Have Massive Open Online Courses Disrupted Higher Education around the Globe? Exploring the Cultural Perspective

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Massive Open Online Courses (MOOCs) are high enrollment college-level courses that have the potential to serve learners worldwide. However, numerous questions about MOOCs are still unanswered. For example, are people enrolled in MOOCs from countries where higher educational systems are very constrained? How much does the basic infrastructure, such as Internet access, influence the awareness and acceptance of MOOCs? We believe the effectiveness and efficiency of MOOCs will be improved by understanding the answers to these questions. Our study explored the effect of cultural differences on course enrollment using power distance index, one of Hofstede's cultural dimensions. We looked into enrollment patterns and cultural beliefs of learners from 67 nations across three MOOCs offered by the Pennsylvania State University. The findings indicate that when the variable of Internet access for all countries is controlled, the PDI value of a country influences whether people from that country would register for MOOCs.

Keywords: MOOCs, Culture, Power Distance Index, Enrollment, Internet access

INTRODUCTION

Education is a human right, to which everyone is equally entitled, but the unequal access to educational opportunities and resources has been a challenge for personal attainment and social prosperity. In particular, higher education institutions have controlled the privilege of knowledge, yet its access is restricted by increasingly higher tuition costs and admission criteria (Brown, Costello, Donlon & Giolla-Mhichil, 2015). Massive Open Online Courses (MOOCs) have been asserted as disruptive innovations to higher education with the potential to bring people around the world access to the higher education system (Spector, Johnson, & Young, 2014). With MOOCs, we have hoped that higher education would become available to millions of online learners, especially the ones otherwise unable to attend (McAuley, Stewart, Siemens, & Cormier, 2010). So now, anyone with access to

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the Internet can register for desired college-level courses, and millions are doing so (Littlejohn, Hood, Milligan, & Mustain, 2016; Tang & Carr-Chellman, 2016). By the time of this writing, *Coursera* (http://www.coursera.org), one of the primary MOOC providers, has offered 1969 courses for more than 15.4 million users.

However, the disruptive potential of MOOCs has not been fully fulfilled, especially with regard to the existing imbalance of MOOC adoption in different countries (Ho et al., 2014; Rohs & Ganz, 2015). The adoption of MOOCs in a country is determined by multiple factors. On the one hand, MOOCs as online innovations are primarily dependent on Internet access and other relevant infrastructures, and thus the conditions of these required network infrastructures in a country might influence the adoption of MOOCs. Some undeveloped countries with extremely bad network conditions seemingly have a much lower awareness and usage of MOOCs than these developed countries. For example, by the summer of 2013, only 2.6% of the EdX (another major MOOCs provider) enrollments are from countries on the list of Least Developed Countries by United Nations (Ho et al., 2014).

On the other hand, even for these audiences with an access to the Internet, their awareness and acceptance of MOOCs might still differ, especially in consideration of the cultural differences (Che, Luo, Wang, & Meinel, 2016; Guo & Reincke, 2014). The situation of MOOC adoption differs by cultures, as indicated by the fact that the number of registered learners varies among countries (Kizilcec, Piech, & Schneider, 2013). Cultural differences tend to be projected into people's perceptions of MOOCs and then influence how people adopt and use MOOCs (Kizilcec et al., 2013; Nkuyubwatsi, 2014). MOOCs originated in Canada and the United States, so the cultural and pedagogical imperatives underlying MOOCs are more consistent with cultures and experiences in the western world (de Waard et al., 2014). However, a large majority of enrolled MOOC learners are from countries and districts embracing different cultural values and pedagogical norms, such as China and India. Learners in these countries are likely to undertake additional cultural translation when enrolling in MOOCs. Otherwise, without efficient cultural translation, MOOCs might yield unequal educational opportunities and resources for audiences from different cultures (Nkuyubwatsi, 2014). That is, MOOCs have to move beyond the current "one-size-fits-all" model originated in the western culture. Providing learners with a culturally responsive experience becomes a critical initiative to minimize the negative influence of cultural difference on the adoption of MOOCs.

Therefore, the investigation of cultural tension in learner awareness and acceptance of MOOCs is a worthy research endeavor to fulfill the potential of MOOCs in furthering the educational equality (Liyanagunawardena, Adams, & Williams, 2013). Specifically, understanding how people in a certain culture handle the inequality issue becomes a vital step to support the endeavor. Power distance index (PDI) is a widely acknowledge dimension of culture that indicates how people address the inequality in a culture (Hofstede, 2001; Wu, Huang, Yen, & Popova, 2012). PDI is defined as "the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally (Hofstede, 2011, p.9)." In high PDI countries, people tend to follow and seldom challenge authority (Downey, Wentling, Wentling, & Wadsworth, 2005). They are more likely to accept the condition that power and resources are distributed unevenly in that society (Hofstede, 2011). However, in low PDI countries, people might accept and expect the equal distribution of the power and resources although the absolute equality is unrealistic (Fang, Grant, Xu, Stronge, & Ward, 2013; Hofstede, 2011). Given that people's attitudes towards the unequal situation vary, it is valuable to identify how the ways in which people address the inequality in a society influences the awareness and acceptance of MOOCs in that specific country. Our hypothesis is that people from high PDI cultures might accept the unequal distribution of educational resources so

they might not actively contribute to the upsurge of MOOCs and other open educational resources. In contrast, people from low PDI cultures are more aware of and then secure their equal rights by taking advantage of these educational opportunities.

Therefore, this research intends to investigate the relationship between the PDI value of a country and the number of registered MOOC learners from that country. Given the gap of relevant empirical evidence in the existing literature, the research thus taps into the enrollment patterns and cultural beliefs of learners from different nations across different MOOCs. By examining this issue, the research hopes to add empirical insights of the cultural perspective in an effort to move beyond the "one-size-fits-all" model of MOOCs and thus provide learners with a more culturally responsive learning experience.

LITERATURE REVIEW

MOOCS: THE HOPE OF OPENING UP HIGHER EDUCATION

The universities offer the privilege of academic knowledge, but only to a limited population who stand out from the competition and/or are able to afford the associated expenses (Brown et al., 2015). However, during recent decades, the advances of web technologies have engendered increasing societal needs for the knowledge. The unequal access to higher education becomes a major challenge for personal and social development (Rohs & Gans, 2015). MOOCs have thus been envisioned as the panacea by providing a cost-effective alternative to open up higher education for the unprecedentedly massive number of audiences (Brown et al., 2015; Schuwer et al., 2015; Zhang, Perris, Zheng, & Chen, 2015). In addition, many MOOCs provide open licensing content for learners to "retain-reuse-remix-rework-redistribute" (Jansen, Schuwer, Teixeira, & Aydin, 2015), which further challenges the closed knowledge privilege held by traditional universities (Schuwer et al., 2015).

Thousands of learners can register for desired online courses without any prior requirements or charges (Littlejohn et al., 2016). In particular, courses from prominent universities like Harvard or Princeton become freely available to audiences who otherwise cannot attend their campus-based program because of the high rejection rates (Zhang et al., 2015). Moreover, MOOCs encompass a complete course experience that combines lectures and assessments so that upon completion a learner can earn a certificate of completion at an affordable expense. Learners follow worldwide best educators, enlarge individual networks, and develop profession aspirations in MOOCs (Dillahunt, Wang, & Teasley, 2015). Those advantages lead to the desirability of MOOCs among learners worldwide.

CULTURE, PDI, AND MOOCS

Hofstede (2001) defines *culture* as "the collective programming of the mind that distinguishes the members of one group or category of people from another" (p. 9). Generally, culture has a wide range of underpinnings in various disciplines. For educational endeavors, national cultural dimensions (NCD) identified by Hofstede (2001, 2011) are viewed as the most operational interpretation of culture (Wang, 2007). Hofstede (1986; 2001; 2011) identifies six cultural dimensions including PDI, individualism versus collectivism, masculinity versus femininity, uncertainty avoidance index, long-term versus short-term orientation, and indulgence versus restraint (Hofstede, 2011). Accordingly, six cultural dimensions in Hofstede's NCD provide a metric that has been used to explain cultural differences in teaching and learning practices.

In particular, PDI is the index that represents how people deal with the distribution of power (Hofstede, 2001; Wu et al., 2012). In high power distance cultures (e.g., the Confucian-heritage culture), people are more likely to accept a hierarchical structure and

thus demonstrate greater respect for power, age, and authority than those in low power distance cultures (Zhang, 2013). In addition, Wang (2007) indicates PDI has a greater impact on learning and teaching practices than other dimensions. Prior research also confirms the significance of PDI in shaping learners' perceptions of the online learning experience. For example, people from high PDI cultures prefer following the guidance from authority figures that are embodied as instructors in the learning and teaching practices (Liu, Liu, Lee, & Magjuka, 2010). They expect more support and guidance from the course instructors, yet at the same time, they feel less comfortable to reach out to instructors than people from low PDI cultures (Wang, 2007). In addition, people from low PDI cultures tend to perceive an online learning system as more beneficial than peers from high power distance cultures (Downey et al., 2005), partly because online systems generally offer learners relatively less guidance and fewer supports.

In sum, the cultural perspective of MOOCs is worthy of more endeavors to support the effort to further the educational equality (Liyanagunawardena et al., 2013). More attention is being paid to the investigation of how cultural attributes, such as the PDI score of a country, influence the learning experience in MOOCs (e.g., Kizilcec et al., 2013; Liu et al., 2016; Nkuyubwatsi, 2014). For example, Liu et al. (2016) investigated learner behaviors in course activities, quizzes, and discussion forums of MOOCs and revealed that learners from high PDI countries are primarily more likely to be *solvers* (i.e., mainly watching video lectures with the attempts to complete quizzes), but in contrast, these learners are inferior contributors in the forum discussions. Therefore, PDI actually influences learner behaviors in MOOCs in consideration of PDI's impact on the relationship between learners and instructors. On the other hand, MOOCs are claimed to provide a student-centered learning experience (Reeves & Bonk, 2015), which is more consistent with the cultural beliefs embraced by low PDI cultures (Hofstede, 2011). In this way, the disparity of PDI values might yield different learner awareness, perception, and acceptance of MOOCs among various cultures. To bridge the gap among countries in MOOC adoptions, it is important to identify what factors contribute to this imbalanced condition.

RESEARCH QUESTIONS

This research intends to focus on the influence of PDI on the adoption of MOOCs by investigating this cultural attribute within several large MOOC datasets. Primarily, this research investigates how PDI influences course enrollment in different countries based on datasets retrieved from three MOOCs in different subjects. Further, the researchers control for the rate of the Internet access of all countries to examine the variation of enrollment in countries with different PDI values. Specifically, the research questions to be addressed are as follows.

1. What is the relationship between the PDI value and MOOC enrollment patterns in a country?
2. Are the PDI value and MOOC enrollment patterns correlated when the variable of Internet access for all countries is controlled?

METHODOLOGY

DATASETS AND VARIABLES

MOOC Datasets. The MOOC datasets were retrieved from three MOOCs offered on Coursera by the Pennsylvania State University. The three courses were: 1) "*Introduction to Art*" (Art); 2) "*Creativity, Innovation and Change*" (CIC); and 3) "*Maps and the Geospatial Revolution*" (Maps). The datasets used in this study were based on the first

offering of these courses during 2013 to 2014. These three courses represented different subjects, including liberal arts (e.g., the Art MOOC), science (e.g., the Maps MOOC), and engineering (e.g., the CIC MOOC).

To align with the research purpose of this study, we define a "registrant" as anyone who registered for a MOOC at any time after the course was launched. Data from all three MOOCs, including participants' IP addresses and demographic data were received from Coursera in MySQL "data dump" format. The research team reorganized the data into SPSS readable files and used IP addresses to identify the nation in which each learner had registered for the courses.

In addition, the researchers gained the IRB approval before processing the datasets with the due respect to the research ethics. Further, the researchers cleaned the dataset, during which the relevant personal information was also left out to protect individual privacy. More details will be addressed in the section of "Data Processing and Analysis".

The PDI Dataset: The PDI dataset was retrieved in February 2016 from Hofstede's cultural dimension dataset (http://geerthofstede.com/research-and-vsm/dimension-data-matrix/). The dataset included PDI values of a total of 206 countries. In this dataset, PDI was presented by a score ranging from 0 to 100, and scores were referred to as either high (scores of 50 and up, coded "1") or low (scores of below 50, coded "0"). For the purpose of this study the value of PDI was dichotomously coded to mirror Hofstede's high and low categorizations. The higher score a country was, the more likely their people were to accept and expect the unequally distributed power in the society.

The Internet Access Dataset: The dataset of the Internet access for all countries was retrieved in February 2016 from UNData, copyrighted by the United Nations Statistic Division (http://data.un.org). The dataset included data of a total of 202 countries in regard to their Internet access rates. This dataset described the percentage of the Internet users in different countries.

DATA PROCESSING AND ANALYSIS

The researchers cleaned the data and prepared for the data analysis. For example, the researchers left out countries that were 999 in the PDI dataset. The value of 999 in the Hofstede's dataset indicated that the data for that country was uncertain. In total, the datasets for data analysis recorded the enrollment of 270,263 learners from 67 different nations.

A series of Chi^2 analyses were performed to determine the relationship between the PDI value and MOOC enrollment in a country, using an additional variable, the Internet access percentage, to minimize the influence of the network infrastructure conditions in a country on the relationship between PDI and MOOC enrollment. In addition, to investigate enrollment patterns, we used the percentage of enrolled learners in a country by calculating the proportion of enrolled learners to the gross population in that country. The rationale of doing so is to make sure we consider the enrollment in each country evenly since the population in each country varies tremendously.

RESULTS

This section reports several statistically significant results which have emerged from the data analysis. These results may enable the future MOOC instructors and designers to adapt their offerings in ways which are more sensitive to cultural differences exhibited among enrolled learners.

A Chi-Square analysis of the relationship between the percentage of enrolled learners in all countries and the recoded PDI categories was conducted. The results indicated that there was no statistically significant relationship between two variables across three

MOOC courses (p>0.05, see Table 1). This contradicted our hypothesis that the PDI value of a country might determine learner awareness and acceptance of MOOCs in that country. However, because MOOC adoption is a complicated topic that is also influenced by economic factors (e.g., the condition of network infrastructures), the researchers conducted the following analysis after controlling the variables pertaining to the economic factors.

Table 1. *Chi-Square analysis results.*

	Art			CIC			Maps		
	Value	df	Asymptotic Significance	Value	df	Asymptotic Significance	Value	df	Asymptotic Significance
Pearson Chi-Square	95.30	91	0.36	93.56	92	0.44	88.110	82	0.30
Likelihood Ratio	106.33	91	0.13	104.12	92	0.18	98.574	82	0.10
Linear-by-Linear Association	2.71	1	0.10	2.95	1	0.09	3.802	1	0.05
N of Valid Cases	98			99			99		

Given the fact that MOOC adoption is highly dependent on access to the Internet, we conducted a Pearson Correlation test between the two variables investigated in the Chi-Square analysis, after controlling the variable of Internet access rate in each country. The results showed that there was a weak negative correlation ($r < 0.3$, see Table 2) between these two variables, but it is worth noting that all these correlations across all three MOOC courses were significant ($p < 0.05$, see Table 2). Despite a weak correlation, the overall result still supported the hypothesized effects of PDI values on the patterns of enrollment when level of access to the Internet was statistically controlled. There might be various reasons accounting for the weak relationship, such as being limited by the type of data available and the topics of the MOOCs in this study and the value of these topics in the different cultures. We will address this further in the Discussion section. In sum, this finding revealed that, after controlling for the level of Internet access in the different nations, people from countries where the mainstream culture were more likely to accept the unequally distribution of power were less likely to enroll in a MOOC course

Table 2. *Correlation between enrollment percentage in all countries and their PDI values.*

	Art	CIC	Maps
Correlation	-0.21	-0.21	-0.23
Significance (2-tailed)	0.04	0.04	0.02
df	93	93	93

DISCUSSION

This research investigated the relationship between the cultural attribute of how people address the inequality in a country (i.e., PDI) and MOOC enrollment in the country, based on datasets available for three MOOCs on different subjects. The findings indicate that PDI values of a country are not directly related to the MOOC enrollment in that country, but when the Internet access is controlled at the same level for all countries, PDI values have a slight influence on whether people enroll. This might be due to different levels of awareness about MOOCs and/or the cultures' willingness to accept these resources offered by prestigious educational institutions. We speculate that people from high PDI countries tolerate or even overlook the inequality of educational opportunities and resources (Wang,

2007). They are not interested in MOOCs which are featured as an online innovation intended to provide an equal access to higher education for massive populations. In addition, people from high PDI countries tend to respect the authority of instructors without preconditions so they might not feel comfortable with learning in a more self-regulated MOOC environment (Littlejohn et al., 2016; McAuley et al., 2010). Furthermore, people from high PDI countries are more probably attracted by the prominence of offering institutions or the fame of the instructor in the domain considering their higher levels of obedience to authority (Bush & Haiyan, 2000). In contrast, people from low PDI countries are more likely to get involved in and benefit from the wave of MOOCs. These audiences from low PDI countries may expect equal educational opportunities and resources so they might view MOOCs as an alternative for them to approach equality. Moreover, people from low PDI countries may be more attached to the autonomy and the student-centered pedagogy advocated in MOOCs (Reeves & Bonk, 2015). For these audiences, it is worth further bolstering an autonomous and democratic learning environment in future MOOCs.

The findings of this research add to the body of evidence indicating that culture plays multiple roles in shaping learners' perceptions and awareness of MOOCs. Certainly, it is one of the global ambitions to improve the condition of network infrastructures in these relatively resource-restrained countries. However, when Internet access is not a concern, or when we investigate countries with similar access to the Internet, cultural underpinnings might still influence learner acceptance and usage of MOOCs in a country. This research reveals that, provided with the same condition of the Internet access in all countries, how a country's mainstream culture accepts the unequally distributed power influences its enrollment patterns in a MOOC. This study will hopefully remind MOOC stakeholders to address cultural tensions in the future offerings of MOOCs. Educational researchers are encouraged to continue the effort to enable learners by providing a more culturally responsive experience in MOOCs, via more elaborated design. Although MOOCs are consistent with the cultural and pedagogical norms embraced by the countries of their origin, for people with contrasting cultural beliefs, especially these from high PDI cultures, they require a process of cultural compromise and reconstruction (Liu et al., 2010; Wang, 2006). Nkuyubwatsi (2014) stresses the cultural translation in the design of MOOCs in support of the intention of providing global learners with a culturally responsive experience. For the future offering of MOOCs, this study also recommends including the issue of the cultural translation for learners from high PDI countries as a required design component.

Previous cultural study provided insightful implications on how to help high PDI countries increase learner awareness and extend the dissemination of MOOCs. In fact, PDI is not a single index but interrelated with other cultural dimensions, such as individualism versus collectivism, masculinity versus femininity, uncertainty avoidance index (Hofstede, 2011; Wang, 2007; Zhang, 2013). For some high PDI countries, people are more likely to embrace the collectivism whereby the relationships between people are considered more important than the tasks (Hofstede, 2011). Wang (2007) thus recommends including teamwork or some collaborative projects as required activities in online courses offered in high PDI countries. Similarly, to maintain the growth of MOOCs, some high PDI countries, such as China, designers might incorporate open online forums where users can be informed of new MOOC course offerings, can share course notes, and can recommend excellent course resources (Zhang, 2015). If learners know more about the courses before enrolling and can also identify back-up supportive resources when they feel uncomfortable since they are unable to reach out to instructors or speak publicly in MOOCs. For learners in these high PDI countries, this format of online forum is also an alternative way to extend the dissemination of MOOCs.

There are surely some limitations worthy of further discussions in this study. To start with, the Pearson correlation coefficient value in this study is in the range of (-0.3, 0), which is widely viewed as a weak correlation in social science research. Two drawbacks in the research design and implementation might account for a weak relationship. The foremost drawback might result from the exclusion of countries with a PDI value of 999 from the data analysis (see Table 3), which meant that no data on PDI levels was available for these nations.

Table 3. *Descriptive analysis of the PDI values of all countries.*

	Frequency	Percent
Low distance countries	24	11.7
High distance countries	76	36.9
Total	100	48.5
Missing	106	51.5
Total	206	100.0

By removing these countries form consideration we eliminated nearly half of the countries, some with potentially high values of PDI. For instance, unfortunately, the research did not include countries including Nigeria and Egypt because their PDI data does not exist but we did see that many learners from these two countries enrolled in these three MOOCs. Future research might consider seeking for and using a more robust dataset with a larger data volume of PDI values for countries. In addition, the research only investigated the pattern of enrollment and cultural attributes in three MOOCs from the same university and offered on the same platform. Although the research attempted to involve courses from three different domains, the homogeneity of offering institutions and platforms and the variations in the types of data available make this problematic. Therefore, future research might consider collecting multidisciplinary datasets from a wide range of offering platforms and institutions to increase the rigor of the research. Additionally, future research might extend the investigation of cultural attributes to other relevant cultural dimensions (e.g., collectivism versus individualism and masculinity versus femininity) and even the nexus of different dimensions. Another potential direction of future research is to investigate the impact of cultural attributes during different phases of MOOC offerings to provide temporal insights on the optimal design, development, and dissemination of MOOCs and also, more importantly, to enable learners a constantly cultural responsive learning experience in MOOCs.

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