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Value hierarchy for Massive Open Online Courses

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ABSTRACT

With E-learning emerging as an important application for education, Massive Open Online Courses (MOOCs) have further sparked a trend of online higher education learning. In order to explore the target values that learners pursue through MOOCs, this study adopted Means-end Chains theory and laddering interview to examine the structure of MOOCs' "Platform Attribute–Learning Consequences–Terminal Values" through learners' perspective. The study found that through platform attributes of ***Rich course contents***, ***Real-time discussion platform***, ***Video instruction*** and ***Qualifications***, learners were able to benefit from the learning consequences of ***Enhanced understanding of knowledge, Facilitation of learning exchanges and interactions***, ***Ease of time management*** and ***Improve competitiveness,*** thereby delivering the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of achievement***. The study also took a further step to examine the discrepancies between user groups of different experience and number of courses completed and found that users in different groups emphasized on different attributes. In addition, the study also offered suggestions pertaining to management and education implications. Results of the study should not only enable platform designers to become more effective in the development process but also enable teachers to develop teaching guidelines that will effectively boost learners' motivations so as to further refine the MOOCs learning environment.

1. Introduction

The advancement of Information and Communication Technologies has allowed educators and learners alike to break free from the traditional limitations of time, location and environment for learning. E-learning has the potential to influence higher education around the world in different formats and improve learning quality while lowering the costs of education (Alexander, 2001; Edwards, 2012). The development of E-learning has transformed relevant education, learning and training into a key topic that has received significant international attention (Gilbert, Morton, & Rowley, 2007). According to survey by Docebo (2014), the global value of the E-learning industry amounts to US$ 35.6 billion in 2011 and is expected to reach US$ 51.5 billion in 2016. Asia is the biggest contributor with an impressive growth rate at 17.3%, with the region market expected to reach US$ 11.5 billion by 2016. Consequently, more and more organizations of educational resources around the world have openly shared contents of university courses that are freely accessible via PCs with internet connection (Robert, Rhoads, & Toven-Lindsey, 2013). Spector (2014) also pointed out in the midst of various emerging formats of education, Massive Open Online Courses (MOOCs), Personalized Learning, and Game-based Learning will emerge as the focus of education in the near future. Nevertheless, these innovative teaching methods must be thoroughly studied and tested in order to verify their corresponding strengths and weaknesses.

The process of learning is sophisticated, with numerous methods and channels of learning at one's disposal (Ozyurt, Ozyurt, Baki, & Güven, 2013). Given the latest trends in education, it would be a worthy endeavor to find out how students actually conduct learning on the Internet (Sun & Hsu, 2013). Presently, in the domains of higher education in the U.S., approximately 1/3 of the students have chosen one or more online courses for learning (Allen & Seaman, 2013). Open education is the principle concept that has enabled MOOCs to develop and thrive because MOOCs are not only unlimited by factors such as finance and physical distance to freely impart knowledge to those who yearn to learn but have also been validated as a superior model of teaching compared to web-based lessons. MOOCs have transformed the traditionally teacher-centered teaching model to a student-centered model of learning (Yuan & Powell, 2013). However, Wolff, Baumol, and Saini (2014) pointed out that the average rate of course completion

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for MOOCs fell at approximately 7%, which suggest that a portion of the learners who have taken the courses were not obliged or motivated to complete their courses. It is recommended that the calculation of course completion rate should exclude sit-in learners and only use standard learners (i.e. those who have actually selected the course) as the basis of calculation. In addition, there are two other potential factors that could have attributed to the low completion rate of MOOCs, namely excessive number of learners and the lack of motivation for course completion (Chafkin, 2013).

In order to create better learning environments to ensure improved learning outcome for learners to create optimal value, it is imperative for developers to understand the needs of learners in order to design popular learning platforms. And as such, the study has adopted the Means-end Chains (MECs) theory that sheds light on the process of cognitive formation for the subjects to examine the most representative platforms of MOOCs such as Coursera, EDX, Udacity and so forth in order to investigate the implicit platform attributes of MOOCs from the perspective of learners and identify the corresponding learning consequences and terminal values for each platform attribute. The hierarchy of "platform attribute – learning consequence – terminal value" constructed based on the finding of this research will not only shed light on the key elements that MOOCs learners emphasize on but also enable one to better understand the correlations between "platform attributes", "learning consequences" and "terminal values". Hopefully, the finding of the study will serve as a useful reference for platform designers in their development of platform design and optimized learning environment and educators as a guideline for strengthening learners' inclination and motivation for learning.

The rest of this paper is organized as follows. In the next section, we review related literatures and studies about MOOC and the MEC theory. Section 3 structuralizes our research methodology consisting of research framework, the subjects participating, the method of data collection, and the analysis methodology. Section 4 summaries and discusses the empirical results. Finally, Section 5 contains our concluding remarks and implication of the study.

2. Theoretical framework

2.1. Open course ware

In 2001, the Massachusetts Institute of Technology (MIT) announced that the university will make most of its course materials and contents freely available on the internet so that educators, students and interested learners around the world could independently engage in learning and thus acquire knowledge and experience. This was made possible through the program of Open Course Ware as the concept of development (Caswell, Henson, Jensen, & Wiley, 2008; Hirwade & Rajasree, 2013), which in turn consolidated the foundation of Open Educational Resources (OER).

The term OER was initially adopted at the United Nations Educational Scientific and Cultural Organization (UNESCO) forum in 2002. Essentially, it created a new framework of knowledge dissemination and coordination model that offers free information query for learners and users around the world (Çakmak, Özel, & Yilmaz, 2013). In addition, the "Open Learn" concept proposed by the UK-based Open University in 2006 not only consolidated OER's structure but also continued to offer ample resources for higher education in the midst of OER's global development, thereby laying the foundation of learning and educational resources for MOOCs (Scanlon, 2014).

In terms of learner population, Coursera, EDX and Udacity have emerged as the three largest MOOCs platform at present (Brahimi & Sarirete, 2015; Breslow et al., 2013; Liyanagunawardena, Williams, & Adams, 2013). With the planning and operation of different management teams, different course contents, functional interface and service models have been developed for these platforms. These courses cover more than a dozen disciplines, including science and technology, humanities and arts. At present, the most popular MOOCs courses (with the highest ratings) are machine behaviors, behavioral economics, modern and contemporary American poetries and so forth (Brahimi & Sarirete, 2015; Top free classes, 2014). Oliver and Herrington (2001) pointed out that the design of digital learning should encompass learning resources, learning missions and learning support. Therefore, the three platforms (Coursera, EDX and Udacity) have been compared based on the concepts of resource, mission and support with the results presented in Table 1 below. Coursera has the largest and greatest range of courses covering many subjects and areas. As of June, 2015, Coursera had 13 million users from 190 countries enrolled and offered more than 1041 courses from 119 institutions (from https://www.coursera.org/).

2.2. Massive Open Online Courses

Constructed on a webpage framework, MOOCs allow learners to access free and high quality knowledge and contents of higher education regardless of their educational background and physical locations without being subjected to geographical or time constraints. MOOCs make it possible for tens of thousands of learners to engage in learning at the same time in accordance with their individual learning objectives, knowledge background, skills, interests and needs (Voss, 2013). Depending on their needs, learners may go over the contents repeatedly and practice with tests through MOOCs. This not enables learners to review their learning results and prevent oversights while MOOCs responds in real-time with the correct answers. MOOCs offer significant benefits by inspiring learners to achieve understanding of knowledge and learning results (Gore, 2013).

MOOCs allow learners to perform different operations and as such, they are also referred to as a platform (Parkes et al., 2013). MOOCs provide an interactive learning environment for students, professors and teaching assistants to form social communities centered on courses (Karsenti, 2013). MOOCs make up for the discrepancies in learning for students lacking ideal learning facilities and have become an emerging domain of research (Bansal, 2013). Furthermore, the emergence of MOOCs also led to the formation of new education models, learning examples and commercial models (Wood, 2013). MOOCs not only utilize modern technologies to make online education more interactive than it used to be but also enabled a working model of open, cooperative learning to be achieved earlier than one has anticipated (Audsley, Fernando, Maxson, Robinson, & Varney, 2013). With innovative and enriched virtual learning environment that essentially changed the global environment of education and learning, MOOCs have shaped the

Table 1
Comparison of three platforms (as of June, 2015).

	Coursera	EDX	Udacity
No. of courses	1041*	611**	87***
No. of domains	25	31	7
Instruction format	Short video clips, Online tests, Assignments		
Assessment	Essay questions	Essay questions	–
	Peer assessments	–	–
Social interaction	Online discussion forum		
	Meet Up learning group	–	–

Data Resource:
* https://www.coursera.org/.
** https://www.edx.org/.
*** https://www.udacity.com/.

preferred path of continued education for learners (Audsley et al., 2013).

The incorporation of teaching philosophies in Virtual Learning Environment (VLE) is an important task for the designers of online courses wishing to achieve specific learning results (Swan, Matthews, Bogle, Boles, & Day, 2012). By establishing Learning Management System (LMS) using Big Data, VLE has been deployed for different forms of education and learning, such as course interface development, calendar system, synchronized management information, online test and assessment, test solutions, trainings and so forth. Through digital and network technologies, VLE not only eliminated limitations of physical location for the delivery of knowledge but also presented opportunities resource sharing and usage, interaction, cooperation and offered space for educators and students alike (Parkes et al., 2013; Wilson et al., 2007). In fact, as much as 95% of the institutes of higher education in England have applied LMS for education purposes (McGill & Klobas, 2009).

Past research suggests that results of digital learning are superior to the results of learning in traditional classroom settings and that when coupled with Blended Learning (i.e., incorporating online and face-to-face instructions), the results could be further augmented (Means, Toyama, Murphy, Bakia, & Jones, 2010). It is important to increase the number of digital learning databases on a constant basis because it would enable organizations, communities and individuals to engage in learning on a web-page platform, thereby deriving new professional models and facilitating the sharing of effective teaching philosophies (Millard, Borthwick, Howard, McSweeney, & Hargood, 2013).

2.3. Means-end Chains Model

MEC is a model that allows one to understand why consumers have chosen a specific product or service and how their choice allows them to arrive at the terminal state of satisfaction (Gutman, 1982). A means-ends chain comprises three specific factors: Attributes, Consequences and Values. The model is usually used in the analysis of chain relationship between products and customer services (Gutman, 1982; Olson & Reynolds, 1983; Walker & Olson, 1991). In a means-end chain, attributes are linked to their consequences, which are in turn linked to values. Some researchers have proposed that Attributes, Consequences and Values can be further separated into two categories under six dimensions, namely: Concrete Attributes, Abstract Attributes, Functional Consequences, Psychosocial Consequences, Instrumental Values, and Terminal Values (Olson & Reynolds, 1983). Refer to Fig. 1 for a MECs model.

First, "attribute" refers to specific qualities or characteristics that users associate with good products/services. Some studies maintained the separation of attributes into concrete and abstract categories to be crucial. Concrete attributes are tangible characteristics, such as color, packaging, pricing and weight while abstract attributes are intangible characteristics such as brand, quality, service and reputation (Klenosky, 2002; Peter & Olson, 2010; Reynolds, Dethloff, & Westberg, 2001; Stanton, Etzel, & Walker, 1991; Valette-Florence & Rapacchi, 1991). Second, "consequence" refers to the result of consumers' experience (with the attribute) from buying/using a specific product (Olson & Reynolds, 2001). Valette-Florence and Rapacchi (1991) has separated consequences into Functional Consequences (directly perceived by the user), such as drinking water to quench thirst; wearing clothes to stay warm and so forth, while Psychological Consequences are more abstract and less direct. (i.e., drawing other people's attention by wearing designer apparel and accessories). Finally, "value" is the description of one's personal beliefs that would enable them to achieve their ultimate goals (Gutman, 1982; Rokeach, 1973). Value is positioned as the final component of the MEC model and can be further separated into "Instrumental values" (Gutman, 1982; Rokeach, 1973; Valette-Florence & Rapacchi 1991) (i.e., one's preferences or perception, such as the desire to be respected, to experience warm relationship with others) and "Terminal values" (i.e., ultimate state that one would like to achieve, such as Self-fulfillment, fun and enjoyment of life).

3. Methodology

3.1. Constructing means-end chain

In order to examine the correlation between "platform attribute–learning consequence–terminal value" for MOOCs learners, this study has chosen MECs as its theoretical basis, complemented with laddering, content analysis, implication matrix and hierarchical value map (HVM) for different steps of the research (Reynolds & Gutman, 1988; Wittink, Vriens, & Burhenne, 1994).

First, laddering is the most extensively applied technique of data collection for MEC studies and it involves one-on-one, in-depth interviews between the interviewer and the interviewee (Reynolds & Gutman, 1988). Laddering allows one to learn how consumers connect product attributes to personal consequences and terminal values and enables the complete construction of the "attribute-consequence-value" chain (Peter & Olson, 2010; Reynolds & Gutman, 1988). Secondly, content analysis makes it possible to analyze the rudimentary data collected via laddering and present the sophisticated interview data in an objective, systematic and quantified manner (Kassarjian, 1977). Content analysis involves multiple steps including data collection, analysis, concentration, deduction and description; sampling and coding were performed based on the nature of the contents (Krippendorff, 2012). During the coding process, similar descriptors uttered by interviewees were organized and sorted into their corresponding attributes, consequences and values. Coders then assign the appropriate verb and code to the data in order to complete the coding process (Krippendorff, 2012; Reynolds & Gutman, 1988; Santosa & Guinard, 2011). Third, implication matrix summarizes all the chain relationships for the users and represents the quantified correlation between the attributes, consequences and values in rows and columns to make up for the discrepancies between qualitative and quantitative analysis. The figures in the matrix represent the number of connections between the elements; a high number between two elements indicate a strong correlation and vice versa. The chain correlations summarized by the implication matrix served as the basis for the compilation of the HVM (Reynolds & Gutman, 1988). Fourthly, the HVM has been compiled from the corresponding figures in the implication matrix; the diagram presents a summary of the entire network of chains for all users and it offers adequate explanation of users' "attribute–consequence–value" value structure (Reynolds & Gutman, 1988). The most classic approach of HVM makes it possible to incorporate all correlations of different objectives in the map (Reynolds, Gengler, & Howard, 1995); for users that have different value perception, their chain correlations would also be different (Valette-Florence & Rapacchi, 1991).

3.2. Sample and data collection

Past research pointed out that, when using the laddering technique, the sample size must be no less than 20 (Reynolds et al., 2001); in order to ensure adequate and reliable statistics, the number of interviewees should fall between 50 and 60 (Leppard, Russel, & Cox, 2004). To ensure that the results of the research are significant and representative, the study has adopted open and snowball sampling by using the "QQ5.0" communication software developed by Tencent, Inc. to conduct in-depth, VoIP

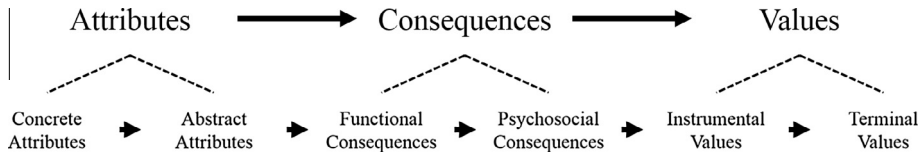

Fig. 1. Means-end Chains Model. Source: Olson and Reynolds (1983) and Walker and Olson (1991).

Table 2
Demographics of participants.

Measure	Item	Frequency	%
Gender	Male	24	40
	Female	36	60
Age	16–25	40	66.7
	26–41	20	33.3
Education	Master degree or above	17	28.3
	Undergraduate	38	63.3
	Senior high school	5	8.3
Profession	Student	31	51.7
	Non-Student	29	48.3
Using experience	Below 3 months	25	41.7
	More than 3 months	35	58.3
Number of learning hours (every day)	Below 2 h	39	65
	More than 2 h	21	35
Number of courses	Below 3 courses	25	41.7
	More than 3 courses	35	58.3
Geographical location	North China	19	31.7
	Central China	21	35
	Southern China	20	33.3

interview with 60 Chinese learners who have signed up for MOOCs (Coursera, EDX or Udacity) learning platform. The interviews took place between October 2013 and February 2014, with each session spanned between 45∼60 min. The in-depth interviews featured open-ended questions including ***(1) Why have you chosen MOOCs (platforms such as Coursera, EDX and Udacity) as a learning tool? (2) What functions, attributes or characteristics of your chosen platform appeal to you? (3) What benefits or results do they bring? (4)From the benefit/result, what personal value did you achieve? (5) What other improvements or elements do you think can be incorporated into MOOCs?*** During the process of the interview, interviewees were able to freely describe their experience with MOOCs and the interview for a specific chain path would end when the interviewee responded, "That's it", "I don't know" or wasn't able to answer.

As for sample structure, 40% of the subjects were male and the remaining 60% were female; 67% of the subjects fell between the ages of 16 and 25 and the remaining 33% fell between the ages of 26 and 41. In terms of the subjects' level of education, 28.3% of the subjects were graduate students (and higher) and 63.3% were undergraduates. The ratio of students and non-students came close to 50%. In terms of usage experience, 41.7% of the subjects had less than 3 months of experience, with the remaining 58.3% having had more than 3 months of experience; 65% of the subjects studied 2 h (or less) on a daily basis and the remaining 35% studied for more than 2 h per day. 41.7% of the subjects completed less than 3 courses and the remaining 58.3% completed more than 3 courses on the platforms. The samples came from three regions of northern China, central China, and southern China with equal distribution as shown in Table 2.

4. Results and discussion

4.1. Content analysis result and intercoder reliability

The study adopted the model of content analysis proposed by Krippendorff (2012) and included multiple steps such as data analysis, unitization, category coding, data concentration, deduction and description of results in order to code and categorize utterances of attributes, consequences and values made by interviewees during the interviews based on the corresponding level of abstraction. Since the data extracted through the in-depth interviews are abstract descriptive phrases, the coders have received training in the interpretation of abstract semantics prior to data analysis in order to boost their coding experience, thereby improving their inter-subjectivity during coding (Grunert & Grunert, 1995). After multiple sessions of discussion, the coders would come to consensus by adopting "appropriate", "exhaustive" and "mutually exclusive" as the coding principles to gradually extract the elements mentioned by the interviewees. These elements would then be named and coded based on their characteristics. For the three categories of elements, the research identified a total of 14 attributes, 12 consequences and 9 values as shown in Table 3.

This study adopted the coder credibility model proposed by Holsti (1969) for inter-coder agreement and reliability analysis. In order to prevent the researchers' subjective perceptions from influencing one another, the 3 researchers were asked to grade the elements under each category established in this research independently at different periods so as to establish consistent coding results. The average inter-coder agreement and reliability came to 0.781 and 0.915 respectively, with the latter meeting both Russo, Donnelly, and Reid (2006) and Woodruff and Gardial (1996)'s standard threshold of 0.8, indicating the coding results to be highly reliable as shown in Table 4.

4.2. Main path analysis

With the number of connections between the elements of the three categories compiled and calculated through the implication matrix (as shown in Appendix A), the significant paths of connection of the elements are represented through a total of 270 value ladders (averaging 4.5 per interviewee) and 590 connections (averaging 9.83 connections per interviewee). However, if all connections were accepted as effective connections, the resulting HVM would be overly sophisticated and unwieldy to offer a concise representation of the important connections that the interviewees were truly concerned with. Past research suggested that with a sample size between 50 and 60, the cutoff value could be configured at between 3 and 5 and adjusted to an appropriate value depending on the situation (Reynolds & Gutman, 1988). In an effort to present the most stable connections, the cutoff value for this study has been set at 5 for the illustration of the HVM (as shown in Fig. 2). In this study, the paths of MOOCs value chains that learners emphasized most are presented herein, with descriptions for the top three paths in terms of their importance.

4.2.1. A07 Rich course contents → C04 Fortify knowledge comprehension → V01 Fun and enjoyment of life or V04 Self-fulfillment

MOOCs with **Rich course contents** allow learners to freely choose courses that they were interested in and during the learning process, through the acquisition of knowledge and repeated practice, learners could achieve the consequence of ***Fortify knowledge comprehension***. The consequence not only makes the

Table 3
Item codes of MOOCs data.

Elements	Item	Frequency of Citation	%	Frequency of respondent	%
Attributes	A01 Free resources	10	3.7	6	10
	A02 Real-time discussion platform	42	15.6	22	36.7
	A03 Syllabus overview	3	1.1	2	3.3
	A04 Course selection list	6	2.2	4	6.7
	A05 Announcement and notification	6	2.2	3	5
	A06 Video instruction	21	7.8	11	18.3
	A07 Rich course contents	99	36.7	40	66.7
	A08 Qualified lecturers	8	3	4	6.7
	A09 Homework and peer-review	37	13.7	17	28.3
	A10 Qualification	14	5.2	6	10
	A11 Multilingual caption	10	3.7	5	8.3
	A12 Appraisal and recommendation system	1	0.4	1	1.7
	A13 Personalized interface	8	3	5	8.3
	A14 Digital teaching material available online	5	1.9	2	3.3
Consequences	C01 Ease of time management	43	13.4	23	38.3
	C02 Facilitation of learning exchanges and interactions	41	12.8	22	36.7
	C03 Elevate level of thinking	22	6.9	9	15
	C04 Fortify knowledge comprehension	101	31.6	36	60
	C05 Enhance problem-solving ability	7	2.2	4	6.7
	C06 Improve competitiveness	33	10.3	14	23.3
	C07 Burden free	7	2.2	3	5
	C08 Improve learning efficiency	36	11.3	16	26.7
	C09 Reinforce sense of responsibility	15	4.7	10	16.7
	C10 Ensures learning equality	6	1.9	3	5
	C11 Gain virtual experience	2	0.6	2	3.3
	C12 Improve fun of learning	7	2.2	4	6.7
Values	V01 Fun and enjoyment of life	95	35.2	44	73.3
	V02 Security	3	1.1	3	5
	V03 Self-respect	3	1.1	3	5
	V04 Self-fulfillment	58	21.5	33	55
	V05 Sense of belonging	28	10.4	21	35
	V06 Sense of accomplishment	40	14.8	24	40
	V07 Well-respected	18	6.7	12	20
	V08 Warm relationship with others	14	5.2	11	18.3
	V09 Excitement	11	4.1	11	18.3

learning process more enjoyable for learners but also lead to the terminal value of ***Fun and enjoyment of life***. In addition, it would propel learners to accomplish their learning objectives more aggressively and thereby enabling them to achieve the terminal value of ***Self-fulfillment***.

Past studies maintained that through challenging, sophisticated and hands-on training, educators could help students cultivate problem-solving abilities and also foster their capacity to accomplish specific objectives (Liu, Ma, Ru, Guo, & Ma, 2009). The research found that, through the attribute of **Rich course contents,** learners would choose courses that they are interested in and review the course contents repeatedly for better comprehension. This attribute would not only lead to the consequence of ***Fortify knowledge comprehension*** but also help learners to improve their problem-solving abilities. At the same time, learners also believe that improvement in their abilities would help them to accomplish they have set for their future, thereby leading them to the terminal values of ***Fun and enjoyment of life*** and ***Self-fulfillment***.

4.2.2. A02 Real-time discussion platform → C02 Facilitation of learning exchanges and interactions → V01 Fun and enjoyment of life

Through the ***Real-time discussion platform*** provided by MOOCs, learners could engage in discussions and communications with fellow students from around the world and the process would lead to the ***Facilitation of learning exchanges and interactions***. The consequence not only makes learners happy but also benefit from the value of ***Fun and enjoyment of life***.

According to Agudo-Peregrina, Iglesias-Pradas, Conde-González, and Hernández-García (2014), the interaction between students and teacher (and among students) is beneficial for effective learning that involves brainstorming and exchange of ideas. The study found that through ***Real-time discussion platform***, learners were able to discuss questions with peers or seek the help of their instructors for clarification. This not only ***Facilitates learning exchanges and interactions*** to produce effective learning results but also lead to the terminal value of ***Fun and enjoyment of life***.

Table 4
Intercoder reliability.

Researcher	A	B
B	0.857	
C	0.771	0.714

Average of agreement = (0.857 + 0.771 + 0.714)/3 = 0.781
Reliability = (3 × 0.781)/(1 + (3–1) × 0.781) = 0.915

4.2.3. A6 Video instruction → C01 Ease of time management → V01 Fun and enjoyment of life

Video instruction of MOOCs offer short video clips that learners can freely watch and learn at their desired time. The attribute not only brought about the results of ***Ease of time management*** for the learners but the convenience also pleased the learners, thereby leading to the terminal value of ***Fun and enjoyment of life***.

Past studies pointed out that, regardless of cultural backgrounds, course designers should always attempt to design their lessons to facilitate convenient personal learning (Viberg & Grönlund, 2013). The study found that ***Video instruction*** offered by MOOCs enables learners to engage in personal learning, the convenience of short video clips and brought greater ***Ease of time management*** for the learners. With versatile time management, learners will not have to worry about missing a lecture due to time

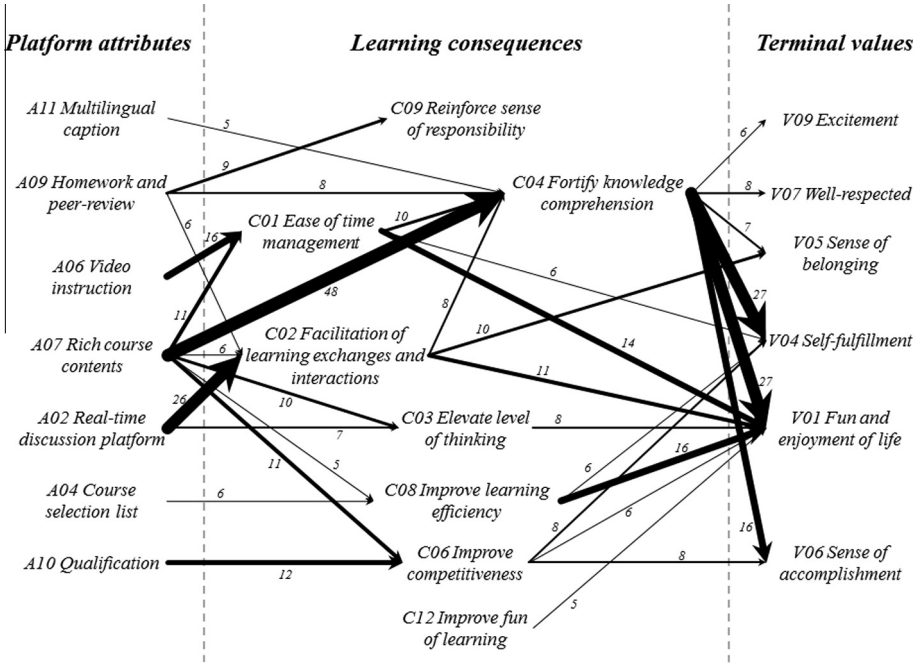

Fig. 2. HVM for all participants (cut-off level = 5).

constraints and falling behind because of it and instead can choose to focus on a specific segment to continue learning on the Internet. By offering more versatile time planning and enabling learners to engage in active learning, the consequence leads to the terminal value of ***Fun and enjoyment of life***.

4.3. Structure of group paths

Results of the study revealed that the paths constructed by subjects of different gender, age, level of education, occupation, average duration of learning per day and geographical location showed no significant differences. However, the paths for subjects of varying degrees of experience and course completion showed significant discrepancies. However, in order to prevent the sample sizes from becoming asymmetrical after grouping and the HVM from becoming too complicated due to numerous groupings, the cutoff value for grouping in this study adopted Leppard et al. (2004)'s proposal of "top–down cut-off" and used the two highest values among the element pairs (A–C, C–C, C–V) as the basis for HVM illustration which makes it possible to compare ladders of significant difference or groups of different sizes.

4.3.1. Groups of varying degrees of experience

Coursera courses are 6–10 weeks long, with an hour or two of videos per week. These courses provide quizzes, weekly exercises, and sometimes a final project or exam (Kamenetz, 2012). Since most students who signed up for MOOCs had to work within semester systems, the study divided the 60 subjects into two groups; learners with less than 3 months of experience and learners with more than 3 months of experience in order to examine the similarities and differences in their value paths. From Fig. 3, it is apparent that in the major paths for subjects of varying degrees of experience, both group emphasized the attribute of ***Rich course contents***, which connects to the learning consequence of ***Fortify knowledge comprehension*** and ultimately the terminal values of ***Fun and enjoyment of life*** and ***Self-fulfillment***.

However, both groups also showed considerable differences in the paths they constructed. First, learners with less than 3 months of experience configure their learning stage objective through ***Rich course contents*** and through the process of ***Fortify knowledge comprehension*** to assimilate new knowledge, these learners believe they would not only benefit from effective learning but also derive the terminal values of ***Sense of accomplishment***, ***Fun and enjoyment of life*** and ***Self-fulfillment*** by accomplishing their stage objective. In contrast, learners with more than 3 months of experience would engage more actively in learning, take notes constantly and remain highly focused in the hopes of ***Improve learning efficiency*** after having the consequence of ***Fortify knowledge comprehension***. These learners were highly optimistic with their learning performance and full of hope for their future, thereby leading them to the terminal value of ***Fun and enjoyment of life***.

Furthermore, learners with less than 3 months of experience utilize the download features of ***Video instruction***, which frees them from the limitations of time and space and enables them to focus on the important segments to achieve effective learning, thereby leading to the consequence of ***Ease of time management*** for them. Being able to engage in learning whenever they wished to and being able to use their time flexibly to construct and comprehend knowledge allow these learners to ***Fortify knowledge comprehension***. When learners succeed in reinforcing their learning motivation and achieving adequate knowledge comprehension, they arrive at the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of accomplishment***.

As for learners with more than 3 months of experience, they would aim to achieve Facilitation of learning exchanges and interactions through Real-time discussion platform and seek to Fortify knowledge comprehension and Improve learning efficiency through exchanges to ultimately arrive at the value of Fun and enjoyment of life. Past studies suggested that online interactive learning environments could utilize specific tools or features to prompt learners to reflect upon the course materials and the act of immediate reflection could effectively improve learners' performance. Results of the study showed that Real-time discussion platform with instructors or teaching assistants enables learners to improve their social skills while Facilitating learning exchanges and interactions and helps learners to better understand the course materials through interactive exchange and thereby Fortify knowledge comprehension. In addition, immediate and correct response

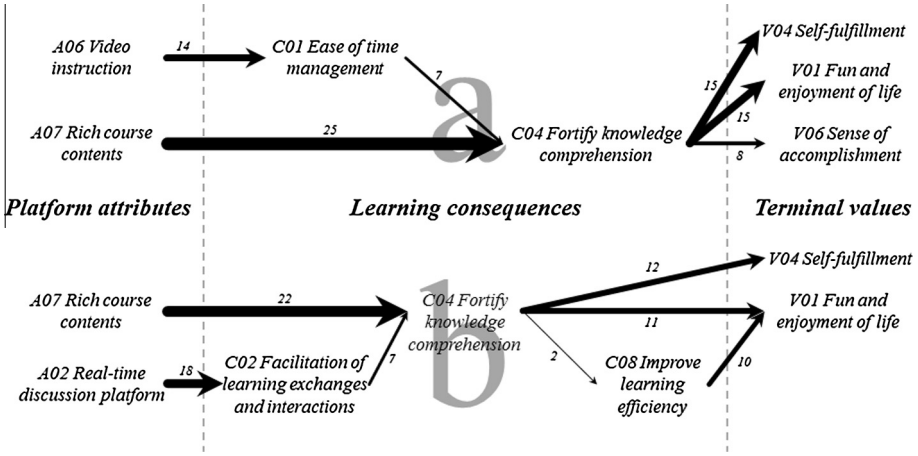

Fig. 3. (a) HVM for less than 3 months of experience; (b) HVM for more than 3 months of experience (cut-off level = Top-2).

to learners' questions would help learners to Improve learning efficiency (Garcia & Pacheco, 2013; Means et al., 2010). The discussion of questions and answers led by course instructors via Real-time discussion platform would also benefit learners through the Facilitation of learning exchanges and interactions. Consequently, learners would be able to Fortify knowledge comprehension through the process of discussion and clarifying their doubts to achieve the terminal values of Fun and enjoyment of life and Self-fulfillment.

4.3.2. Groups of varying numbers of course completion

Analysis of 60 respondents, 58.33% (n = 35) of the learners completed 3 or more courses and the remaining 41.67% (n = 25) completed less than 3 courses on the platforms. The weighted average value is 3.08. Hence, the study has taken one step further to divide the subjects into two groups based on the number of courses they have completed (i.e., less than 3 courses and 3 or more courses completed). Similarly, the cutoff value was set to top-2 for the illustration of HVM.

The study found that learners in both groups emphasized the attribute of ***Rich course contents***; in addition to pursuing the learning consequence of ***Fortify knowledge comprehension***, both group of learners sought to derive the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of accomplishment*** from the consequence (as shown in Fig. 4). Results of the study showed that designs of ***Rich course contents*** could satisfy learners' needs for learning and enable them to ***Fortify knowledge comprehension*** by attending courses they were interested in. These learners not only learn more from the courses they were interested in but also achieve the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of accomplishment*** through the application of knowledge.

As for their differences, learners who have completed less than 3 courses prefer to engage in learning through ***Video instruction***, which allows them to learn in shorter periods of free time and enables them to make versatile use of their time, thereby offering the consequence of ***Ease of time management***. ***Video instruction*** allows learners to freely focus on specific segments by watching the segments repeatedly to foster their understanding of specific concepts and problems, thereby attaining inspiration of knowledge by means of ***Fortify knowledge comprehension***, which then leads to the terminal values of **Fun and enjoyment of life** and ***Self-fulfillment***. On the other hand, Jones and Steel (2013)'s study proposed that when learners are faced with conflicting opinions or in doubt of their learning environment, enriched communications during the course could in fact improve learning. When learners watch videos of MOOCs courses, they will be able to engage in discussions with other fellow learners and strengthen their interests in learning (Li et al., 2014). Results of the study showed that subjects who completed 3 or more courses were adept in using the meet-up function of ***Real-time discussion platform*** to resolve whatever doubt they had in the lessons and solve questions they have encountered on spot. In such meet-up groups, learners benefit from the consequence of ***Facilitation of learning exchanges and interactions*** and ***Fortify knowledge comprehension*** through the exchange of opinions and ultimately arrive at the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of accomplishment***.

5. Conclusions and implications

5.1. Conclusions

Spector (2014) believes that few MOOCs today have been designed by professional educators or subjected to stringent evaluations and appraisals. However, the formats of instruction on MOOCs have gone through significant changes and lecturers have turned from educators to course designers. With this transition came the realization that course design must incorporate elements that will draw learners to sustain learning in order to boost their learning motivations. The study found that ***Rich course contents***, ***Real-time discussion platform***, ***Video instruction***, ***Qualification*** and ***Homework and peer review*** to be the attributes that learners emphasized. Educators can use these five attribute variables as incentives for learning and thereby strengthen their motivation for learning and the improvement of learning environment design.

Results of the study revealed that most learners emphasized the attributes of ***Rich course contents*** and ***Real-time discussion platform***, followed by ***Homework and peer review***, ***Video instruction*** and ***Qualification***. Learners believed that attributes such as ***Rich course contents*** and ***Real-time discussion platform*** could bring the consequences of ***Fortify knowledge comprehension*** and ***Facilitation of learning exchanges and interactions***. On the other hand, learners associated attributes of ***Homework and peer review*** and ***Video instruction*** with the consequences of ***Reinforce sense of responsibility*** and ***Ease of time management***. In addition, the subjects believed the attribute of ***Qualification*** to lead to the consequence of ***Improve competitiveness*** and all these attributes lead to the terminal values of ***Fun and enjoyment of life*** and ***Self-fulfillment*** that learners valued most.

In addition, the study also separated subjects into different groups based on their usage experience and number of course

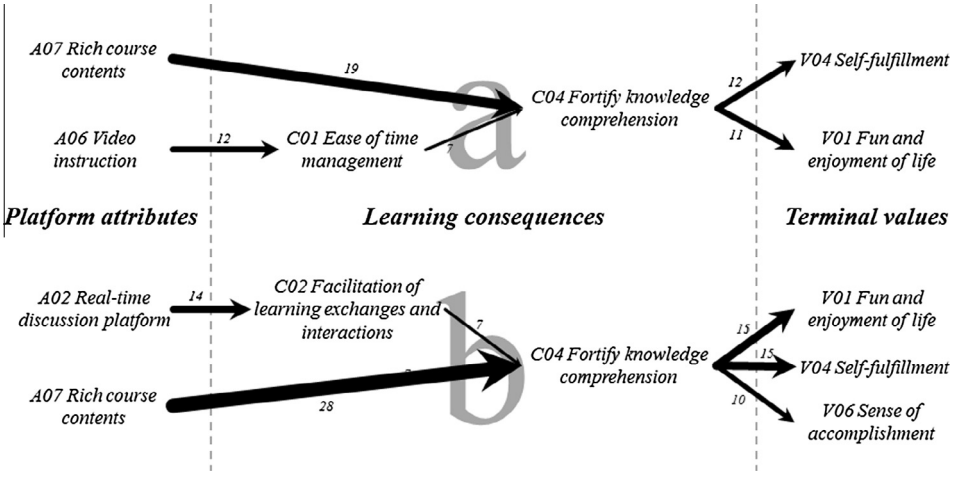

Fig. 4. (a) HVM for less than 3 courses; (b) HVM for 3 or more courses (Cut-off level = Top-2).

completion for further analysis. In terms of usage experience, all learners (regardless of the extent of their experience with MOOCs) associate the attribute of ***Rich course contents*** with the consequence of ***Fortify knowledge comprehension***, which in turn leads to the values of ***Fun and enjoyment of life*** and ***Self-fulfillment***. Subjects who had no more than 3 months of learning experience also associated ***Fortify knowledge comprehension*** with ***Sense of accomplishment***. Subjects who had no more than 3 months of learning experience emphasized the format of ***Video instruction***, from which they derived the consequences of ***Ease of time management*** and ***Fortify knowledge comprehension***, thereby arriving at the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of accomplishment***. In contrast, subjects with more than 3 months of learning experience emphasized more on the attribute of ***Real-time discussion platform,*** from which they expect to derive the consequences of ***Facilitation of learning exchanges and interactions*** and through ***Fortify knowledge comprehension,*** they sought to ***Improve learning efficiency***, which would ultimately lead to the terminal value of ***Fun and enjoyment of life***.

In terms of course completion, results of the study suggest that all learners (regardless of the number of courses they have previously completed) emphasized the attribute of ***Rich course contents,*** which they have associated with the consequence of ***Fortify knowledge comprehension***, thereby leading to the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of accomplishment***. Subjects who completed less than 3 courses sought the value of ***Well-respected*** through the consequence of ***Fortify knowledge comprehension*** and believed that ***Video instruction*** would lead to ***Ease of time management*** and in addition to the consequence of ***Fortify knowledge comprehension***, they could also derive the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment***, ***Sense of accomplishment*** and ***Well-respected***. For learners who have completed more than 3 courses, they sought the consequence of ***Facilitation of learning exchanges and interactions*** through the attribute of ***Real-time discussion platform*** and from the process of ***Fortify knowledge comprehension***, they would arrive at the terminal values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of accomplishment***.

5.2. Managerial implications

Nawrot and Doucet (2014) pointed out that MOOCs platforms should not only offer high quality learning materials for their learners but also support and assist learners in their pursuit for knowledge. The examination of MOOCs attributes should help operators of digital learning platforms to formulate definitive plans of improvement. This study has taken the perspective of learners to offer several suggestions for digital learning platform companies to improve and strengthen specific attributes that have been identified as essential.

For the attribute of ***Rich course contents***, operators could incorporate specialty courses from universities around the world. Platform design companies could introduce online voting systems to find out the courses that learners really want to take and the instructors that they prefer before searching for qualified instructors and the voted specialty courses available at the universities and colleges worldwide. This would enable learners around the world to access the finest courses through the internet and thereby establish the platform as a brand of quality learning. In addition, the study also suggests developers to offer comprehensive series of professional courses to ensure thorough learning for the learners. For example, developers could add a block function their existing platform system functions that will allow learners to search for related courses (i.e., Probability (I), Probability (II) and other courses in specific series). Developers can also incorporate other peripheral courses (i.e., by allowing instructors to post follow-up and other courses that are related to their current course on a bulletin board) to allow users to acquire more knowledge. In addition, developers can also collaborate with the media to incorporate documentary courses. For instance, MOOCs platforms can invite notable figures and experts related to the subject matter to give lectures or renowned CEOs to offer lectures on management so that learners may obtain their desired learning outcome and in turn achieve the values of ***Fun and enjoyment of life***, ***Self-fulfillment*** and ***Sense of accomplishment***.

The study also suggests that, for the attribute of ***Real-time discussion platform*** digital learning platform operators could incorporate **models of real-time communication** such as a real-time communication interface that will enable learners to raise questions immediately when they come across contents in the course they could not understand. Such feature would facilitate peer aid and solution among the learners, thereby enabling learners to experience the terminal values of ***Sense of belonging*** and ***Well-respected***.

For the attribute of ***multilingual caption***, the study suggests that bilingual captions appear in sync on video contents. To achieve this, platform developers can embed captions in two languages into the videos so that learners can also practice their foreign language while digesting the materials. In addition, the study also suggests that developers use official captions provided by the content developers whenever possible. Presently, 34% of

the MOOCs learners are located in the United States as the majority while the remaining 66% of the learners come from Asia and other regions (Christensen et al., 2013). Taken the English proficiency of learners (whose native tongue is not English) around the world into account, developers can consider providing captions in other languages. For instance, captions with English on top and Chinese at the bottom in videos would be useful for learners of Chinese from English speaking countries as the captions would help to ensure better comprehension of course materials for learners from different regions. As for the ***Course selection list*** *attribute*, the study suggests developers to incorporate a filter function for popular courses that would enable learners to access the list of the latest/most popular courses available on the platform. Such a function would allow learners to quickly access the courses they want and ultimately achieve the value of ***Fun and enjoyment of life***.

5.3. Pedagogical implications

Among the MOOCs platforms available at the moment, Coursera has the largest learner base. The platform operates by examining student's previous learning experiences in order to determine the courses they would avoid/prefer to take. This has been made possible with Coursera's database that has been established in a multi-faceted approach. For most learners, wishing to learn about specific topic, the desire to acquire more knowledge/to update what they have learned in the past or to learn about latest topics constitute their primary motivation for taking MOOCs (Audsley et al., 2013; Hew & Cheung, 2014). And as such, for the attribute of ***Rich course contents***, the study suggests educators to conduct pre-course surveys on the courses that students may be interested in (i.e., utilizing relevant platform features to conduct pre/post-lecture surveys). Pre-lecture survey can be used to determine the anticipated learning objectives for learners while post-lecture survey can be used to gauge learner satisfaction. Such surveys would enable educators to better understand learners' inclinations and serve as a useful reference for adjustments in course contents.

Past studies pointed toward online forums and chatrooms to be venues that attract high degrees of learner participation and satisfaction. The benefits of such forums and chatrooms include the exchange of ideas, submission of questions, posting of links to useful websites and so forth (Levy, 2011). For MOOC's attribute of ***Real-time discussion platform***, the study suggests that educators can set up course content discussion forum that offers similar learning benefits. With such forums, lecturers can post questions relating to the course on the forum and have learners form groups to engage in question discussions. This would facilitate discussions and exchanges among the learners. In addition, educators can arrange periodic meetings for learners (alternatively, learners can take the initiative to gather for such meetings) so as to convene small seminars, which offer opportunities for learners to voice their thoughts and receive clarifications on questions they might have.

With regards to ***Video instruction***, the study suggests educators to give quizzes or raise critical questions regarding to the contents that have just been covered at the end of each segment in order to improve learners' focus on the contents. It is also recommended that download links to video contents are kept accessible to learners at the conclusion of the course so that learners can carry on learning. Educators can also use short video clips supplemented with visual aids for the presentation of course contents in order to ensure clear and precise delivery of knowledge.

Presently, the State of California has entered into agreement with the Udacity platform and students who complete and pass three designated courses on Udacity may earn transferable credits for college. Although the passing rate for the courses remains relatively low, the percentage of course completion has nevertheless dramatically risen to 86%, which clearly illustrates the positive correlation between learning motivation and course completion rate (Chafkin, 2013). In order to boost learners' motivation and participation, the study suggests that, after learners have achieved their target scores/grades for the course, their lecturers can issue "certificates" of course completion signed by the lecturers or adopt a "foreign authorization" approach that will entice learners to take long-distance learning more seriously. For example, if learners in Taiwan could receive a certificate/diploma from a US university/college upon the completion of a course offered by the university/college, it would no doubt reinforce learners' motivation.

Dillenbourg (1999) pointed out that, when learners of the same age group interact, they would not engage only in additional activities such as explanation, conflicting opinion and negotiations but establish an additional system of perception that generates inspiration and sharing of knowledge. The attribute of ***Homework and peer review*** is fairly important. It requires learners to adhere to the principle of grading established by the lecturer and complete the task of making their peers' homework before the designated date. Not only that, lecturers will also show the comments left by other learners to each learner. This would enable learners to see the areas they have overlooked and ideas they did not previously consider. In addition, educators can also adopt game-based learning in their instructions so that learners could have fun through gaming during the learning process. For instance, when a student finishes a ***Video instruction***/***Homework and peer review*** or help their peers to solve a problem, he/she will earn the right to expand their "learning territory" by occupying new turf; the larger a learner's territory is, the higher the degree of learning he/she has completed. Alternatively, learners can engage in "learning conquest games" with their peers to further boost their motivation and interests in learning, thereby amplify their learning results whilst having fun.

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Appendix A. Structural implications matrix of MOOCs.

	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	V01	V02	V03	V04	V05	V06	V07	V08	V09	Total
A01	1			3			3			3												10
A02	1	25	7	4	2			3														42
A03	2							1														3
A04								6														6

Appendix A (*continued*)

	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	V01	V02	V03	V04	V05	V06	V07	V08	V09	Total
A05								4	2													6
A06	17			2				2														21
A07	11	6	10	47		11	1	5		3	1	4										99
A08		3		3				1	1													8
A09	4	5	2	8	3	4			9			2										37
A10						12		2														14
A11	2			5				3														10
A12								1														1
A13	4	1						3														8
A14				4				1														5
C01				10			2	1	1				15			6	1	3	1	2	1	43
C02				8				1	2				11			3	10	1	1	4		41
C03													8			3	1	4	2	2	2	22
C04		1				3		2			1	1	26	1		27	7	16	8	2	6	101
C05			2										1			1	2	1				7
C06							1						6		3	8	3	8	4			33
C07				2									3			1		1				7
C08	1			1	2	2							16			6	2	2	1	2	1	36
C09			1			1							4	2		2	1	2	1	1		15
C10				4												1				1		6
C11																	1	1				2
C12													5					1			1	7
Total	43	41	22	101	7	33	7	36	15	6	2	7	95	3	3	58	28	40	18	14	11	590

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