledge (Chang et al., 2015). In addition, other learner variables such as age, gender and occupation played a significant role in MOOC adoption. Further, *Language Competencies*, which included English language proficiency, foreign language anxiety, and overall communication skills, also affected MOOC adoption. This is understandable considering most MOOCs are published in English and non-native English users may lack the confidence to join group discussions in open online courses. As one example among many, Taguchi and Nakahara (2006) found that when using text-based discussion boards, some students, who were not good at text-based communication, had difficulties sharing thoughts and eventually disappeared from the boards. By adding these two new constructs, a richer explanation can be offered to explain MOOC adoption.

This research endeavor proposes the addition of two more variables to the UTAUT model and offers a more robust conceptual framework of MOOC adoption as shown in Figure 1.

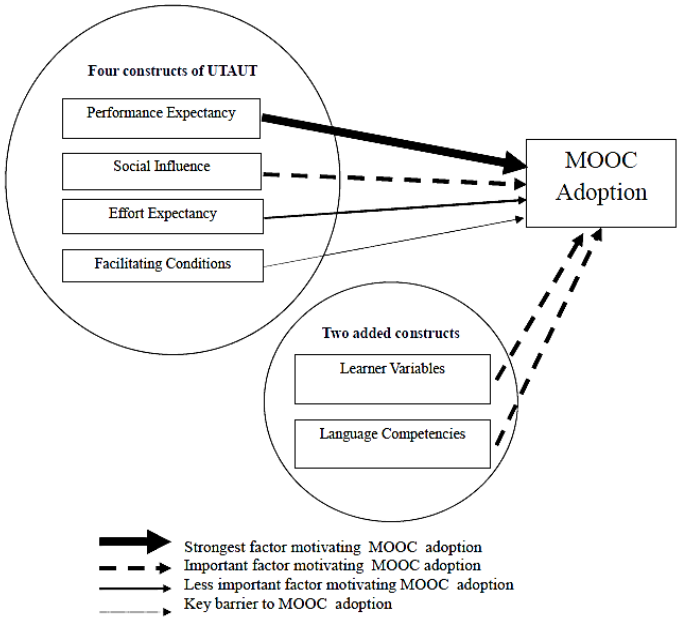

Figure 1: A conceptual framework of MOOC adoption

Conclusion

This paper examined factors influencing MOOC adoption depicted in recent empirical studies and analyzed them using UTAUT as a framework. The rise of MOOCs, means it is critical, in the context of teaching and learning. to understand what factors affect decisions in adopting or not MOOCs The present study revealed that the four constructs of the UTAUT model, while useful in explaining and determine the strength of predictors for learners' intention to adopt MOOCs, did not present a complete picture. The addition of two further constructs was needed to fully understand MOOC adoption and were presented in a conceptual framework. This framework is intended as a basis for suggesting strategies appropriate to promote MOOC adoption, while reducing barriers, in various teaching and learning contexts.

Considering the fast growth of free, open online courses or MOOCs, it is noteworthy that there was a strong connection between learners' foreign language proficiency, mainly English, and self-confidence in expanding networking with other learners. This finding suggests more research is needed regarding community building and social networking in order to help increase learners' interest and engagement with MOOCs. Additional research is necessary here to identify *key learner' variables* including prior knowledge, age and gender that affect successful completion of MOOCs in both primary and secondary languages.

Finally, it is important to highlight that a large number of MOOC users, described in the studies, were students at top educational institutions or employed by companies. It can be safely stated therefore, that MOOCs were mostly directed towards users who have already attained a certain degree of education which facilitated their understanding

of contents. In the future, MOOC stakeholders and developers should devise ways to reach those individuals who need to receive support in their elementary or secondary education.

This study has limitations and caution is needed when interpreting or generalizing findings. First, the study reviewed only published articles; the researchers had no access to raw data from any study to further analyze or corroborate results. All assumptions were made based on the findings and interpretations reported by the 12 selected studies. Further only a small number of studies which focused on primarily one type of MOOCs were included in our analysis. Future research is needed that includes a larger number of empirical studies covering a wider variety of MOOCs. Additionally, going beyond a literature review to research the conduct of empirical studies is advisable to verify the conceptual framework suggested in this report.

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