Influences of Online Learning Support Services on Continued Intention to Use MOOC

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Abstract—In this study, an undergraduate course in Wuhan City, China was chosen as the respondent and a questionnaire of influences of online learning support services on continued intention to use MOOC was designed. The influencing degree of four aspects of online learning support services (education teaching, curriculum resources, learning facilities and management services) on continued intention to use MOOC were analyzed. Moreover, differences in continued intention to use under various online learning contact time were discussed. Results demonstrated that the overall Cronbach α of the questionnaire was 0.872, KMO value was 0.833 (>0.8) and the corresponding P value was 0.000, indicating that the designed questionnaire had good reliability and validity. Education teaching, curriculum resources and learning facilities all have significantly positive promotions on the continued intention to use MOOC. According to the Kruskal-Wallis test statistics, online learning contact time presents typical "inverted V-shaped" relations with the learners' continuous intention to use. Research conclusions have important values to maintain a relatively high learning intention of learners by strengthening learning support services and promote learning outcomes of MOOC and adopt specific learning support service strategies.

Keywords—online learning, learning support services, MOOC, continued intention to use

1 Introduction

The COVID-19 pandemic promotes large-scale applications of online education. Emerging technologies such as cloud computing, big data, and artificial intelligence continue to promote education reform. Not only did it propose higher requirements on learning support services to remote education, but it also lays solid foundations for personalized and intelligent education teaching. In the era of "Internet+", learning has not been limited within various campuses at all levels and online learning has been realized by using various advanced mobile Internet technologies and high-quality mobile terminal equipment. As an important type in online courses, MOOC is widely accepted with having considerable potential to overturn existing high-education modes due to its openness and sharing characteristics. Promoting educational equality of MOOC becomes a hotspot of learners. Meanwhile, new high-quality education resources are

added into the free and open resource lists continuously. Many of these resources provide valuable opportunities to students who originally cannot contact such high-quality education resources completely. Thus, a common consensus that MOOC has considerable values in promoting educational equality was observed. With the increase in MOOCs, poor-quality courses are increasing continuously and learners are difficult to distinguish accurately. Thus, the learning quality and learning enthusiasm cannot be protected effectively. The primary characteristic of online courses is temporal-spatial separation between teaching and learning, which allows learners to determine their learning pace by themselves and bring them many adverse influences on online learning. The teacher-student dialogue is established through interaction, which provides an optional path to solve online courses. Moreover, MOOC has some unique attributes, such as large-scale applications and openness. It requires more resources to guarantee the good operation of MOOC.

Nevertheless, the low completion rate of MOOC is also an important aspect of doubt. Motivation and attitudes of MOOC learners can be evaluated effectively by improving their continued intention to use, thus preventing learner loss. In the beginning of contacting MOOC, learners have a sense of freshness. However, as time goes on, learners are easily burnt out and they have no stronger continuous intention to use, thus decreasing the learning performance. In the era of big data, data analytical methods such as learning analysis enrich online learning support services contents. Online learning support services can design intelligent and humanized support services based on data analysis technologies like learning analysis to facilitate learners to make more effective learning of MOOC. Centering at online learners, learning support services aim to explore service needs hidden behind the data by collecting, storing and analyzing online learning data of learners. On this basis, it provides learners support services from various dimensions, including schools, teachers, peers, and so on. Perfect learning support services can improve autonomous learning enthusiasm of students, increase online learning outcome and facilitate knowledge system construction of learners. With the popularization of higher education, there may have been remarkable changes and progresses in concepts, teaching process and management of traditional higher education. The scope of learning support services to students is more extensive and there are components of learning support services in all aspects, such as governments, schools, teachers, and peers. Thus, increasing learning support services can make learners maintain a relatively high level of learning duration, increase their learning efforts and learning motivations, strengthen emotional communication of online learning, and improve learning effect, thus enhancing their continuous intention to use MOOC.

2 Theoretical basis and proposition of hypotheses

2.1 Theoretical basis

The theory of learning support services develops early in developed countries and has achieved relatively rich research fruits. Some achievements in teaching practice have been gained. David Sewart [1] proposed the concept of "learning support services"

explicitly in his Continuous Attentions of Distance Learning System to Students. This provides a unified expression and research basis for support services to students in the distance education circle. Subsequently, numerous scholars have made positive explorations on learning support services. Theoretical studies on learning support services focus on service system, service mode, and education technology. Theory of learning support services mainly believes that learners do not have an inborn learning ability and they can only finish the learning process under the strong learning support service system, thus building the knowledge system successfully. Deep learning abilities of learners such as the autonomous learning ability and self-management ability can only achieve considerable development under assistances of strong learning support services. Learning support services promote learners to realize the learning process through comprehensive assistance. The essence of learning support services lies in the continuous two-way communication activities between students and schools/teachers. Schools can provide learners with appropriate feedbacks by using the perfect learning support service system or help learners to gain all activities and factors related with cognition, skills and emotional improvement during the teaching process. In view of existing studies, learning support services include teaching and tutoring institutions, advice and consultation institutions, information and monitoring institutions, and other microscopic factors. From the perspective learners' demands, it is believed that all services shall be centered at learners to improve the reflection, emotion and cognitive ability of student individuals and promote their systematic development. Therefore, various schools at all levels in foreign countries pay attention to providing learners with personalized learning services, thus fulfilling the learning demands of each student. Through one-to-one mentor system, many measures are adopted to promote learning of learners at a higher efficiency, such as diversified evaluation services, elastic exam system and trans-school acceptance of credit points. With the continuous development of teaching information technology, the personalized learning services of network education based on big data technology fulfills the personalized learning demands of learners to some extent, while avoiding great investments of capitals and equipment. Moreover, they have the potential for large-scale applications and may lay foundations for online learning support services to personalized learning. In a good school environment, learning support services can collect data to evaluate the learning states of learners by analyzing their behavioral data throughout the process, thus forming a learning database of learners. Learning outcomes are evaluated comprehensively from the learning effort, learning effect, learning style, and individual characteristics perspectives, thus providing learners more scientific and accurate online learning support services. Schools and teachers can adjust management services and resource services timely according to data feedbacks of students in the network learning environment.

2.2 Proposition of hypotheses

Many studies have demonstrated that building a learning support service system not only guarantees the online learning outcome, but also plays an important role in improving talent training quality. Some studies have discussed how the learning support service system may influence teaching and influence the learners' continuous intention

to use courses. Ludwig-Hardman, S et al. [2] demonstrated that using effective learning support services can decrease loneliness of some students of distance learning programs and courses, strengthen self-guidance and management, and improve their learning motivation level. MacGillivray, H [3] analyzed the effectiveness of learning support services provided by the Queensland University of Technology. Results found that such learning support services fulfilled the students' need of various abilities. Britto, M et al. [4] demonstrated that online learning support service department builds and implements a whole set of services for online students, which can strengthen experiences of online students, thus increasing retention rate of students directly and indirectly. Russo-Gleicher, R [5] determined that university managers have to educate and encourage online teachers to acquire various learning support services by using the community universities, or insufficient use of learning support services may lead to relatively low retention rates of online courses. Walters-Archie, A et al. [6] analyzed the effects of various academic support services and resources to improve online learning outcomes in the Open University of the West Indies. Results demonstrated that these support services aim to train positive and meaningful online learning experiences, thus assuring students to complete courses and learning plans successfully. Rangara-Omol, T. A et al. [7] investigated the degree of available support services of students and they found that only four of nine indexes to measure learning support services are positive stimuli. They suggested schools to improve their support service ability to solve problems that may occur. Conceição, S. C. O et al. [8] investigated support strategies that are viewed as important by students in the higher education network in the United States. Results showed that learning support services mainly include support services from teachers, family members, and friends. Hunte, S [9] described support services to new students of online learning in the background of developing countries in Caribbean small islands. According to survey results, participants have relatively high overall cognition to support services and school's supports to new students of online learning have positive influences on their performances in online learning environment. Lee, S. J et al. [10] believed that learning support services include teaching support, peer support, and technological support. Results showed that teaching support, peer support, and technological support are significantly correlated with their overall satisfaction to the online course. Tere, T et al. [11] determined that the learners' satisfaction can be promoted by strengthening the construction of the learning support service system. Alzaza, N. S et al. [12] concluded that current higher education environment now is equipped with mobile technological infrastructure for mobile learning and students have sufficient knowledge and good consciousness to use such technologies in their education environment. Tallman, F. D [13] found that the students' satisfaction is significantly correlated with support services that learners perceived. Malanga, A. C. M et al. [14] investigated the behavioral factors that influenced the intention of university students in Brazil to use an e-learning system and found that promotion conditions, social influences, habits, and quality can influence their intention to use the system. Dai, H. M et al. [15] demonstrated that learning habit is the key factor that increases the continuous intention to use MOOC significantly. Wu, B et al. [16] determined that perceived ease of use, task-technology matching degree, reputation, social recognition and social influence are key influencing factors of continued intention to use MOOC. According to results,

Hsu, J. Y et al. [17] found that consciousness of community and perceived benefits both may influence behavioral intention of learners from ordinary e-learning platforms and MOOC. Yang, M et al. [18] indicated that system quality, course quality, and service quality are significant decisive factors of continuous intention of individuals to use MOOC. Dai, H. M et al. [19] found that the continued intention to use MOOC can be predicted from individual curiosity, but the attitude plays a considerable dominant role. Relevant factors of online learning support services can improve learning motivations, learning performances, and continuous intention to use significantly. Learning support services include various support services and many factors, including personal support, learning resource support, learning activity support, learning evaluation support, and so on. Strengthening learning support services can help and promote autonomous learning of students, solve difficulties they encounter in the learning process, improve learning quality and effect, and promote innovative talent training.

Based on aforementioned studies, the following hypotheses were proposed.

- H1: In online learning, teaching can significantly improve continuous intention of learners to use MOOC.
- H2: In online learning, curriculum resources can significantly improve continuous intention of learners to use MOOC.
- H3: In online learning, learning facilities can significantly improve continuous intention of learners to use MOOC.
- H4: In online learning, management services can significantly improve continuous intention of learners to use MOOC.

3 Methodology

3.1 Questionnaire design

In this study, a questionnaire of Effects of Online Learning Support Services on Continuous Intention to Use MOOC was designed. It covers three aspects. The first aspect is basic information of respondents, including four questions about gender, subject, grade, and online learning contact time. The second aspect measures the online learning support services. Learning support services use studies that are highly cited in China. Four aspects in evaluation indices of distance learning support services in Zhu Z L et al.[20] were applied, which were teaching, curriculum resources, learning facilities, and management services. These four aspects were measured by 4, 3, 3, and 4 questions. The third aspect was applicable to measure continuous intention to use. In this study, seven questions from Lin, W. S et al. [21] questionnaire were used. The questionnaire was measured by a seven-point Likert scale and all questions were scored from 1 to 7.

3.2 Respondents

A college of civil engineering in an ordinary university in Wuhan was chosen as the respondents. This is a key school of the university and has obvious advantages in faculty. The school has carried out a lot of teaching reforms in recent years and possesses good online teaching resources. The research team conducted a paper questionnaire survey during break time. A total of 254 questionnaires were set and 236 were collected. After invalid questionnaires were excluded, 196 questionnaires remained, showing an effective collection rate of 77.17%. In view of gender, these questionnaires were filled by 107 boys (54.59%) and 89 girls (45.41%). In view of majors, there were 21 respondents from civil engineering (10.71%), 34 from the project management (17.35%), 72 from the engineering cost (Sino-foreign cooperation) (36.73%), 29 from the water supply and drainage science and engineering (14.80%), 28 from environmental engineering (14.29%), and 12 from underground works (6.12%). In view of grades, there were 40 freshmen (20.41%), 71 sophomores (36.22%), 67 juniors (34.18%), and 18 seniors (9.18%). In view of online learning contact time, there were 32 respondents who have contacted with online learning for less than one year (16.33%), while 31 respondents who have contacted with online learning for one to two years (15.82%), 28 respondents who have contacted with online learning for two to three years (14.29%), 27 respondents who have contacted with online learning for three to five years (13.78%), and 78 respondents who have contacted with online learning for more than five years (39.80%). University students have accepted online education modes extensively during middle school or high school. Therefore, most students have more than five years of online learning experiences.

4 Results analysis and discussion

4.1 Reliability and validity

The questionnaire data's consistency and stability were measured by a reliability test. Cronbach's α is a common method. The higher Cronbach's α indicated the higher consistency of the scale. According to data analysis based on SPSS22.0, Cronbach's α is higher than 0.8 for all four independent variables and one dependent variable and the Cronbach's α of the whole questionnaire was 0.872, indicating that the designed questionnaire has good reliability.

Table 1. Reliability results

Variable type	Name of variables	Number of questions	Cronbach α	Cronbach α
Independent variable	Education teaching	4	0.935	0.872
	Curriculum resources	3	0.869	
	Learning facilities	3	0.856	
	Management services	4	0.946	
Dependent variable	Continued intention to use	7	0.939	

A validity test aims to test the effectiveness of the questionnaire, determine whether the designed questions are reasonable, and whether it is corresponding well to the research expectation. In the statistical analysis, it is the most common questionnaire validity test method. Questionnaire validity was tested by the KMO and Bartlett spherical test. Results are shown in Table 2.

Table 2. KMO and Bartlett tests

KMO value		0.833
Bartlett sphericity test	***Approximate chi-square***	3891.295
	df	210
	p value	0

Table 2 shows that the KMO value was 0.833 in this study (>0.8) and the corresponding P value was 0.000 (<0.01), indicating that the proposed questionnaire has good validity.

4.2 Regression analysis

It can be seen from Table 3 that:

H1 is true. In online learning, education teaching can significantly improve continued intention of learners to use MOOC. Reasons are explained as follows. Although online teaching requires independent study of learners in many times, teaching and tutoring of teachers have very important influences on academic performances of learners. Since online learning lacks the sense of immediacy in traditional teaching, learner-teacher interaction has to be completed online in to improve learning outcome comprehensively. Therefore, teachers shall be familiar with use of online teaching platforms, increase interaction frequency with students during live broadcast by establishing various social groups (e.g. WeChat group and QQ group), improve interaction quality and fulfill emotional needs of learners. With respect to use of teaching strategies, teachers shall trust learners completely, give them enough learning space, promote them to make more learning reflections and deep learning reflections, help learners to control learning process effectively, facilitate their high-efficiency integration of curriculum knowledge, and form a more scientific knowledge system. Moreover, only teachers who have corresponding professional knowledge and training background can answer questions of students better during online learning, thus enabling to help students in improving learning performances and guarantee satisfying learning outcomes. Through after-class tutoring, learners can reflect on learning process effectively, control progress in the next learning process, improve initiative in learning, and finally strengthen the continued intention to use MOOC.

H2 is true. In online learning, curriculum resources can significantly improve continued intention of learners to use MOOC. During online learning, curriculum resources are a type of very important learning resources for learners. Quality of curriculum resources determines the independent learning outcome of students directly and influ-

ences quality of online learning indirectly. This reflects that great effort has been invested to curriculum development and a perfect curriculum development system is developed to guarantee high quality of curriculum resources. Nowadays, online learning courses have considerable resources in diversified forms, which include teaching videos, document resources, microlectures, Flash cartoons, etc. In particular, learners are easy to be distracted after watching the microlecture videos for a long time. On the one hand, university teachers can help learners to concentrate by embedding tests and forming question popups in videos. On the other hand, students can get feedback timely and determine whether they have mastered knowledge points, thus taking the initiative to build, criticize and understand knowledge. Moreover, curriculum professor teams from the university are good at listening feedback of learners and attach high attentions to iterative optimization of curriculums. The rich curriculum resources can help learners devote themselves into learning and participate in learning process positively, thus increasing their continuous intention to use MOOC. Therefore, universities shall pay attention to the quality of curriculum resources and avoid rejection of learners due to the excessive low quality of curriculum resources when establishing the learning support service system.

H3 is true. In online learning, learning facilities can significantly improve the continuous intention of learners to use MOOC. Reasons are interpreted as follows. Online learning depends more on good use of learning resources. University students basically have good basic conditions (e.g., mobile phones, iPads, and laptop). Nevertheless, online learning is based on network. The Internet speed and coverage degree may influence the student-teacher online interaction and students' learning. Now, most universities have high basic Internet speed and large coverage area. Students can watch video resources and make independent learning at any time and any place, without any obstacles. Good online learning hardware basis can improve the continued intention to use MOOC. To realize personalized and accurate learning of students, learning states of learners are analyzed by using information technologies such as big data, which is convenient for learners to adopt more scientific learning plans and guarantee the final online learning outcome.

H4 is false. In online learning, management services fail to improve the continuous intention of learners to use MOOC significantly. Reasons are introduced as follows. Online learning emphasizes more on teacher-student interaction and student-student interaction. Different from traditional classroom teaching, learners mainly perceive relevant behaviors of teachers and peers, but they have fewer perceptions to management services and they even believe that management services are ineffective. This conclusion also inspires our high efficiency. Setting a special study consultant and provide management service consultation to students is necessary. Therefore, students can seek assistance from the consultant when they encounter problems and difficulties. The consultant can provide specific advices and opinions to students. This not only guarantees answering to the students' confusions and prevents problem accumulation and even outbursts effectively, but is beneficial to maintain the stability in learning enthusiasm, realize management services, and improve continuous intention of users to use MOOC.

Table 3. Regression coefficient

Variables	Standardized coefficient	t	p	VIF	R^2	Adjusted R^2	F
Constant	-	2.469	0.014*	-	0.227	0.211	F (4,191)=14.035, p=0.000
Education teaching	0.328	5.011	0.000**	1.056			
Curriculum resources	0.351	4.789	0.000**	1.328			
Learning facilities	0.159	4.856	0.000**	1.191			
Management services	0.043	0.604	0.547	1.228			

D-W:1.470
* p<0.05 ** p<0.01

4.3 Difference analysis

Kruskal-Wallis test statistics are shown in Table 4. Obviously, online learning contact time is significant on the 0.05 level with respect to the continued intention to use (p=0.036<0.05), indicating that online learners have different continuous intentions to use. In view of specific numerical values, online learning contact time presents a typical "inverted V-shaped" relationship with the continuous intention of learners to use. This reflects that when learners come into contact with online learning in the beginning, they are unfamiliar with online learning resources, failing to realize preview and review. As a result, learners exert fewer efforts to learning and thereby decrease their academic performance. Finally, their continued intention to use is decreased. With the increase of online learning contact time, learners become more familiar with the method of using online learning resources, which stimulates their online learning enthusiasm and increases learning efforts. Accordingly, they are more skilled in interacting with teachers and other students by using the online platform and strengthen emotional communications with others. However, online learners lose their initial learning interests and encounter barriers in learning after online learning contact time reaches its peak. Therefore, they are easily burnt out and cannot keep learning anymore. Their enthusiasm in interaction with teachers and peers declines and their learning motivations are weakened, thus decreasing continuous intention to use accordingly.

Table 4. Non-parameter test results

	Online learning contact time (median)					Kruskal-Wallis test statistical H value	P value
	1.0 (n=32)	*2.0 (n=31)*	*3.0 (n=28)*	*4.0 (n=27)*	*5.0 (n=78)*		
Continued intention to use	4.125	4.151	4.423	4.256	4.175	10.248	0.036*

* p<0.05 ** p<0.01

Table 5 shows that students from different majors and at different grades show similar continued intention to use MOOC. This proves that online learning in universities

brought relatively equal benefits to students from different majors and at different grades, without obvious differences.

Table 5. Difference analysis of continued intention to use among different majors and grades

Major (mean ± standard deviation)						**F**	**P**
1.0(n=21)	***2.0(n=34)***	***3.0(n=72)***	***4.0(n=29)***	***5.0(n=28)***	***6.0(n=12)***	0.752	0.586
4.25±1.27	4.15±1.15	4.52±1.15	4.27±0.86	4.23±0.97	4.25±0.57		
Grade (mean ± standard deviation)						**F**	**P**
1.0(n=40)	***2.0(n=71)***		***3.0(n=67)***		***4.0(n=18)***	1.311	0.272
4.11±1.00	4.35±1.09		4.50±1.00		4.14±1.38		

5 Conclusions

With the popularization of online learning, many universities in China have begun to build MOOC in accordance with their situations. Online courses do not supplement traditional teaching, but it becomes the mainstream teaching mode. However, learners of MOOC are easily tired of learning and decrease learning enthusiasm because MOOC emphasizes on knowledge transfer and has spatial separation between teaching and learning. Strengthening online learning support services can increase learning efforts of students and maintain a relatively high continuous intention to use MOOC. This study conducts a case study based on an undergraduate university in Wuhan, China. Influencing degrees of four aspects (education teaching, curriculum resources, learning facilities and management services) of online learning support services on continued intention to use MOOC are analyzed. Meanwhile, differences in continued intention to use with online learning contact time are discussed. Research results demonstrated that the overall Cronbach's α of the questionnaire is 0.872 and the KMO value is 0.833, indicating that the designed questionnaire has good reliability and validity. Education teaching, curriculum resources and learning facilities all have significantly positive promotions on the continued intention to use MOOC. According to the Kruskal-Wallis test statistics, online learning contact time is significant on the 0.05 level with respect to continuous intention to use ($p=0.036<0.05$). It is suggested to expanding questionnaire respondent samples in building the learning support service system from the mixed perspective and conducting deep studies on the relationship between individual characteristics of learners and their continued intention to use MOOC.

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