Understanding the barriers to the use of MOOCs in a developing country : an innovation resistance perspective

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**Understanding the Barriers to the Use of MOOCs in a Developing Country: An Innovation
Resistance Perspective**

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Abstract

Despite the promised benefits of MOOCs (Massive Open Online Courses) to address the digital divide and promote equity in educational opportunities, the use of MOOCs is still lagging especially in developing countries. The purpose of the present study is to investigate the barriers underlying the adoption of MOOCs in the context of a developing country. Drawing from the theoretical framework of innovation resistance theory (IRT), this study conducted focus group discussions with 69 college students in China, a major developing country in Asia. It was found that innovation resistance theory is plausible to explain the barriers to adopting MOOCs. Our results showed that the main barriers in the adoption of MOOCs encountered by students in a developing country are usage barrier, value barrier and tradition barrier. Furthermore, to complement the perspective of IRT, this study also conducted an inductive analysis to identify other types of obstacles hindering students' use of MOOCs. It was found that individual factors (e.g., self-control and attitude) as well as the environment (e.g., promotion and economical circumstance) are also barriers to the use of MOOCs. Implications and suggestions for practice are also discussed.

Key words: MOOCs, barriers of adoption, Innovation Resistance Theory (IRT), individual-level barriers, environmental-level barriers

1. Introduction

In recent years, MOOCs (Massive Open Online Courses) become prevalent across various disciplines among different countries (Barclay & Logan, 2013). MOOCs describe “an evolving ecosystem of online learning environments that encompass a spectrum of course

designs” (Veletsianos & Shepherdson, 2016, p. 198). This new learning approach has gained attention from educators, professionals, and media because of its effectiveness in delivering course content to reach a large number of audiences. In fact, MOOCs have been regarded as one of the most efficient methods to deliver video course contents through online platforms (North, Richardson, & North, 2014). Participation in MOOCs is often voluntary depending on learners’ interests. MOOCs provide learners with a variety of advantages to strength their learning abilities (Barclay & Logan, 2013). In summary, the platform promises potential to promote online learning due to the following reasons: (1) economical to the learners as most of the course materials are either freely available online or available at very low cost; (2) accessibility as the platform can reach a global scale of learners who can access the platform at anytime anywhere; (3) personalized learning as learners are able to choose the course content based on their own interests and time schedule (Barclay & Logan, 2013). Thus, MOOCs hold potentials to bridge the digital divide by enabling access to educational resources which will benefit students in developing countries where the quality and accessibility to such resources is deemed to be less desirable (Liyanagunawardena, Adams, & Williams, 2013).

Despite these potential benefits, there are some problems with students’ usage and adoption of MOOCs. For instance, it is found that the dropout rate of MOOCs is very high (Koutropoulos et al., 2012). It was reported that more than 90% learners cannot finish the registered MOOCs lessons online (Jordan, 2013). In addition, because of economical disadvantage, students in developing regions might encounter challenges in the adoption of MOOCs. Despite these known challenges, the barriers hindering the use of MOOCs by students

in developing countries have not been investigated in research (Barclay & Logan, 2013). Since one of the purposes of online education is to address the digital divide and promote equity in educational opportunities, understanding the barriers faced by students in developing country is an important endeavor.

As MOOCs are regarded as an educational innovation, understanding individuals' innovation resistance is at least as important as studying innovation adoption. But empirical studies in this field is very rare (Kleijnen, Lee, & Wetzels, 2009). The situation is similar in the field of MOOC adoption research whereby there is little knowledge about students' non-adoption of MOOCs (Koutropoulos, et al., 2012). In addition, most innovation adoption studies have been conducted in the context of the work environment (for a review, see Venkatesh, Morris, Davis, & Davis, 2003). As MOOC learning takes place in students' spare time and is mainly based their own interests and selections, the theories and models derived from the environment context need to be adapted and revised when studying students' MOOC adoption.

Indeed, the group of non-adopters contains valuable information which is helpful for the successful marketing of innovation diffusion and the reduction of product failure (Ram, 1987). Past research of innovation adoption has mainly focused on studying the drivers or motivators of innovation adoption, while studies of barriers or obstacles to adopting innovations are relatively scarce (Lian & Yen, 2014). Specifically, little research has been conducted to examine the resistance of MOOCs in the context of developing countries (Barclay & Logan, 2013) especially from the perspective of non-users. Therefore, to address this research gap, the purpose of the

present study is to investigate the barriers underlying students' adoption of MOOCs in a developing country by examining both users and non-users of MOOCs.

Here, the present study proposes the use of innovation resistance theory (IRT) as the theoretical foundation of this study to explain students' resistances towards adoption of MOOCs. Specifically, IRT is a comprehensive model to explain users' resistance of innovations (Ram & Sheth, 1989). This theory classified possible barriers of innovation adoption into two categories consisting of functional barriers and psychological barriers. Functional barriers relate to "product usage patterns, product value, and risks associated with product usage" while psychological barriers arise from "traditions and norms of customers, and perceived product image" (Ram & Sheth, 1989, p. 7). Correspondingly, students' resistance of MOOCs will be investigated through both functional and psychological barriers. In this study, the focus is on students from developing countries as MOOCs are deemed to promote educational equality as such will benefit students in these countries. Hence, this study presents the following research question: *From the perspective of innovation resistance theory, what are the barriers that prevent students in developing countries from adopting MOOCs?*

2 Literature Review

2.1 MOOC Adoption Studies

Most past studies have focused on the drivers of MOOC adoption. For instance, Lee, Hsieh, and Hsu (2011) investigated the influential factors underlying learners' adoption of online learning systems by integrating technology acceptance model and diffusion of innovations theory. Pedrotti and Nistor (2014) explored the determinants of students' adoption of online

courses and found social influence from peers and faculty could exert significant influence on their decisions. In line with this study, Gao and Yang (2015) examined learners' adoption of MOOCs by applying technology acceptance model with additional factors. They found that perceived usefulness, ease of use, and mimetic pressures were significantly associated with learners' intention of adoption. While previous studies have identified the antecedents which are valuable to understand the drivers influencing adoption, innovation adoption is distinct from innovation resistance and empirical studies concerned with innovation resistance are surprisingly rare (Claudy, Garcia, & O'Driscoll, 2014; Lian & Yen, 2014). Khan et al. (2012) summarized the main barriers that hindered information communication technology (ICT) adoption in developing countries, such as lack of equipment and technical support, insufficient funds, and social and cultural factors. By interviewing 52 MOOC users, Said (2013) uncovered several design factors that affected MOOC retention, including learner control, integrative design, mobility and language. These studies mainly focused on users to examine barriers of MOOC adoption rather than non-users. Since non-users may provide valuable information of barriers encountered by innovations (Ram, 1987), it is necessary and insightful to incorporate the perspective of non-users.

Further, it should be noted that innovation resistance is not the obverse of innovation adoption (Ram, 1987). Resistance is conceptually separated from innovation adoption, which needs to be investigated as a specific form of consumer behavior (Gatignon & Robertson, 1991). Indeed, resistance may take place earlier than adoption after the innovation is launched and

ultimately consumers' resistance may lead to innovations' failure in the market. Hence, it is important to understand the underlying reasons for innovation resistance.

2.2 Innovation Resistance Perspective

Innovation resistance is defined as “the resistance offered by consumers to an innovation, either because it poses potential changes from a satisfactory status quo or because it conflicts with their belief structure” (Ram & Sheth, 1989, p. 9). That is, resistance may happen when the innovation disrupts consumers' established routines, habits, traditions and norms, or causes conflicts to consumers' beliefs, values, and faith. It is suggested that most people are reluctant to change and this tendency of maintaining status quo seems more typical and rational (Sheth, 1981). An innovation may bring changes to the consumers' formed habits, beliefs and/or values, which may result in consumers' resistance to the innovation (Ram & Sheth, 1989). Indeed, users have an intrinsic need to keep psychological equilibrium (Ram, 1987). It seems to be a normal and typical response for users to resist innovations if they disrupt the formed equilibrium (Ram & Sheth, 1989).

While the previous studies on innovations mostly focused on drivers or motivating factors of adoption, the barriers or resistance that inhibit the adoption of innovations seem to be neglected in the literature (Laukkanen, Sinkkonen, & Laukkanen, 2008; Lian & Yen, 2014). This is due to “pro-innovation bias” (Rogers, 2003), whereby researchers assume that the innovations are good and they should be and will be adopted by users sooner or later. The group of users who have not adopted the innovations is simply classified as “laggards” (Rogers, 2003). Sometimes, even though the innovations are considered necessary and desirable, resistance may also take

place (Ram & Sheth, 1989). Thus, it is not useful to emphasize the drivers of innovation adoption but neglect the barriers that cause resistance.

Based on the perception of users, Ram and Sheth (1989) proposed a comprehensive theory to explain the influential factors underlying users' resistance to innovation, namely Innovation Resistance Theory (IRT). They suggest that users' resistance to innovation can be attributed to functional and psychological barriers. It is suggested that the functional barriers will exert influence once users feel changes brought the innovation, whereas the psychological barriers will be triggered if the innovation conflicts with their formed beliefs or values. IRT is widely applied in the field of business and marketing research to explain users' resistances towards different innovative products, such as internet banking (Laukkanen, et al., 2008) and online shopping (Lian & Yen, 2014).

As an educational innovation, MOOC learning shares some similarities with other business innovations. For instance, unlike traditional way of studying in classroom, MOOC learning is based on students' interests and voluntariness (Liyanagunawardena, et al., 2013). In other words, students can be considered as "consumers" of MOOCs as they can choose MOOCs according to their own will. In this context, their behavior is comparable to online consumer behavior. Therefore, explaining students' resistance to towards MOOCs' adoption through the lens of IRT will uncover diverse perspectives from past research in different disciplines (i.e. education, marketing and information science). Collectively from past works, the functional barriers include usage barrier, value barrier and risk barrier, while psychological barriers include tradition barrier and image barrier. The present study explores students' resistance towards

MOOCs through these five aspects which are usage barrier, value barrier, risk barrier, tradition barrier, and image barrier.

Usage barrier. This term is used to explain situations when an innovation brings incompatibility or inconvenience to existing workflows, practices or habits, which is the most common reason for users' resistance to innovations (Ram & Sheth, 1989). If a new product disturbs the usage patterns and brings more problems rather than convenience, it is not surprising for the new product to face resistance from users. In the context of using MOOCs to support learning, usage factors, such as perceived ease of use and usefulness, are considered as critical determinants which impact students' adoption intention (Gao & Yang, 2015). For example, Bourrie et al. (2016) suggested educational innovations should be easy to use and implement in order to facilitate students' usage. Indeed, the usage of MOOCs should not be an obstacle for today's students as watching online courses is a simple skill of surfing on the internet and the operations are not complicated. However, infrastructure issues may affect usability, such as the lack of internet access and availability of computers or other equipment, especially for the students living in developing countries or regions (Barclay & Logan, 2013). Thus, the usage barrier may hinder students from applying MOOCs in their study in the context of developing countries.

Value barrier. This term refers to the cost of an innovation and its performance-to-price ratio compared to the existing substitute (Ram & Sheth, 1989). On one hand, if the cost or price of the innovation is too high for consumers to afford it, it is not possible for them to adopt it. On the other hand, even if users can afford it, they are likely to consider the performance-to-price

ratio which will be factored into the adoption decision.. For students in developing countries, the cost of MOOCs could be an obstacle due to their economical disadvantages, even though there are free courses online. Approaching this concern issue from the perspective of performance-to-price ratio, the issue should be whether MOOCs bring more benefits and advantages to students compared to traditional learning methods (i.e., studying in the classroom and supervised by instructors). For students who are new to MOOCs, the efforts they need to put in to familiarize themselves with the environment can also be considered another type of cost. Collectively, the value barrier may prevent students from adopting MOOCs if the costs outweigh the benefits.

Risk Barrier. For any kind of innovation, uncertainty is inherent (Ram & Sheth, 1989). At the beginning, consumers may have little information to evaluate the innovation in terms of its performance, complexity, and potential harms. Users may not adopt the innovation until the perceived risk is decreased through information gathering. There are several types of risk barriers including physical risk, economic risk, functional risk, and social risk (Ram & Sheth, 1989). The risks the students may encounter when using MOOCs are as follows. First, there might be concerns with the accuracy of the information as it is well-established that the sharing of misinformation in social media is prevalent among students (Liu et al., 2016). Second, students may be concerned with the risks of wasted time and effort as learning in MOOCs is a new study approach and the outcomes are not certain. Hence, student may face a combination of different risks when using MOOCs.

Tradition barrier. Within a group, there are social norms and values for the members to follow and obey (Laukkanen, et al., 2008). If an innovation requires users to deviate from social

norms or break with established traditions, resistance may take place (Ram & Sheth, 1989). However, users are more comfortable in their routines and follow daily habits. As a result, resistance is simply brought by habits, for individuals are reluctant to change if they feel satisfied with their current status (Sheth, 1981). Indeed, learning in MOOCs is different from most students' prior learning experience conducted in a formal setting (i.e. classroom). More importantly, in MOOCs there is a lack of face-to-face interactions with course instructors and other classmates (North, et al., 2014) which is a break for tradition learning practices as most students may be more accustomed to the face-to-face interactions based on traditional formal learning. Hence, tradition barrier may become an obstacle which prevents students from adopting MOOCs, which may bring changes to established traditions and habits.

Image barrier. The image of a product serves as an important cue for consumers to evaluate the product and service, which may be derived from stereotypes, word of mouth, media coverage, and other non-experiential sources (Kleijnen, et al., 2009). Users may have certain image perceptions for each innovation (Ram & Sheth, 1989), such as the product quality produced by the original countries, the values propagated by certain brands, and the style designed for a special group of people. For example, some older adults feel anxious when dealing with computer and other technologies (Lian & Yen, 2014). Older adults may perceive that complex skills are required which are beyond their ability and lead to a "difficult-to-use" image. Consequently, these adults may avoid using the technology innovations in their daily life. For MOOCs, due to the lack of direct instruction and supervision with the course instructors, some students may be confused or have difficulties following the instructions and course content.

Ultimately, students who dislike learning may lack the enthusiasm and motivation to conduct learning by themselves on MOOCs and hence the image of MOOCs may be viewed unfavorably by these students.

In sum, the present study intends to apply IRT as the theoretical framework to investigate the reasons for MOOC resistance in developing countries. Specifically, this study attempts to explore potential barriers of MOOC adoption from five barriers categories which are usage, value, risk, tradition and image.

3 Methodology

The objective of this study is to explore what barriers hinder students from using MOOCs in a developing country. To answer the research question, qualitative data was collected via focus-group discussions. Although a qualitative method is criticized to be subjective and results can be to generalize, qualitative methods tend to generate insight into understanding and identifying context-specific reasons compared to quantitative methods (Bryman & Bell, 2015). In addition, it has been identified that past empirical studies on MOOCs mainly focused on analyzing quantitative, click stream and observational data, and there is an urgent need for expanding the methodological approaches in order to reveal insights of MOOC learners themselves (Veletsianos & Shepherdson, 2016). Thus, the present study used qualitative methods to examine learners' opinions about MOOCs and the study was conducted in the natural setting as participants were college students.

Focus group technique is a method of interviewing individuals together as a group, usually at least four, whereby the views and perspectives are extracted from the participants'

discussion (Bryman & Bell, 2015). Since the purpose of this study is to examine barriers to MOOC adoption among students, it would be helpful and meaningful to let students themselves talk about their own perceptions and evaluations of MOOC learning. Indeed, the researchers were able to elicit responses beyond the barriers identified in past research from the focus group discussions. During the discussions, the participants were able to articulate their opinions and share their ideas and feelings towards MOOC usage with the researcher. As such, the researchers were able to derive insightful and valuable views from the qualitative data collected. Thus, focus group discussion is appropriate for this research.

All the participants were college students who were studying in a local university located in the northwest of China, which is an economically disadvantaged region. This study was conducted in China because China is considered a developing country where educational resources are not equally distributed and educational innovations are in demand (M. Zhou, 2016). MOOCs can help to address the problem of digital divide and inequity in educational opportunities and there is a strong cultural emphasis on the importance of education in China (Tran, 2013).

In all, 69 students (32 males and 37 females) were invited to participate in the focus group study, and each of group consisted of four to six participants. The researchers recruited only college students as they were appropriate for the study as course content in MOOCs is typically pitched at the higher education level. The researchers conducted nineteen focus groups and participants in all the groups were requested to share their experience and perception of MOOC usage. All focus groups were moderated by a member of the research team who was in

charge of data collection and note taking. In a typical session, the discussion began with an introduction and explanation of the research project. Then the participants were asked to describe their MOOC usage experience as a starting point. Several questions regarding MOOC adoption and resistance (such as usage habits, reasons for adoption and non-adoption) were designed in advance to structure the discussion procedure. Participants were encouraged to freely express their opinions rather than being forced to talk about factors derived from the theoretical framework. The moderator helped to keep the discussion on the right track and summarize ideas and opinions during the discussions. These notes were collected as the original data for further analysis.

The focus group transcripts were subsequently analyzed by content analysis. Content analysis is often applied to analyze interview transcripts to reveal patterns and models underlying peoples' ideas and thoughts (Bryman & Bell, 2015). In this study, a mixed method by combining both deductive and inductive approaches was applied when categorizing the themes from the transcripts. Deductive coding is based on categories suggested by an existing theory or model, while inductive coding is used to generate categories from transcripts during the coding procedure (Bryman & Bell, 2015). At the beginning of the study, an initial coding scheme was provided based on the five categories of barriers proposed in the theoretical framework, including usage barrier, value barrier, risk barrier, tradition barrier, and image barrier. Meanwhile, themes that could not be categorized into the proposed framework were studied further by creating new categories. The new categories were inductively added to the scheme as

new themes emerged during the categorizing procedure (Riffell & Sibley, 2005). The new categories emerged from analysis are discussed in later paragraphs.

The comments collected from the participants during the focus group discussions were analyzed and separated into discrete themes as the unit of analysis for categorization. In order to ensure the reliability of the content analysis, two coders were involved in the coding procedure. A coding manual was provided which included description of categories, rules for assigning codes, and examples. The coders were trained before conducting the content analysis. The proportional reduction in loss (PRL) (Rust & Cooil, 1994), a measurement of qualitative reliability, was applied in the present study. There were a total number of 108 themes exacted from 19 groups, and these themes were further classified into the five categories proposed in the theoretical framework. Themes that did not fit into these categories were separated out as new group for further exploration. The percentage of coding agreement between two coders was 82%. Using tables offered by Rust and Cooil (1994), data generated a PRL reliability of 0.88, which is comparable to a Cronbach's alpha of 0.88 and fairly good.

4 Results

In all, 108 themes were extracted out from the transcripts from the nineteen focus group discussions. The themes were first categorized into different groups indicating the five barrier groups proposed by IRT (i.e. usage barrier, value barrier, risk barrier, tradition barrier, and image barrier). For each category, the researchers further identified the sub-themes associated with each barrier. In addition, recurring themes that did not fit into the categories identified from IRT needed to be categorized to gain a richer understanding of the phenomenon. For this purpose,

new categories were derived from data during analysis. Particularly, the researchers identified “individual-level barrier” and “environmental-level barrier” categories. The insights from these new categories can be used to complement the barriers identified by IRT.

Usage barrier. Regarding the usability of MOOCs perceived by the student, it seems that students had no doubt about the usefulness of this educational innovation. However, what they complained about most was the lack of Internet access. They explained that there was no internet or Wifi connection in the students’ dorms and mobile connection was costly and not as efficient. These were obstacles that prevented students from using MOOCs. For example, some students mentioned ‘*there is no Wifi access in our dorm, and the cost of connecting Internet through mobile phone is very expensive...*’, and ‘*the power is off after eleven o’clock in the evening.*’ In addition, the students were concerned with the lack of interaction and instruction with the lecturer, which would make the learning process difficult to follow. Some students also commented that it was not easy to choose suitable courses as no instruction was provided. Examples include ‘*It is not easy to take notes, and discussing with lecturers and other students is also a problem....*’, ‘*...the course resources are abundant and diverse, and we just don’t know how to choose the proper one...*’, and ‘*the choice (for MOOCs) is quite few.*’

Value barrier. The value barrier refers to the obstacles derived from cost and performance-to-price ratio. It is surprising to find that cost is regarded as a main barrier by the students, considering there are an abundant number of free courses online. The students were of the opinion that spending additional money on studying via MOOCs was not cost effective as they

were able to find the content from alternative online platforms. Hence, they would rather spend the money on other activities. Examples comments include *'I'd rather spend my money on Taobao (a popular online shopping website in China) than learn from MOOCs...'*, *'...my parents may have a doubt whether we can learn on the Internet. Thus, they are not likely to spend money for us...'*. In addition, except for some certificates issued by the MOOC platform (sometimes nothing at all), MOOC learning does not contribute to any course credits. Expectedly, the students were not motivated to put efforts and time in MOOC learning. For instance, one student mentioned that *'no credit will be rewarded after finishing the online courses. Our schedule in the school is already very full. After all, the purpose of studying in the university is to get the degree.'*

Risk barrier. The perceived risk derived from using MOOCs is the least mentioned barrier. This is not surprising since participating in MOOCs is free and voluntary in most cases. Thus, it poses little risks. However, one group of students expressed their uncertainty about the objective of studying in MOOCs and questioned whether MOOCs would be effective to address their learning needs. This can be regarded as one type of functional risk as, students were unsure of how effective MOOCs function as a learning platform. Furthermore, , there are many alternate online learning resources students may turn to (such as a search engine, or other websites) to meet their learning needs . For example, it was mentioned that *'...the objective is not clear, and we are not sure if what we learn from MOOCs is helpful to solve our problem...'*, and *'... after all, we can turn to Baidu (a Chinese searching engine) and find the solution very quickly.'*

Tradition barrier. The tradition barrier is frequently mentioned by the students, in forms of ‘tradition’, ‘habit’, and ‘thinking model’. Chinese students are found to be reluctant to discover knowledge by themselves with the facilities that are available to them, and are used to being “spoon fed” by lecturers (Tran, 2013). This is in contrary to online learning or learning in MOOCs which requires students to conduct self-directed learning meaning that students have to take responsibility for decisions related to their learning (López-Pérez, Pérez-López, & Rodríguez-Ariza, 2011). The students were used to traditional classroom learning where they were passive learners waiting for instructions and content from the instructors. Some examples to reflect this point include *‘it is the traditional way in which we study at school and learn under the supervision of instructors (in the classroom). We have learned in this way for a dozen of years already.’*, *‘...I never used Internet when I was a child. So I don’t have such a habit to learn from MOOCs...’*, and *‘it is our learning tradition to consume knowledge passively from the teachers. The mode of consuming knowledge passively is deeply rooted in our tradition and practices and it is hard to change.’*

Image barrier. For these students who rarely tried MOOCs, some expressed their indifference or even antipathy towards learning within MOOCs. For them, learning means to study under the instruction of lecturers rather than to take their own responsibility for learning. As a result, students in such an environment tend to stay passive and resist to changes (Jie, 2009). This kind of stereotype may hind students from learning within MOOCs. For example,

the students said '*I am not interested in studying at all...*', and '*.. students here may lack the spirit of exploration and consider learning as a difficult task.*'

Individual-level Barrier. Besides these barriers included in IRT, what was mentioned most by the students were themes related to self-control. Relevant themes include 'procrastination', 'distraction', and 'concentration'. As participating in MOOCs is voluntary and self-regulated, it requires students to instill discipline to concentrate on learning. However, there are a variety of interesting and entertaining applications on the Internet which may distract students from studying in MOOCs. This may also explain why the drop-out rate of MOOCs is so high. Example comments include '*as there are so many interesting applications in the internet, such as videos, games, online shopping, etc., it is not easy for us to concentrate on learning MOOCs when connecting to the internet*', '*there is so much pressure in our work, and I don't have any mood to study (after work). I'd rather visit Taobao rather than learn MOOCs...*', and '*the course resources are always there online. So we always tend to postpone the plan of studying MOOCs.*'

In the focus group discussion, some students expressed their antipathy to study itself. In other words, their attitude towards studying is passive. This is not attributed to MOOCs but the students themselves. They seemed to have no interest in studying and to be indifferent to any innovative learning approach. For example, some students mentioned '*we are reluctant to study in the classroom, let alone study online by ourselves...*', and '*(Chinese) students lack enthusiasm to study actively, but prefer to seek short-term interests.*'

Environmental-level Barrier. Lastly, the factors derived from physical and social environment seem to exert influence on students' adoption of MOOCs. Firstly, the students said that the learning atmosphere is not strong, and most students would like to play rather than study in the dorms. This impact from peers would negatively affect students' adoption of MOOCs. For example, some students said *'the learning atmosphere is not strong around us...'*, and *'I didn't see anyone who studied MOOCs before.'* Secondly, some students complained that they did not know what MOOCs were before participating in the discussion. This may be attributed to the lack of promotion of MOOCs in the university. Example comments include *'...the promotion is not enough...'*, and *'the promotion is lacking, and we are not sure how it is going to benefit us.'* Lastly, the economy level is also found to be influential. As the university is located in an underdeveloped area, the development of information and communication technology is relatively slow. This may constrain students' intention to adopt MOOCs in their studies. Example comments include *'Here (where the study was conducted) is economically disadvantaged and the process of adopting technological innovation is relatively slow...Thus, we don't have the awareness to utilize the Internet for studying.'* Thus, factors derived from the environment are also found to exert influence on students' MOOC adoption.

Furthermore, the frequency of themes coded in each category was summarized out (see Figure 1). The researchers also found interesting associations and patterns emerge. It was identified that barriers derived from students themselves, including lack of self-control and passive attitude towards studying, were the most mentioned obstacle for adopting MOOCs, and

26.9% of the quoted themes were relevant to this barrier. The second mostly quoted barriers were relevant to usage of MOOCs, which consists of lack of internet access, inadequate course resources, and lack of interactions. This category took up 25% of quoted themes in all. In addition, value barrier, in terms of cost and performance-to-price ratio, was 13.9% of quotes of the resistance themes. 12% of quoted themes were concerned with environmental factors, which included lack of promotion and disadvantage of local economy. Tradition barrier was also mentioned as one of the major barrier hindering students from adopting MOOCs, taking up 11.1% of the coded themes. Image barrier (3.7%) was also found to be influential on MOOC adoption, which exerted influence by imposing stereotype that studying should take place in the classroom rather than in the online context. Not surprisingly, risk barrier (0.9%) was the least mentioned theme that impacted students' adoption of MOOCs. Although some students expressed their uncertainty in terms of functional risk (i.e., the objective of learning within MOOCs), the risk barrier was insignificant in terms of the physical, economic, or social aspect.

<Insert Figure 1 here >

5 Discussion

In sum, the barriers identified in IRT were applicable to explain the resistances encountered by students in the use of MOOCs. In fact, the IRT theoretical framework can explain 54.6% of the barriers that hinder students from adopting MOOCs, while barriers derived from individual level and environmental level can cover 38.9% of resistance reasons. That is, the two new categories complement the explanation power of IRT by integrating individual-level and

environmental-level factors into the model to explain why students in a developing country were not adopting MOOCs.

The results of content analysis show an unbalanced impact among the different categories of barriers (Figure 1). Within the scope of innovation resistance theory, usage barrier was the most quoted theme by the students, followed by tradition barrier, value barrier and image barrier. Risk barrier was least mentioned by the students. Regarding usage barrier, the students complained that the lack of internet access was one of the main technological obstacles to MOOC usage. Indeed, research was conducted in the more economically disadvantaged regions in China where the internet and communication network infrastructures were still not as well developed as compared to other major cities in China. In addition, lack of interaction with lecturers and other students also prevented students from adopting MOOCs. The students also shared that they found it difficult to access and understand the course in MOOCs. For these reasons, they preferred traditional classroom learning. This finding is aligned with North et al.'s (2014) conclusion. Indeed, it is difficult for the university alone to improve the Internet infrastructures in a short time, considering the lack of fund and resources. However, it is possible to cooperate with educational IT enterprises to develop the Internet access on campus together. In addition, universities should regularly provide some technical support and instructions to students when they need help for learning MOOCs.

In terms of the tradition barrier, the traditional teaching-learning routine was deeply rooted in many students' minds which might be attributed to the Chinese educational culture. The

researchers found that the students in our study were accustomed to playing the role of a passive learner. This is not surprising as Chinese students were reported to be passive learners who preferred to be under the supervision and regulation of their course instructors (Tran, 2013). Pierson (1996) explained that this passive learning habit is due to the traditional learning style rooted in the cultural heritage, or “Confucian values”. In the Confucian heritage culture, students are taught to respect teachers and absorb what they deliver without critical thinking (Tran, 2013). Specifically, teachers in China have high public respect, as such learning in MOOCs without the direct supervision of the course instructors (teachers) appears to be in conflict with this Chinese cultural norm which explains students’ resistances towards MOOCs in our study. To overcome this barrier, one possible solution is to organize the students to study MOOCs together under lecturers’ supervision and instruction at the beginning, in order to cultivate their new studying habits and recognize the benefits of learning from MOOCs.

Concerning value barrier, the students think it is not worthy of spending money and time on MOOCs. Specifically, as learning in MOOCs contributes little to gain credits in the school, students were unwilling to spend effort and resources. Concerned with image barrier, students who have no interest to study may consider MOOC learning as boring as a traditional learning approach, even though they have not tried it before. As such, universities can attempt to recognize the credits gained from learning designated MOOCs to motivate and encourage students.

Besides these barrier categories proposed by IRT, this study also identified resistance behavior at the individual and environmental levels that contributed to the non-adoption of MOOCs in developing countries. At the individual level, the main reason is that students in our study were unable to self-regulate and were not utilizing self-regulating strategies due to the voluntary nature of MOOC learning (Q. Zhou, Lee, & Sin, 2017). The researchers explained that the reason could be due to the students' lack of self-control which leads to their tendency to postpone the learning task. Indeed, lack of self-control was one of the often-cited reasons preventing students from adopting MOOCs in the study. As the online learning environment is characterized as autonomous, the ability of self-control is deemed to be very critical for learners to succeed in online learning (Barnard, Lan, To, Paton, & Lai, 2009). While there are many interesting and entertaining applications on the internet, students may be easily distracted to do other things (e.g., chatting online, watching videos, etc.). Indeed, even if the usage barrier (e.g., Internet access) mentioned by students is solved, they may be still unwilling to learn MOOCs due to the lack of self-regulation strategies. In addition, some students' attitude towards MOOC studying is negative. It is probably due to the lack of valid and helpful information for them to evaluate the product since there is a lack of instructions from the sponsoring universities and organizations. The lack of information may make it difficult for students to understand how to integrate MOOCs into a traditional learning routine. Therefore, it is critical for universities to help students to understand the benefits of learning MOOCs and develop self-regulation learning habits, for example, through tutorials and regular training programs.

At the environmental level, the researchers found that the lack of promotion was a major obstacle to MOOC usage. Promotion plays a critical role in promoting the adoption and diffusion of innovations (Rogers, 2003). Effective information dissemination would help consumers access necessary information for evaluation and further reduce resistance to innovation (Ram, 1987). During the focus group discussion, some students shared that they had not heard of MOOCs before. The researchers attributed this to the fact that communication and network infrastructure in economically less developed countries is much less favorable, which makes the spread of educational innovations slow and lagging (Khan, et al., 2012). In addition, the attitude towards innovation adoption might be relatively conservative in economically disadvantaged areas. This further hinders the spread of educational innovation. Thus, it is the responsibility of the local government and university to improve the infrastructure and raise awareness of MOOC learning among learners in terms of its advantages and resources.

This study emphasizes the importance beyond the technological factors of MOOCs. It is argued that success of applying educational technology depends not only on technology itself but also on the learners, educators, and the learning process Olgren (2000). School level factors, such as organizational vision, beliefs, and culture, are deemed to be critical to impact the adoption of educational innovation (Snoeyink & Ertmer, 2002). Instructors should also encourage students to use MOOCs, as instructors' attitudes and beliefs about teaching and learning is very critical for integrating educational technology in the study (Hew & Cheung, 2014). In addition, as MOOC study is characterized to be autonomy and interest-based (Barnard, et al., 2009), it is important to attract students to actively learn knowledge . In other words, MOOCs, as well as other educational innovations, is competing with other online applications to attract users as many as possible. Thus, students should be treated as “consumers” acquiring knowledge, but not as passive receivers of knowledge. In such case, MOOCs need to be designed at least as interesting as other online applications in order to attract and keep learners. This requires changes in terms of teaching, organizing, and course content, not just the way of delivering.

Conclusion

In sum, the present study investigated the barriers underlying students' adoption of MOOCs. It showed that innovation resistance theory is valid in explaining students' resistance to MOOCs. Particularly, usage barrier, tradition barrier, value barrier and image barrier were found to exert influence on students' adoption of MOOCs. In addition, other barriers at the individual level

(e.g., self-control and attitude) and environmental level (e.g., infrastructure, economy) were also identified to impact students' decision of using MOOCs.

This study has contributed to research in several aspects. Firstly, it has proved that innovation resistance theory has explanatory power in terms of explaining students' resistance to MOOC usage. Particularly, this study provides operational measurements for each barrier category of IRT for future quantitative analysis. Furthermore, this study extends the innovation resistance theory by integrating individual-level factors and environmental-level factors into the theoretical model. Lastly, the study focused on MOOC resistance in the context of a developing country by studying both adopters and non-adopters to provide a comprehensive view of resistance towards MOOCs among learners.

The results also have practical implications for universities, content providers, course instructors. For universities, the results indicate that it is necessary to provide instructions on equipping students with the knowledge on how to self-regulate their learning in MOOCs. Moving forward, it is possible for universities to set MOOC learning as an integral part of traditional classroom learning where the course instructors are still needed to provide instructions. This means that students may need to learn how to navigate formal learning with learning in MOOCs. In addition, in order to motivate students to study MOOCs, universities may explore ways to recognize the credits gained from learning the designated MOOCs as part the formal curriculum. For content providers, it is critical to make the course content interesting and attractive. As there are so many competing applications drawing students' attention, they need to

make the learning process enjoyable and the course content interesting and attractive as well.

Meanwhile, it might be necessary for MOOC platforms to promote MOOCs as other digital commodities and let students know the benefits of learning from MOOCs. For course instructors, they should pay attention to cultivating students' habit to learn within MOOCs in their studies. For instance, instructors can blend MOOCs in the classroom teaching, and let the students realize the advantage and benefit of MOOC learning.

It should be cautious when interpreting the findings of the present study. Firstly, less coded themes do not necessarily imply lower importance. For instance, educational tradition was less mentioned by the students, but it doesn't mean that tradition is not important. It was less quoted because this study used a student-centered approach from which the results were derived from the perceptions of students. Tradition and other social environmental factors may be beyond students' direct observations and perceptions, and thus were less mentioned or discussed. In addition, due to the nature of the focus group method, the number of study participants is limited and the student background is homogeneous (same age group and from the same university). As such, the results are difficult to be generalized to other type of students (i.e. working professionals) or even other regions in China especially the economically advantaged regions. Future study should examine how socio-demographic information (e.g., gender, age, income) would exert influence. Furthermore, , future research can apply quantitative methods (e.g., survey) to recruit more participants and test the explanation ability of the present findings.

In sum, despite these shortcomings, the present study contributes to a better understanding of the barriers to learning MOOCs in context of a developing country.

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sFigure **Figure 1.** Frequency of themes coded in each category