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ESSAYS ON THE ROLE OF MOOCS IN THE CONTEXT OF CONTEMPORARY HIGHER EDUCATION

DOCTORAL THESIS

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International Doctorate in Entrepreneurship and Management

Bellaterra (Cerdanyola del Valles), July 2022

Abstract

This research focuses on the role of MOOCs, many relevant studies have well-documented student behaviours towards MOOCs, but few ones have discussed the impact of MOOCs from the perspectives of higher education administration and teachers' perception. Therefore, to fill the research gap, this research aims to develop a complete understanding of MOOCs in contemporary higher education (HE) regarding the perspective of higher education institutions (HEIs) in which we only focus universities, teachers and students, respectively.

Concerning the perspective of HEIs, in the first essay, this research has adopted the theory of resource based views (RBV) and explored the essential intangible resources for HEIs to produce MOOCs as an innovative project in the competitive marketplace. Regarding teachers' perspective, the second essay is the first empirical attempt to incorporate the theory of planned behaviour (TPB) and Playbour (PL) as an incorporated research model to explore teachers' perception and behavioural intention (BI) to adopt MOOCs. Besides, this research has also considered Hofstede's cultural dimension theory to explore how teachers with different cultural backgrounds perceive MOOCs and discuss how the role of culture has affected the process of working with MOOCs. Additionally, concerning students' perspective, the third essay has adopted the technology acceptance model (TAM) and TPB as an incorporated model to comprehensively explore students' perception and BI addressing students' technical experience and psychosocial determinants. Furthermore, this research has also utilized Hofstede's cultural dimension theory to detect how students with different cultural backgrounds perceive MOOCs.

Several quantitative methods are employed in this research. First, for the Chapter of HEIs, variables are identified through extant literature reviews focusing on HEIs management and secondary data from different university Webpages. Second, for the Chapters on teachers and students, well-designed questionnaires are used to collect data for teachers and students, respectively, with a five-point Likert scale. Hence, this research has used different techniques for the analysis: Exploratory factor analysis (EFA), Ordinary least squares regression (OLS), Tobit regression, Structural equation modelling (SEM) and Multigroup analysis (MGA).

Besides, the main findings of this research can be divided into three perspectives associated with HEIs, teachers and students. Addressing HEIs, two determinants are identified to impact HEIs to produce MOOCs, which are size and proximity. The findings suggest that the universities with large size are superior to initiate new projects and universities located far away from political center are more motivated to produce MOOCs. Concerning teachers' side, (Attitude) ATT, Subjective Norms (SN) and Perceived Behavioural Control (PBC) are found as essential determinants impacting teachers to work with MOOCs. Besides, PL is confirmed as a significant mediator in the research model. Regarding the students' side, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are considered as techinical experience and proven as positive variables affecting students' ATT. Besides, SN and PBC are also confirmed as significant variables to impact students' BI towards MOOCs.

Additionally, the potential difference caused by culture has been detected in the perspectives of teachers and students respectively. Concerning the teachers' side, Chinese teachers are more influenced by PBC while Spanish teachers are more likely affected by SN. Concerning the students' side, Spanish students are more likely influenced by PEOU while Chinese students are

more susceptible to PU regarding ATT. Addressing BI, Spanish students are more likely affected by ATT while PBC more likely influences Chinese students

The main findings of this research suggest higher education administrators should invest more essential resources and make full use of extant ones to support MOOCs' projects and replenish their disadvantages in the marketplace. Moreover, teachers' perceptions are significantly associated with the BI towards MOOCs. Additionally, students' technical experience is essential for forming positive perceptions towards MOOCs and further impacts the BI.

This research has important implications for both theory and practice. The research contributes to the theory development as it is essential to understand crucial resources that HEIs should be invested based on RBV and the individual adoption towards MOOCs based on the TAM and TPB. In addition to the theoretical contributions, this research also plays a vital role in offering comprehensive managerial recommendations for policymakers of HEIs.

Keywords: MOOCs, Higher Education Institutions, Teachers behaviour, Students behaviour, RBV, TAM, TPB

Acknowledgment

On September 4, 2018, I landed in Barcelona and started a new study journey at Universitat Autònoma de Barcelona. As yet, more than three years have passed quietly and I have many thoughts in my heart when writing the acknowledgment. This doctoral dissertation is not only the crystallization of my life experience but also the precious memory of my life. On completing my doctoral dissertation, I would like to express my most heartfelt thanks to my beloved teachers, classmates, friends and relatives, who have offered me countless help.

First, I am thankful to you---my God for blessing me with your mercy and love. You are always here with me in the day and night and in my prayers. I would never finish this journey without your precious support and confidence.

Second, I would like to thank my most respected doctoral supervisors, Prof. Stefan Felix van Hemmen and Prof. Josep Rialp Criado. Nevertheless, I would like to first express my high respect and deep gratitude to Prof. Stefan. It was Professor Stefan who became my guide and a strong spiritual support at my most helpless and confused moment, allowing me to carry out my doctoral journey unswervingly and smoothly after I completed my master's study.

During my doctoral journey, Prof. Stefan and Prof. Josep have cultivated my rigorous academic research attitude and ethics. Besides, under the invaluable words and deeds of Prof. Stefan and Prof. Josep, I have always been able to coordinate my studies and pressure with a peaceful attitude. Their broad ideas have greatly enriched the subject of my doctoral thesis and passed me profound inspiration, which laid a solid foundation for my doctoral thesis writing and future development. At the same time, their sharp and logical thinking and suggestions play a crucial role in the doctoral dissertation's overall framework and chapter content and further help me finish this doctoral dissertation. In addition, I would also like to thank all the teachers and administrative staffs for their countless help during my academic journey at the Business Department.

Additionally, I would also like to thank my parents who worked hard for providing me with high quality education. Their love and hardships involved have subtly established my personality of independence and autonomy. Besides, I would like to thank my dear friends who have offered me unlimited support in these years: Ms. Wang Yiyi, Ms. Yang Lingyi, Mr. Zhu Chengju, Mr. Wang Tiezheng, and Mr. Jiang Zhipeng. Simultaneously, I would also like to thank the IDEM Ph.D. students of 2019 Class who have been able to lend a helping hand when I encountered difficulties in my studies or life.

Last, I want to appreciate myself for my efforts and my perseverance. And, say to myself: Learn to enjoy the rest of life and Make life interesting.

Contents

Acronym list

ATT: Attitude
AVE: Average Variation Extracted
BI: Behaviour intention
CFA: Confirmatory Factor Analysis
CR: Composite Reliability
EFA: Exploratory Factor Analysis
HE: Higher Education
HEIs: Higher Education Institutions
ICT: Information and Communication Technology
IT: Information Technology
KMO: Kaiser-Meyer-Olkin
MGA: Multigroup Analysis
MICOM: Measurement Invariance of Composite Models
MOOCs: Massive Open Online Courses
OLS: Ordinary Least Squares Regression
PBC: Perceived Behavioural Control
PEOU: Perceived Ease of Use
PL: Playbour
PLS: Partial Least Square
PU: Perceived Usefulness
RBV: Resource Based View
SEM: Structural Equation Modelling
SN: Subjective Norms
SRL: Self-Regulated Learning
TAM: Technology Acceptance Model
TPB: Theory of Planned Behaviour
TRA: Theory of Reasoned Action
VIF: Variance Inflation Factors

Chapter 1

1 General introduction

1.1 The context of MOOCs

MOOCs are valued for the promise to increase access to education for learners from all backgrounds bringing the shimmery hope that free education can reach the remote corners of the world (Lambert, 2020). These online courses have the potential to revolutionize the boundaries of modern learning by providing more students with a high-quality education. Learners can access the courses and get help from professionals via the internet regardless of the constrain of geographical issues (Shapiro et al., 2017). MOOCs can also serve as a conduit for university outreach worldwide, expanding access to free, trusted information to the public, which would increase public awareness (Goldberg et al., 2015). Besides, increasing the knowledge and skills of excluded learners who are traditionally excluded from HE will improve social inclusion through access to skilled jobs, increased wealth, status and prosperity (Lambert, 2020). Furthermore, MOOCs assist in offering a route to efficiently improve in-depth education for students connecting with groups of specialized experts (Ma et al., 2013). MOOCs also provide an efficient venue for adults to enhance professional skills or gain new skills staying current with further development in their field, and more MOOCs are designed to offer continuing education to learners in professional areas (Vivian et al., 2014). All the evidences show MOOCs have more significant potential to promote lifelong learning than residential classes.

Whereas criticism comes with success and in a short few years, although the commercial MOOCs may already be offered in many developing countries and privileged in those countries that primarily benefit, the MOOC revolution has been argued to have little impact on educational access patterns (Lambert, 2020). Demographics have been analyzed to show that the vast majority of learners are highly qualified professionals, not the global community of disadvantaged learners originally envisioned, who do not have access to good HE (Laurillard, 2016). Some educators fear that the rapid development of MOOCs will significantly reduce the quality of learning and teaching so as to deteriorate the HE system further. They emphasize the importance of residential class engagement, particularly in the laboratory section, clinical or fieldwork that is impossible to be replicated online (Cooper & Sahami, 2013). Besides, cultural differences matter and MOOCs have also been found to be socioculturally excluded from the millions of non-English speakers, those with English as a second or third language for whom the content and cultural views do not apply to local contexts (Adam, 2019).

Additionally, turning sights on the current research disciplines, most of the research is related explicitly to MOOC pedagogy and learner outcomes. The relevant studies are split into seven categories: course score, dropout, forum posts, students' behaviour, students' motivations, MOOCs content, and teachers' behaviour.

1. Course score: The purpose is to predict the score that students may obtain in a course. Moreno-Marcos et al. (2018) stated that the learning process in a MOOC could be well presented by the scores of students on different assignments, and it is helpful to detect problems and tackle the problems. In their study, the questions of "how different course scores can be predicted, what elements or variables affect the predictions and how much and in which way it is possible to anticipate scores" have been analyzed, and the results showed the importance of indicators over the algorithms and those forum-related variables do not increase power to predict grades.

Additionally, different types of tasks can vary the scores.

2. Dropout: The aim is to predict whether a student will quit the course before completing it. Moreover, some papers are about course completion in this group since Moreno-Marcos et al. (2018) stated it is the same concept but positively. Hong et al. (2017) stated high dropout rate of MOOCs is criticized while a dramatically increasing number of learners are appealed to these online learning platforms. Gregori et al. (2018) investigated learner support strategies that enable the success and completion of MOOCs. The findings showed that designers and teachers should pay special attention to their students during the course. What's more, the teachers' presence during the course, the interactions with students and the quality of the videos presented are significant determinants of course completion. Li (2018) predicted the user dropout rate in MOOC learning based on the features extracted from users' learning behaviour. The research sheds new light on the feature extraction and learning effect of MOOC programs. Lyu et al. (2018) established a learning experience model by extending an existing framework in the MOOC literature. They identified variables that predict students' learning outcomes and completion. The model also enables researchers to develop an Individualized Learning Path System further. Moreno-Marcos et al. (2020) explored how SRL strategies could be included in predictive models for self-paced MOOCs. This article showed that event-based SRL strategies present a very high predictive power, but variables related to learners' interactions with exercises are still the best predictors.

3. Forum posts: The aim is to predict students' probability of achievement in MOOCs through engaging in forum posts of a MOOC. Bonafini et al. (2017) found that most students' forums display more information acquisition than critical thinking, and students' engagement in forums and videos increases the probability of course achievement. Crues et al. (2018) suggested that women and men have different reasons for taking MOOCs, and they persist at different rates, an outcome moderated by forum participation.

4. Student's behaviour: The aim is to predict whether students will engage in MOOCs and their performance in a MOOC. Kizilcec et al. (2017) studied the relationship between SRL and achieving personal course goals. The results stated that goal-setting and strategic planning learners are more likely to revisit previous course materials, particularly course assessments. Li and Baker (2018) examined how the relationship between engagement and achievement and found the same engagement measure may be oppositely associated with achievement for different subgroups and that some engagement measures predict achievement for one subgroup but not another. Mulik et al. (2018) studied the adoption of MOOCs by extending the Unified Theory of Acceptance and Use of Technology. They found that performance expectancy, effort expectancy, social influence, facilitating conditions, and perceived value significantly influence intention to use MOOC. Lung-guang (2019) studied the decision-making determinants of students participating in MOOCs and investigated the relationship between SRL and planned behaviour by integrating the TPB and the model of SRL. The results showed a positive and significant relationship between TPB and SRL. Chiu et al. (2018) demonstrated the effectiveness of monitoring students' behaviour in answering questions, watching videos, and participating in forums to predict student performance in MOOCs and improve completion rates. Li (2019), in his study, provided implications for researchers to study self-directed learning environments, differences in learning of learners with diverse backgrounds, and SRL behaviours, as well as for educators dealing with increasing SRL strategy usage, improving online learners' satisfaction and teaching cross-culturally. Sun et al.

(2019) proposed a model that conceptualizes the MOOCs' engagement consisting of psychological and behavioural engagement to explore the antecedents of students' engagement in MOOCs. The results showed that fulfilling three basic psychological needs for autonomy, competence and relatedness have significant positive effects on intrinsic motivation, increasing students' psychological engagement in MOOCs.

5. Student's motivation: The aim is to predict the motivation of students to adopt MOOCs. Free online courses, including MOOCs, have great potential to increase the inclusiveness of education but suffer from very high course dropout rates. A growing number of learners have perceived the usefulness of MOOCs (Zhou, 2016) since MOOCs allow millions of students around the globe to enrol and participate (Kaplan & Haenlein, 2016), providing them with thousands of courses to satisfy their diverse learning objectives and motivations. Bayeck (2016) stated that MOOC learners differ in different objectives for enrolling on a MOOC, such as educational pursuits, professional development, and learning new knowledge. Higashi et al. (2017) applied different underlying motivational models to predict persistence rates in the course and pointed out that the future design of free-choice learning environments can be taken into account. Zhou (2016) integrated the TPB and the self-determination theory as a research framework to study Chinese university students' acceptance of MOOCs, and the results showed that the ATT toward MOOCs and PBC were significant determinants of student's intention to accept MOOCs in Chinese universities.

6. MOOCs content: The aim is to predict if the content of a course is relevant or of interest to students. Li et al. (2018) explored the relationship between asynchronous discussion and satisfaction with MOOCs, and the results indicated that asynchronous discussion plays a vital role in predicting satisfaction with MOOCs in China. Luo et al. (2018) stated that course videos significantly influence learning. Li and Zhou (2018) revealed that the learners could effectively increase their learning efficiency and quality for the courses when the learning styles are identified and proper recommendations are made by using the method.

7. Teachers' behaviour: The aim is to predict teachers' behaviour towards MOOCs. Ramírez-Montoya et al. (2017) argued that digital competence is considered as a drive for educational innovation because of the appearance of the production of new digital media resources for teaching such as Open Education Resource. Moreover, in their study, an ordinal logarithmic regression was conducted to verify whether teachers who hold positive self-perceptions of digital competence are more likely to use open education resource such as MOOCs in their teaching. The model results showed that only the teachers who are in-serve can perceive themselves as digital experts in the production of open education resource, while online teaching greatly benefits the digital competence of teachers.

In general, we see that the extant literature showed that the research topics of students' behaviour and dropout of a MOOC are studied mainly by researchers. Studies address the motivation to explain what factors can influence students to adopt a MOOC, primarily focusing on the demographic and psychological side. Tao et al. (2019) argued that learners' acceptance of MOOCs are not well identified regarding learners' experience and continuous use of a technical system, which presents the research gap for this thesis to replenish.

Moreover, regarding the perspectives of HEIs and teachers, only minor studies (Bobe & Kober, 2015; Wardimi, 2015; Sanders & Wong, 2021; Lai et al, 2018; Chen et al., 2020) are concerned about the research topics. Therefore, this thesis explores and summarises the factors

that lead HEIs to succeed in MOOCs to replenish the existing literature further. Besides, the empirical research aims to explore the factors that may impact teachers' motivation to accept and produce MOOCs even become a MOOC instructors, which would contribute to enriching the literature of teachers' behaviour.

In general, this thesis can be split into two sides: the supply side, including HEIs and teachers, and the demand side, which is mainly related to students.

1.2 Problem statement and research objective

HE today faces a range of challenges, including doubts about its role in society, fragmented functions within universities, concerns about sustainability and growing diversity of the student population (Gasevic et al., 2014; Baturay, 2015), which often places university administrators and policymakers at a crossroad. Whereas, with the advancement in ICT, new technology-enhanced learning approaches are merging, and MOOCs have been one of the most significant technological developments in HE (Deng et al., 2019). MOOCs are large-scale web-based courses designed and delivered by HEIs and other educational organizations. Furthermore, MOOCs are considered an effective way to enhance equity in HE due to their potential to involve broader learners and remove barriers to high-quality education resources delivered by elite institutions (Carver & Harrison, 2013). Compared with university-sponsored online courses, MOOCs are open to provide educational content to a large number of diverse learners worldwide through an online platform with free access regardless of age, gender, geographic location or educational background (Kaplan & Haenlein, 2016). Moreover, MOOCs' movement has crossed 180 million learners boosted by the pandemic, and providers have launched more than 2800 courses, 19 online degrees, and 360 micro-credentials (Shah, 2020).

In addition, previous studies have identified and summarized salient research themes and topics to analyze the interdisciplinary nature of the research, which reveals seven categories: course score (Moreno-Marcos et al., 2018), dropout (Hong et al., 2017; Gregori et al., 2018; Li, 2018; Lyu et al., 2018), forum posts (Bonafini et al. 2017; Crues et al., 2018), students' behaviour (Kizilcec et al., 2017; Li & Baker, 2018; Mulik et al., 2018; Lung-guang, 2019), students' motivation (Zhou, 2016; Kaplan & Haenlein, 2016; Higashi et al., 2017), MOOC content (Li et al., 2018; Luo et al., 2018), and teachers' behaviour (Ramírez-Montoya et al., 2017; Askeroth & Richardson, 2019). Most studies are concerned about students rather than teachers and HEIs. This study primarily focuses on the influence of MOOCs' movement on HEIs and involves three stakeholders that are HEIs, teachers and students. Despite the significant success of MOOCs, many different challenges still exist (Kim et al., 2017).

Regarding the perspective of HEIs, the growing market for MOOCs and processes of globalization in economic development results in HEIs facing intensifying competition in different markets (Camilleri, 2019). Concerning the institutional goals for engaging in MOOCs, competition among HEIs has been regarded as a motivation for producing MOOCs (Nortvig & Christiansen, 2017). Accordingly, an increasing number of educational institutions are expanding their educational domains by offering online degree programs (Annabi & Wilkins, 2016), which results in how universities profile and recruit students. Besides, in recent years, the development of MOOCs in China is the most prominent. The Global MOOC and Online Education Conference[1] held at Tsinghua University in 2020 announced that more than 34,000 MOOCs have been produced, and 540 million learners have enrolled in China since 2013. In addition, the Global

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[1] Accessed: https://www.tsinghua.edu.cn/en/News.htm

MOOC and Online Education Alliance was formally established, and the "Beijing Declaration on MOOC Development" was issued, which demonstrates the HEIs in China are processing the steps with a more global innovation higher education environment to promote further inclusive, quality and sustainable HEIs within the digital era.

The phenomenon has demonstrated great success on MOOCs in China, and Chinese HEIs are taking advantage of the opportunity to expand their profiles and competitive advantages at the regional or international level via MOOCs. Hence, it is essential to ascertain the critical factors for the organization with the questions (Henry, 2021):

Which elements of its resources and capabilities would bring the organization success?

What factors drive the competition in its industry?

Regarding the perspective of teachers, the working environment has been significantly impacted by ICT in the information society, which not only enables the work practice available without the constrain of physical location but also advanced the working way with the ability to incorporate work into free time (Törhönen et al., 2019). As aforementioned, HEIs become increasingly international in the MOOCs' movement, which results in the bundling of scholars and experts in the joint offering courses with other educational institutions worldwide and creates a collaborating phenomenon both nationally and internationally (Brown & Costello, 2015). Some teachers perceive the MOOC activity as leisure and engagement because not only can they concatenate a mass of diverse students/ learners all over the world (Agarwal, 2012; Mackness et al., 2010), but also they can benefit from the procedures where a vast amount of opinions and teaching resources have been generated which can be integrated into the regular classroom-based courses and advance their pedagogical presentation (Kolowich, 2013). Yet, Kozma (2003) and Kreijns et al. (2013) noticed that teachers are more often reluctant than willing to integrate ICT in their pedagogical practices. Therefore, we must answer the following question:

How do university teachers perceive MOOCs?

Regarding the perspective of students, many previous studies show that the completion rate is meagre compared with the registration rate in MOOCs, and there is a decline in the number of students continuing to use MOOCs (Aldowah et al., 2020). In addition, the high dropout rate has attracted many researchers to detect the reasons and factors behind the high dropout phenomenon. Chen et al. (2019) stated that most dropout happens during the early learning period, and more studies should be conducted addressing the explanation. Many previous studies have shown that the high dropout rate is related to lacking motivations (Zheng et al., 2015), limited feedback (Li & Moore, 2018), certain social factors, such as interaction and communication (Yang et al., 2014), personal characteristics (Shapiro et al., 2017), course issues (Shawky & Badawi, 2019) and social, environmental factors (Ma & Lee, 2019). Besides, motivation has been considered a critical element associated with various learning consequences, impacting the learning process in education (Chen & Jang, 2010). Previous studies primarily focus on the roles of demographic and psychological factors in learner acceptance, such as gender, culture, personal innovativeness and self-efficacy (Zhou, 2016; Fianu et al., 2018; Hsu et al., 2018). Whereas potential factors that affect learners' acceptance of MOOCs are not well identified regarding learners' experience and continuous use of a technical system (Tao et al., 2019). As Moreno-Marcos (2018) pointed out, there is a lack of contributions to answer the question:

What factors can influence learners' attitudes, motivation and behaviours?

Additionally, MOOCs initially appear to enable learners worldwide to gain access to

introductory courses from universities, and both HEIs and governments are vigorously pursuing MOOC projects (Gregori et al., 2018). Owing to the MOOC movement, plenty of students worldwide have been attracted and enrolled in MOOCs with different cultural backgrounds and nationalities (Kaplan & Haenlein, 2016). Simultaneously, more international cooperation is conducted and implemented among illustrious HEIs, which enriches the phenomenon where national and global cultures are interplaying and becoming increasingly collective with the advancement of technology (Bissessar, 2018). In addition, culture has been studied by numerous researchers in different academic fields to detect the potential difference in human behaviour (Beugelsdijk et al., 2017; Huang & Crotts, 2019; Rojo et al., 2020; Shao et al., 2020; Guritno et al., 2020; Vollero et al. 2020). Therefore, it is essential to understand the question according to the values of China and Spain from Hofstede's dimensions:

What is the moderating effect of culture considered addressing the perspective of teachers and students?

Overall, the main objective of this thesis is to explore MOOCs' condition in terms of the influences on HEIs, teachers and students to understand the factors that lead HEIs into MOOC success and the perceptions of teachers and students towards MOOCs. The specific research objectives of this study are the following (each specific research objective is related to a specific chapter).

1. To summarise and explore the underlying factors behind the MOOC success of HEIs in China, so as to better understand how these factors make HEIs more competitive (Chapter 2).

2. To explore the factors that affect teachers' perception and BI towards MOOCs, so as to promote teachers better working with MOOCs (Chapter 3).

3. To explore the potential factors that affect learners' acceptance of MOOCs regarding learners' experience and continuous use of a technical system, so as to better understand learners' motivation (Chapter 4).

4. To detect the potential cultural effect that impacts the BI of teachers and students in the two different cultural contexts of China and Spain respectively (Chapter 3 and Chapter 4).

1.3 Conceptual frameworks

As explained above in section 1.2, each specific research objective is related to a specific chapter. Therefore, the conceptual frameworks adopted are different.

Addressing the perspective of HEIs (Chapter 2), this chapter aims to identify the underlying internal determinants behind MOOC's success and interpret how the underlying determinants affect HEIs to adopt and operate MOOCs in China. RBV is a managerial framework focusing on the resources which are variable, rare, inimitable and non-substitutable of an organisation to determine the strategic resources an organisation can use to achieve its sustainable and competitive advantage. RBV has been utilised and discussed in strategic management for many years (Bromiley & Rau, 2016), focusing on the internal interaction of resources to identify the critical resources and investigate the effect of resources on competitive advantage (Taher, 2012). Hence RBV is utilised as the theoretical framework for this chapter.

Addressing the perspective of teachers (Chapter 3), this chapter aims to study the perception and behaviour of university teachers on MOOCs and explore the critical drives and impacts on teachers' behaviour to work with MOOCs, utilising TPB as a primary research model. TPB has been widely employed and believed to be a ground theory to psychologically predict human BI, which is associated with three determinants: ATT, SN and PBC (Ajzen, 1991). Furthermore, the

MOOC activity is perceived by some teachers as leisure and engagement, which can be characterised by playfulness (Törhönen et al., 2019) as they merge work with play in terms of MOOCs and this kind of combination is defined as PL (Sotamaa, 2007; Ferrer-Conill, 2018; Törhönen et al., 2019). More recently, research has begun to focus more on digitalising the working environments associated with "PL". Therefore, we incorporate PL as a mediating variable between ATT and BI. Besides, this chapter also adopts Hofstede's Cultural Dimensions Theory to include the role of the culture as a moderator to explore how university teachers with different cultural backgrounds perceive MOOCs and discuss to some extent the role of culture has played in working with MOOCs.

Addressing the perspective of students (Chapter 4), this chapter addresses the perception and BI of students towards MOOCs regarding learners' experience. This chapter adopts an incorporated framework of TAM and TPB. As aforementioned, TPB has been widely employed in social science research, primarily focusing on psychological factors; TAM has the advantage of robustness and high predictive power towards information systems (Tao et al., 2019). Besides, PU and PEOU are tow constructs related to ATT in TAM as PU and PEOU are posited as the determinants of technology usage (Davis, 1980). Moreover, previous studies demonstrate that the models of TAM and TPB are complementary, and the results show the incorporated model has better exploratory power than using TAM or TPB alone in terms of IT usage (Glavee-Geo et al., 2017). Therefore, we adopt the incorporated model of TAM and TPB, considering TAM for measuring the factors related to learner's technical experience and TPB for measuring psychological factors. In addition, this chapter also considers the moderating effect of culture to interpret the findings further to understand the potential difference of learners with different cultural backgrounds in motivation to engage in a MOOC.

1.4 Research contribution

The expected outcome of the research objectives listed in section 1.2 above is to extend the empirical research knowledge and literature on MOOCs. More precisely, a detailed analysis of HEIs, teachers and students towards MOOCs can yield valuable lessons specific to the organizational strategy and human behaviours. This section identifies on the gaps in the extant studies on MOOCs from different perspectives of HEIs, teachers and students.

First, as aforementioned, this thesis contributes to the extant literature by providing profound understanding of HEIs and teachers in MOOC context.

Second, Chapter 2 explores perspectives which are largely ignored in current research literature and analyzes the crucial determinants behind the MOOCs' success in Chinese HEIs, which to some extent helps us understand the essential institutional resources that supports the MOOCs' production in HEIs and provides future research with more effective variables. The findings show that the variable of size is a significant determinant for HEIs to produce MOOCs. Besides, proximity is also been detected as a vital determinant for HEIs to produce MOOCs suggesting MOOCs have been utilised as strategic resources to replenish the educational inequality and the uneven distribution of educational resources caused by proximity. Furthermore, the findings also lend empirical evidence in strategic management related to higher education management.

Third, Chapter 3 enriches the literature of TPB by adding a new construct "PL". The findings show ATT, SN and PBC are statistically confirmed crucial determinants that impact teachers' BI to work with MOOCs directly. Furthermore, the validity of the new proposed research model has

been confirmed and "PL" is proven as a crucial mediator between teachers' intrinsic perception and BI. The future research can consider and employ this research framework to conduct research.

Fourth, following the suggestions of previous studies, Chapter 4 adopts the incorporated model of TAM and TPB, which contributes to the existing literature of TAM and TPB. Moreover, this thesis replenishes the research gap of involving experience and psychosocial factors in the research model. PU and PEOU are confirmed as significant indicators and the students' ATT has been proven as a crucial mediator between students' experience and BI towards MOOCs. Additionally, SN and PBC are found to significantly impact students' BI towards MOOCs. Furthermore, compared with ATT and SN, PBC is proven to positively affect students' BI towards MOOCs.

Fifth, the moderating effect of culture has been detected concerning the behaviour of teachers and students in the Chapters of 3 and 4, which provides a crucial evidence that human behaviour differs in culture and also enriches the cross-culture literature in terms of MOOCs. Concerning the teachers' side, Chinese teachers are more influenced by PBC, which means once they perceive that they possess the ability to work with MOOCs confidently, they will form the BI towards MOOCs. Whereas Spanish teachers are more likely affected by SN, the social relationship and pressure around them are more likely to drive them to form BI toward MOOCs. Concerning the students' side, Spanish students are more likely influenced by PEOU, while Chinese students are more susceptible to PU regarding ATT. Addressing BI, Spanish students are more likely affected by ATT, while PBC more likely influences Chinese students.

Last, all the findings are profound and practical for MOOC managers, HEIs' administrators, policymakers to understands how to achieve competitive and sustainable advantages among rivals through MOOCs, also to know the perception and motivation of users (teachers and students) to promote them better to adopt MOOCs.

1.5 The structure of the thesis

The thesis is a collection of papers and is split into five chapters including this general introduction and conclusion. Each section contains its particular objective, methodology and primary research results. At the same time, and in view of providing a comprehensive and holistic approach, core chapters 2, 3 and 4 address MOOCs from a critical stakeholder perspective each, namely that of universities (supply), students (demand), and teachers (content creation and execution). Also, whenever possible, research has attempted gauging the effect of culture by generating original data in China and Spain.

Chapter 1 is the general introduction that briefly introduces the general background of this thesis, the conceptual frameworks of empirical chapters (Chapter 2, Chapter 3 and Chapter 4), the research contribution and the structure of the thesis.

Chapter 2 focuses on the HEIs' perspective and is based on RBV. Through the EFA, the variables were classified into three determinants. Whereas, two determinants of three were detected significant through OLS regression and Tobit regression, these are the determinant of size and the determinant of proximity to political center. The findings show HEIs with larger size can perform better in their knowledge management systems and operational capability to further perform their objectives or generate new competing resources such as producing MOOCs. Besides, the awareness of proximity should also be intensified to remedy the disadvantages of uneven resource allocation due to geographical proximity.

Chapter 3 studies the perception and behaviour of university teachers on MOOCs and explore

the critical factors that impact teachers' BI to work with MOOCs. This paper also includes the culture as a moderator to explore how university teachers with different cultural backgrounds perceive MOOCs. This study is based on a survey with Five point Likert scale. Furthermore, CFA and PLS are used to evaluate the convergent and discriminant validity of the measurement model while the method of bootstrapping is utilized to examine the proposed hypotheses. In addition, MGA is adopted to test the moderating effect role of the culture. The results show that ATT, SN and PBC are crucial determinants of BI. Besides, a strong positive relationship is verified between ATT and PL to explain the great importance of an intrinsic attitude of university teachers to perceive and work with MOOCs. Regarding the moderating effect of culture, the significant difference in perception and behaviour of teachers from Spain and China are detected.

Chapter 4 addresses the perception and BI of students towards MOOCs. This chapter also considers the moderating effect of culture of the students from China and Spain. Besides, following the methodology of Chapter 3, the results show all the proposed hypotheses are positively supported. ATT is confirmed as a desirable mediator among the constructs of PU, PEOU and BI. Among all the constructs, PBC is confirmed as a much stronger construct to impact BI of students towards MOOCs compared with ATT and SN. Regarding the moderating effect of culture, the significant differences have been detected to account for their BI.

Chapter 5 is the general conclusion including implications, limitations and future research direction.

Chapter 2

2 The response of Chinese higher education institutions to MOOCs: the RBV

2.1 Introduction

The educational institution is recognized as a type of organization differing in the missions and objectives for which they exist, and HEIs are managed by human action like other organizations (Vargas-Hernández et al., 2021). Processes of globalization in economic development result in HEIs facing intensifying competition in different markets (Camilleri, 2019); under these circumstances, increased competition has elevated more pressure on HEIs, which affects how universities and colleges profile and compete for students.

Furthermore, requirements for HEIs to cope with the challenges involve many facets generated via evolving priorities within higher education management. These priorities are all to satisfy the demands of a more diverse global population, a new flexible model for lifelong learning, more comprehensive content in cross-discipline and promoting more sustainable and competitive resources. Hence, multiple expectations are forged on HEIs to respond to a galloping changing social environment. New types of resources and forms of management are inevitable to enable HEIs to contribute to the demands and processes dynamically. The challenge for HEIs is to connect the diverse roles of HEIs and incorporate all demanding facets into the value-added management process (Chatterton & Goddard, 2000).

The role of strategy is agreed to achieve competitive advantage for the organizations and to meet the diverse consumers better than their rivals with the competitive values whether operating in the public, private, or not-for-profit sector (Paarlberg & Bielefeld, 2009; Teece, 2019). It is essential to ascertain the critical factors for the organization with the questions of which elements of its resources and capabilities would bring the organization success? What factors drive the competition in its industry? (Henry, 2021).

Addressing China, fruitful results have been achieved in the globalization of HE as more universities have been recognized than ever before in the international level with the amount of 40, 42 and 51 according to the world's 1000 universities of QS World University Rankings from 2019 to 2021 respectively[2]. What's more, in response to the challenges and opportunities brought by MOOCs in China, the Global MOOC and Online Education Conference was held at Tsinghua University from December 9th to 11th, 2020[3], which demonstrates the HEIs in China are processing the steps with a more global innovation higher education environment to further promote inclusive, quality and sustainable HEIs within the digital era. There have been more than 34,000 MOOCs produced and 540 million learners enrolled since 2013. Additionally, in Coursera, a world-famous MOOC platform, there are seven Chinese universities (mainland) on the instructing partner list with 143 courses, which shed light on the internationalism of Chinese HEIs. The phenomenon has demonstrated great success on MOOCs in Chinese HEIs, and Chinese HEIs are taking advantage of the opportunity to expand their profiles and competitive advantages at the regional or international level via MOOCs. Therefore, as aforementioned (Henry, 2021), it is essential to summarise and explore the underlying determinants behind the MOOC success of HEIs in China since little literature has contributed to MOOC management from the perspective of organizational strategy in HEIs. This paper aims to identify the underlying internal determinants

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[2] https://www.topuniversities.com/university-rankings

[3] https://www.tsinghua.edu.cn/en/News.htm

behind MOOC's success and interpret how the underlying determinants affect HEIs to adopt and operate MOOCs in China. RBV is an organizational framework focusing on the resources which are variable, rare, inimitable and non-substitutable of an organization to determine the strategic resources an organization can use to achieve its sustainable and competitive advantages. Thus, this study considers RBV as the theoretical framework.

To accomplish this study, the EFA is firstly utilized for identifying the underlying factors among the data set. OLS and Tobit regression are adopted to examine further the relationship between the factors and the production of MOOCs, which could help us understand the determinants of MOOCs' success in HEIs. Besides, this research includes five parts: part one presents the introduction, part two presents literature review and hypotheses, part three presents the methodology, part four presents results, and part five presents the discussion, conclusion and future research direction.

2.2 Literature review and hypothesis

2.2.1 A brief review of MOOCs in China

In 2012, MOOCs first appeared in China but were not applied into practice until Chinese educational researchers and reformers completed their researches on MOOCs and were fully aware of the positive effects of MOOCs (Li et al., 2017). MOOCs attracted the attention from researchers in diversity fields, such as educational technology and distance learning. Hence, we entered the keyword Massive Open Online Courses (MOOCs) into CNKI, a Chinese Academic Literature Platform focusing on the Chinese publications, and Web of Science (WoS) setting the timeline form 2012 to 2021. A total of 3062 (CNKI:2359[4], WoS:703[5]) papers have been published and 40 disciplines are involved. **Table S1(See Appendix A)** shows the results.

Zheng and Yang (2017) discussed three aspects of MOOCs on reflection on teaching practice, modern teaching method and reform of educational mode. They considered MOOCs have changed the relation of supply and demand in terms of knowledge acquisition in China. Compared with traditional education, MOOC education can be applied to practice due to the advance in ICT, which means MOOCs are established on the construction of modern teaching platforms rather than campus or classrooms. The scholars consider that university libraries should be the platform and forces for MOOC education, but the Chinese government (mainland) must ensure the supply of an efficient working system and effective policies. Most importantly, HEIs should bear the role of supporting and serving in producing and developing MOOCs. Hence, mainly 14 Chinese MOOC platforms, which were established by enterprise and university respectively or founded by enterprise and university jointly, have appeared public since 2012. **Table 1** shows the results:

Table 1. MOOC platforms in China

Name	Established by	Website	Year
Sharecourse	Netxtream Technologies, Inc.	www.sharecourse.net	2012
Zhihuishu	Shanghai Able Electrical Co., Ltd	www.zhihuishu.com	2012
TopU	Guolairen (Beijing) Education Technology Co., Ltd	www.TopU.com	2012
NetEase Cloud Classroom	Neteast	www.study.163.com	2012
XuetangX.com	Tsinghua University	www.xuetangx.com	2013
ewant	5 Jiao Tong Universities in both Mainland and Taiwan	www.ewant.org	2013

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[4] http://wrdvpn.zufe.edu.cn/https/77726476706e69737468656265737421f5e7549e6933665b774687a98c/kns/brief/result.aspx?dbprefix=CJFQ

[5] https://www.webofscience.com/wos/woscc/summary/8b291eb2-1320-4ec2-8528-48c4f0032a27-206b15d0/relevance/1

Name	Established by	Website	Year
Kaikeba	Uniquedu	www.kaikeba.com	2013
MOOC China	Open Company together domestic universities in China	www.cmooc.com	
CNMOOC	Shanghai Jiao Tong University	www.cnmooc.org	2014
UOOC	About 90 universities including Shenzhen University	www.uooc.net.cn	2014
China University MOOC	NetEase and Higher Education Press	www.icourse163.org	2014
Chinese MOOCs	Peking University and Alibaba Group	www.chinesemooc.org	2015
Chaoxing MOOC	Beijing Century Superstar Information Technology Development Co., Ltd.	www.chaoxing.com	2015
UMOOCS	Foreign Language Teaching and Research Press Co., Ltd.	www.moocs.unipus.cn	2018

Own elaboration mainly based on Zheng and Burgos (2018)

The emergence of these MOOC platforms means MOOCs have influenced education in China and have obtained a particularly positive effect. According to the literature on MOOCs, as aforementioned, Chinese scholars are only concerned about the teaching practice, teaching method and educational model within the MOOC context and do not explore the determinants behind the success of MOOCs. Whereas, considering the papers published in international journals from WoS about MOOCs, most of the papers focus on the six categories: dropout (Gregori et al., 2018), scores prediction (Moreno-Marcos et al. 2018), forum posts classification (Bonafini et al. 2017), students' motivation (Zhou, 2016; Kaplan & Haenlein, 2016; Higashi et al., 2017), relevance of content (Li et al. 2018) and students' behaviour (Lung-guang, 2019) and teachers' behaviour (Ramírez-Montoya et al., 2017; Askeroth & Richardson, 2019). Little literature has contributed to identifying the underlying determinants of MOOCs' success addressing the perspective of HEIs' strategic management, and this study can replenish the research gap.

2.2.2 RBV

Compared with the dynamic capabilities theory, which incorporates competition, co-operation and innovation (Kapoor & Aggarwal, 2020) and is identified as the tools for managing the resource structure, learning strategies, improving the technological resources (Eisenhardt & Martin, 2000) to deal with the dynamics of global markets (Teece, 1992). RBV, the foundation of the theoretical framework in this study, has been utilized and discussed in strategic management for many years (Bromiley & Rau, 2016), focusing on the internal interaction of resources to identify the critical resources and investigate the effect of resources on competitive advantage (Taher, 2012). Besides, all the resources identified have the potential to generate competitive advantages and superior performance over time (Ainuddin et al., 2007). Additionally, the aim of this study is to identify the internal crucial institutional resources for producing MOOCs. Thus RBV is considered more appropriate as the theoretical framework for this study.

Barney (1991) edited a special forum on RBV and summarized that a firm could obtain sustainable competitive advantages by implementing strategies based on the internal strengths through responding to the external environment, and four determinants are proposed as value, rareness, imitability and sustainability for generating sustain competitive resources. Besides, the resources in RBV refers to more than tangible assets and also can be considered as intangible assets. Tangible resources refer to the fixed and current assets of an organization that have a fixed long-run capacity (Wernerfelt, 1989), including plant and equipment, mining rights, firm specific

investments by suppliers, debtors and bank deposits, and so on (Rialp-Criado et al., 2004). Intangible resources hinder imitability and substitutability of competitors in the short term due to the inherent complexity and specificity of their accumulation process (Fahy, 2000), including financial and capital assets, reputation, human capital, management skills, organizational process and its information and knowledge (Fuchs et al., 2000; Barney et al., 2001). The diffusion of RBV has been involved in theoretical development and empirical testing in the discipline of strategic management as well as related disciplines (Barney et al., 2001). RBV stipulates the essential resources to the competitive advantages in strategic management, and the performance is connected with the resources' attributes (Barney, 1991; Conner, 1991; Mills et al., 2003).

Besides, more researchers have expanded the RBV model for replenishing the explaining capability for different research contexts. Regarding human resource management, the emphasis is that people are as strategically essential to a firm's success. Collins (2021) expanded the RBV model of strategic human resource management and proposed CEO dynamic managerial capability as a determinant affecting front-line leaders' ability and motivation to operate organizational policy and leading to competitive advantages, which contributed to the literature on the RBV-based model of strategic human resource.

Within the field of economics and finance, there has been a strong connection between the disciplines of strategy and economics. For instance, James et al. (2015) examined the relationship between the corporate governance mechanisms, internal control monitoring mechanism and regulatory mechanism on and the bank performance. The result showed regulatory mechanism significantly impacts bank performance.

Addressing the field of entrepreneurship, RBV can theoretically inform and expand the research on entrepreneurship (Alvarez & Busenitz, 2001). Kiyabo and Isaga (2020) considered entrepreneurship orientation as an intangible resources in form of processes for studying its influence on SMEs' performance. The findings demonstrated the RBV is suitable for explaining not only tangible resources but intangible resources.

Concerning the international business, RBV assists in specifying the nature of necessary resources to overcome the liability of foreignness and providing a revenue to identify the essential resources that underpin product and international diversification (Peng, 2001). Ainuddin et al. (2007) required executives to assess the four resources of product reputation, technical expertise, local business network and marketing skills, labelling the attributes of value, rarity, imperfect imitability and non-substitutability respectively and argued the attribute of resources influence performance in the context of international joint ventures (IJVs).

Addressing the HEIs, Sanders and Wong (2021) discussed the resource can be the motivation for a global alliance among HEIs and utilized RBV as a framework model for selecting international partners among HEIs, through which practitioners and policymakers can better understand what makes for an attractive partner and enable them to engage in and benefit from the international strategic alliance and partnership. Lynch and Baines (2004) employed RBV to explore the potential strategy for British HEIs to cope with the absolute and competitive pressure from the government, which proposes valuable insights and strategic development for universities and proves the validity of RBV for the research of HEIs. In terms of IT adoption in HEIs, Hu et al. (2006) attempted to explore the model of IT usage based on RBV to understand the impact of IT usage in HEIs, and the finding showed organizational support has a significant effect on HEIs' managerial IT usage. Williams (2014) utilized the RBV model to delimit the literature review of

HEI's resources and argued that institutional resources are essential for universities and colleges to achieve objectives. He also suggested the research gap of understanding how tangible and intangible resources can be bundled and integrated to construct organizational capabilities for future research in HEIs. His study shed light on the research idea of this study to identify the underlying determinants behind MOOCs' success and further interpret how these determinants integrated as complementary capabilities to achieve the success of MOOCs in terms of higher education strategic management. Furthermore, according to the **Table S2 (See Appendix A)**, the papers related to higher education management have discussed the resources of HEIs and employed RBV as the theoretical framework. Thus, this paper considers RBV as fundamental theory to accomplish the research in accord with the existing literature.

2.2.3 Research model and hypotheses

Institutional resources are essential to organizations for developing and competing in the industry, and HEIs are no exception. Besides, leveraging resources to achieve specific objectives is part of strategic management (Barney, 1991; Kong & Prior, 2008). Munns and Bjeirmi (1996) defined a project as the achievement of a specific objective, which includes a series of missions and consumes institutional and organizational resources. Empirical studies focusing on HEIs have included measures of institutional resources and considered the institutional resources as independent or control variables to explain the outcomes of interest of HEIs, such as graduates rates (Anstine, 2013), school raking (Schlesselman & Coleman, 2013), the efficiency of university (Sav, 2013) and how universities accumulate and generate resources (Humphreys & Mondello, 2007; Becker et al. 2011).

Wernerfelt (1984) conceptualized production experience as a firm resource and the age of an organization is considered as an intangible resource that impacts performance (Panda & Reddy, 2016; Anderson & Eshima, 2013). Besides, Schlesselman & Coleman (2013) determined the year of the college established (age of the university) is found to be significantly correlated with the ranking performance of HEIs. Alshabandar et al. (2021) stated high ranking universities have adopted MOOCs as an efficient dashboard platform where learners from around the world can participate in courses. In this sense, we propose the first hypothesis:

H1: The age of the university positively impacts HEIs to produce MOOCs.

De Campos et al. (2019) considered human capital as an intangible internal resource of HEIs. Huang and Lee (2012) indicated human resource is one of the essential internal resources of HEIs and the number of teaching faculty is considered as one of the input variables and regarding the resource-related measures (Sav, 2013). Rothschild et al. (1993) stated HEIs are just one among many input users and with the expectation of the teacher inputs, HEIs clearly do be competitive among the marketplace to fill positions. In this sense, we propose the second hypothesis:

H2: The number of teachers positively impacts HEIs to produce MOOCs.

Student enrolment can be one of the most essential factors causing international branch campus closures (Wilkins, 2016). Additionally, the student enrollment has been viewed as a resource acquired by HEIs and the students enrolled is an crucial indicator of institutional characteristics strategically, a university's ability to achieve economies of scale (Worthington & Higgs, 2011) and the magnitude of an institutions' stram of revenue (Williams, 2014). In this sense, we propose the third hypothesis:

H3: The number of students positively impacts HEIs to produce MOOCs.

In the corporate governance, managers stress the capabilities of the project portfolio

management that deals with the coordination of multiple projects pursuing the same strategic goals or competing for the same resource to achieve strategic benefits (Martinsuo, 2013). Moreover, capabilities are understood as organizational routines and unlike resources, capabilities arise from the combination and coordination of different resources and lie in the organizational routines that are intangible (Nelson & Winter, 1985; Leonard-Barton, 1992). Furthermore, the capabilities can be inimitability resource for a company through internal development (Martín-de-Castro et al., 2006). In HEIs, the degree program portfolios offered of a university to the public are crucial competitive resources for competing against their rivals in the higher educational marketplace (Rothschild et al., 1993). Moreover, a phenomenon driven by increased internationalisation and globalisation has pushed HEIs to ensure the quality of their degrees offered (Stensaker et al., 2010), which has resulted in HEIs to ensure comparable, compatible and coherent higher education systems by involving a three cycle system of bachelor, master and doctorate (Strijbos et al., 2015). Eshniyazov et al. (2021) stated the basic requirements for modern bachelor programs should focus on achieving the country's strategic development goals, comply with international and national projects and development programs. Additionally, the increasing importance of postgraduate education at individual, institutional and national level has been noticed (Khalifa et al., 2018). Besides, the adoption of bachelor and master programs with European Credit Transfer System has made HEIs in Europe more comparable and facilitated the mobility of HEIs (Giada et al., 2014). Loukkola et al. (2020) stated the number of degrees obtained at bachelor, master and doctoral level is considered one of the most common indicators in funding mechanisms. In this sense, we propose the fourth, fifth and sixth hypotheses:

H4: The number of bachelor programs positively impacts HEIs to produce MOOCs.

H5: The number of master programs positively impacts HEIs to produce MOOCs.

H6: The number of doctoral programs positively impacts HEIs to produce MOOCs.

Sanders et al. (2021) indicated that the location is viewed as an essential intangible resource for HEIs and the location of university can be defined as geographical proximity, which has been well documented related the organizational outcomes such as innovation and knowledge creation (Kim & Craft, 2017; Catalini, 2018). Besides, geographical proximity is essential in understanding interactive learning and innovation (Boschma, 2005). Anstine (2013) demonstrated the location of the universities significantly impacts the performance of HEIs. Besides, the political environment can also impact the attitudes and preferences of people (Zhang, 2020) and most modern governments have the capacity to influence education policies, school curricula and investment in education and research (Jowett & O'Donnell, 2014). In this sense, we propose the seventh hypothesis:

H7: The proximity to political centre (Beijing) positively impacts HEIs to produce MOOCs.

Research on international operating firms has drawn on RBV to identify international experience as a core intangible resource of firms (Peng, 2001; Mohr & Batsakis, 2014). Moreover, internationalisation as a concept and strategic agenda is a diverse phenomenon in tertiary education (de Wit & Altbach, 2021), where the international activities in HEIs dramatically expanded ranging from traditional study-abroad programs to foreign language programs (Altbach & Knight, 2007). Altbach and Knight (2017) stated international students' program is a specific initiative in terms of the internationalisation of HE. Loukkola et al. (2020) mentioned international students can be a part of statistics relating to the measurement of internationalisation. In this sense, we propose the eighth hypothesis:

H8: The number of international students positively impacts HEIs to produce MOOCs.

Research capability is considered as a competitive resource of HEIs impacting the performance of HEIs (Huang & Lee, 2012; Bobe et al., 2015) and also viewed as one of the dimensions of analysis of quality-effectiveness for HEIs (Murias et al., 2008). Moreover, the number of postdoctoral positions (postdoc) is increasing worldwide and the postdocs play a crucial role on research fronts (Black & Stephan, 2010; Scaffidi & Berman, 2011). Chen et al. (2015) stated the postdoctoral positions are often viewed as stepping stones to academic careers and offer postdocs additional education and training in academic research, which can be viewed as a type of research resources and capabilities of HEIs. In this paper, we have collected the number of post-doctor programs as a measure for research performance and in this sense, we propose the ninth hypothesis:

H9: The number of post-doctor programs positively impacts HEIs to produce MOOCs.

Hence, follow the hypotheses above, we propose the research model below:

Testable model: $NMC=\alpha+\beta_1 Factor1+\beta_2 Factor2+\cdots+\beta_9 Factor9+\varepsilon$

Where, *NMC*=the number of MOOCs; α=the intercept of the regression equation; β=coefficients of independent variables; ε=error term.

2.3 Methodology

2.3.1 Data collection

All the data considered for this study are secondary data from different resources. Besides, the current study aims to explore the determinants of the success of MOOCs in HEIs in China. Following the method of Zakharova (2019) and considering the impact MOOCs caused on university internationalization (Chuang & Ho, 2016), the sample of Chinese universities collected (**Table S3: See Appendix A**) are from the Quacquarelli Symonds (QS) World University Ranking 2021[6] since leading universities initiate MOOCs prior to other HEIs with various online courses that can be subjected to this study.

Furthermore, in terms of HEIs, producing MOOCs as a strategic project has achieved a great success in China. Empirical studies of HEIs have included measures of institutional resources and considered the institutional resources as independent or control variables to explain the outcomes of interest such as graduates rates (Anstine, 2013), school raking (Schlesselman & Coleman, 2013) and efficiency of university (Sav, 2013). Additionally, considering MOOCs is an innovative outcome of HEIs and the objective of this study is to identify the determinants that impact HEIs to produce MOOCs. Hence, based on the extant literature and the discussion with experts, this study follows previous empirical methods for selecting variables and considers the number of MOOCs as the dependent variable and the independent variables that extant empirical studies have considered are listed below **(Table 2)**: the age of the university, the number of teachers, the number of students (including undergraduate, postgraduate and doctoral student), the number of bachelor programs, the number of master programs, the number of doctoral programs, the number of post-doctor programs, the distance to Beijing (political centre of China) and the number of international students as well.

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[6] https://www.topuniversities.com/university-rankings/world-university-rankings/2021

Table 2. Measurement

Variable	Variable description	Data source
Dependent variable		
NMC	the number of MOOCs	University Webpage
Independent variable		
Year	Age of the university	University Webpage
NT	the number of teachers	University Webpage
NS	the number of students	University Webpage
NBP	the number of bachelor programs	University Webpage
NMP	the number of master programs	University Webpage
NDP	the number of doctor programs	University Webpage
NPDP	the number of post-doctor programs	University Webpage
DB	the distance to Beijing	Self-calculation
NIS	the number of international students	www.cuaa.net

2.3.2 VIF examination

Table 3 presents the examination results of VIF for the independent variables. The VIF values of NMP, NDP and NPDP are higher than 5, which indicates the variables are highly correlated and the multicollinearity issue exists. Therefore, factor analysis is utilized to elicit the data.

Table 3. VIF values

Variable	Year	NT	NS	NBP	NMP	NDP	NPDP	DB	NIS
VIF	1.76	2.00	2.69	2.13	9.20	11.67	5.18	1.15	1.49

2.3.3 EFA

Factor analysis is a method for data reduction and analysis (Pallant, 2020). There are two primary factor analysis approach: EFA and CFA. EFA elicits the interrelated measures to discover the patterns among a set of variables (Yong and Pearce, 2013). CFA is adopted for testing specific hypotheses linking to the structural relationships of variables in the research process (Ogunsanya et al., 2019). However, this study adopts EFA for eliciting information regarding interrelationships among the variables. To conduct EFA, three stages have to be considered. These are:

1). assessment of the suitability of data: Two essential conditions must be satisfied: the adequacy of sample size and the correlation strength among the variables. A sample size of 51 can be available for this study. In terms of sample size adequacy, factor analyses are generally performed with large sample size, with the consensus that the larger the sample size, the better. Many early studies stressed the importance of absolute sample size. Guilford (1954) recommended that the minimum sample size should be 200. Comrey (2013) suggested a range of sample sizes from 50 (very poor) to 1000 (excellent). Cattell (1978) proposed that 500 would be a good sample size while 200 or 250 would be acceptable. Later studies demonstrated that the recommendations on the absolute sample size had been gradually abandoned as misconceived (Jackson, 2001; MacCallum et al., 1999). Meanwhile, many studies have pointed out not only the sample size but also the high communalities and number of variables per factor should be considered for factor recovery (Acito & Anderson, 1980; Pennell, 1968; Browne, 1968; Tucker et al., 1969). More recently, several studies demonstrated no absolute thresholds for minimum

sample size. The sample size is a function of several parameters and varies depending on the communities, loadings, the number of factors and the number of variables per factor. A few studies have confirmed the adequacy of a small sample size of less than 50 for evaluation (Geweke & Singleton, 1980; Costello & Osborne, 2005; Zeller & Martsolf, 2006; MacCallum, 2003; Mundfrom et al., 2005). de Winter et al. (2009) verified that the factor recovery could be reliable with a sample size smaller than 50.

In terms of the interrelationship among the variables, the correlation matrix approach is recommended to inspect for the coefficient values higher than 0.3, and the more coefficient values higher than 0.3, the more adequate the sample size is (Ogunsanya et al., 2019). Furthermore, the approaches of correlation matrix, KMO measure of sampling adequacy and Bartlett's test of sphericity are taken for confirming the conditions above. The KMO statistics varies from 0 to 1, and the values greater than 0.5 are acceptable, the values between 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are superb (Kaisier, 1974; Field, 2000).

2). factor extraction: This process entails simplifying the minimum number of factors representing the information among the interrelated variables. Principal component factor analysis is one of the main approaches for processing factor extraction (Ogunsanya et al., 2019). Hence, this study adopts the approach of principal component factor analysis to extract factors.

3). factor rotation and interpretation: The process of factor rotation and interpretation is for sketching the precise contours of the components generated without changing the underlying solutions. Thus, Stata (15) presents the components as a cluster of variables, with which researchers can interpret based on the theory and extant literature. The main approaches for performing factor rotations are varimax, quartimax and equamax, and this study adopts the approach of varimax, which can help achieve a simple structure by minimizing any tendency towards a general component in the solution (Chan, 2012). In terms of factor loadings greater than 0.3 are considered significant, greater than 0.4 are considered more critical, more superb than 0.5 or higher are considered very significant (Hair et al., 2003).

2.3.4 OLS regression and Tobit regression

OLS is a type of linear least square method for examining the unknown parameters in a linear regression model based on the assumption of independent observations (Kashki et al., 2021). Besides, OLS selects the parameters of a linear function of a set of explanatory variables according to the principle of least squares, which minimizes the sum of squares of the difference between the observed dependent variable (the value of the observed variable) and the linear function prediction in a given dataset (Ahmad et al., 2021). In this study, OLS is considered one of the methods to model a dependent variable (the number of MOOCs) regarding its relationship with a set of independent variables.

Furthermore, in spite of OLS, Tobit regression is also considered for the following two reasons: 1) given that the sample size for this study is small and the data description shows that the values of the dependent variable exist 0 value. 2) given the statistical analysis of this study, the dependent variable could be censored due to the characteristic variable of the number of MOOCs that can have two possible values: zero value (no MOOCs produced) and positive value (numbers of MOOCs produced). If the dependent variable is censored, the bias could be caused if verified parameter estimates through conventional regression methods (e.g. OLS) (Henningsen, 2010). In comparison, the Tobit model is designed for estimating linear relationships among variables when the dependent variable is either left-censored or right-censored (Kumari et al., 2021). Thus,

following the methods of Komrattanapanya and Suntraruk (2013), Schlup and Brunner (2018) and Deng et al. (2020), the approach of Tobit regression analysis proposed by Tobin (1985) is also recommended for this study to validate the estimating results further.

2.4 Results

2.4.1 Data description

Table 4 shows the general variable description of the number of MOOCs, the years of existence, the number of teachers, the number of students, the number of bachelor programs, the number of master programs, the number of doctoral programs, the number of post-doctor programs, the distance to Beijing (km) the number of international students.

Table 4. Data description

Variable	Mean	Std. Dev.	Min.	Max.
NMC	79.627	68.333	0	340
Year	90.235	32.088	11	128
NT	4144.098	2795.349	790	15772
NS	36845.310	16401.760	8024	73677
NBP	86.137	27.018	29	141
NMP	106.274	91.532	7	398
NDP	70.176	84.886	3	337
NPDP	25.608	12.957	0	60
DB(km)	1075.137	1599.794	0	11458
NIS	3046.958	1905.885	562	7793

2.4.2 EFA

Regarding the suitability of data, **Table 5** shows correlation coefficients. Most of the values presented are significantly higher than 0.3, which proves the inter-correlation strength among the variables in this study. **Table 6** shows the value of KMO for the overall matrix is 0.703, and the value of Chi-Square is 240.763 with a significant P-value of 0.000, indicating the data is appropriate for performing factor analysis. The values of communality presented in **Table 7** further demonstrate the adequacy of small sample size for this study since the average value is 0.729 and all the values are higher than 0.5 (Field, 2009; Hair et al., 2021).

Table 5. Correlation matrix

	NMC	NIS	Year	NT	NS	NBP	NMP	NDP	NPDP	DB
NMC	1.0000									
NIS	0.4607*	1.0000								
Year	0.5226*	0.3324*	1.0000							
NT	0.4848*	0.2818*	0.2679*	1.0000						
NS	0.3031*	0.2416*	0.2273*	0.5961*	1.0000					
NBP	0.2641*	0.3174*	0.4042*	0.4337*	0.6646*	1.0000				
NMP	0.2598*	0.2626*	0.1885*	0.1262*	0.2880*	0.4501*	1.0000			
NDP	0.3122*	0.3334*	0.2126*	0.2108*	0.3802*	0.5183*	0.9370*	1.0000		
NPDP	0.6191*	0.5376*	0.5423*	0.6551*	0.6965*	0.6290*	0.4513*	0.5642*	1.0000	
DB	-0.1433*	-0.0974	-0.0754	-0.0184	0.1983*	0.0943	-0.0746	-0.0842	0.0239	1.0000

Table 6. KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		KMO=0.703
Bartlett's Test of Sphericity	Approx. Chi-Square	240.763
	Df	36
	Sig.	0.000

Table 7. Communalities

Variable	Variable description	Initial	Extraction
Year	the years of existence	1.000	0.552
NT	the number of teachers	1.000	0.617
NS	the number of students	1.000	0.764
NBP	the number of bachelor program	1.000	0.642
NMP	the number of master program	1.000	0.942
NDP	the number of doctor program	1.000	0.961
NPDP	the number of post-doctor program	1.000	0.863
DB	the distance to Beijing	1.000	0.687
NIS	the number of international students	1.000	0.529
			Average: 0.729

In terms of factor extraction, the original nine variables were analyzed by the principal component factor analysis, three values extracted from the process with an eigenvalue of greater than 1, which explained 72.855% of the total variance, and the eigenvalue of the fourth factor is far from the reference value of eigenvalue of 1 **(Table 8)**.

Regarding factor rotation and interpretation, the rotated component loadings for the three factors are presented in **Table 9**, and only factors with loadings above 0.5 are considered in this study. The factors generated could be the dominant underlying resources for HEIs to produce MOOCs from this result. The three-factor component solution, which explained a total of 72.855% of the variance, was obtained. The three components explained 43.498%, 16.301% and 13.056% of the variance respectively. The variance explained is higher than the recommended minimum of 50% (Field, 2009; Pallant, 2020).

Table 8. Total variance explained

Component	Initial Eigenvalues			Extraction sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.915	43.498	43.498	3.915	43.498	43.498
2	1.467	16.301	59.799	1.467	16.301	59.799
3	1.175	13.056	72.855	1.175	13.056	72.855
4	0.800	8.889	81.744			
5	0.662	7.357	89.101			
6	0.472	5.249	94.350			
7	0.312	3.462	97.812			
8	0.149	1.650	99.462			
9	0.048	0.538	100.000			

Table 9. Rotation factors and sums of squared loadings

	Factors		
	Factor1	Factor2	Factor3
NPDP: the number of post-doctor program	0.8496		
NT: the number of teachers	0.7753		
NS: the number of students	0.7095		
Year: the years of existence	0.6547		
NBP: the number of bachelor program	0.6150		
NIS: the number of international students	0.5550		
NMP: the number of master program		0.9663	
NDP: the number of doctor program		0.9556	
DB: the distance to Beijing			0.8188
Eigenvalue	3.915	1.467	1.175
% of variance	43.498	16.301	13.056
Cumulative variance explained %	43.498	59.799	72.855

Factor 1: Six variables present this factor with factor loading ranging from 0.8496 to 0.5550. The variables are the number of post-doctor programs, the number of teachers, the years of existence, the number of students, the number of bachelor programs and the number of international students. We name this factor Size.

Factor 2: This factor is presented by two variables with factor loading ranging from 0.9663 to 0.9556. The variables are the number of the master programs and the number of doctoral programs. We name this factor Lifelong learning, given that the master programs (professional and academic) and doctoral programs are aimed at training people.

Factor 3: This factor is presented by one variable with factor loading of 0.8188. The variable is the distance to Beijing. Thus, we name this factor Proximity to the political centre.

2.4.3 Results of OLS and Tobit regression

Table 10 and **Table 11** both support the hypothesis of this study and show the goodness of fit is deemed considered and two factors identified are significantly correlated with NMC. The two factors are size and proximity to the political centre, which indicates the hypotheses proposed are significantly supported except the number of master programs (H4) and the number of doctoral programs (H5). In other words, the hypotheses of the ago of the university (H1), the number of teachers (H2), the number of students (H3), the number of bachelor programs (H4), the proximity to political centre (H7), the number of international students (H8) and the number of post-doctor programs (H9) are significant support and these factors positively impact HEIs to produce MOOCs. Besides, the positive correlation coefficients between the number of MOOCs and research potential and size are 0.5857016 in both OLS and Tobit, respectively, indicating research potential and size would increase the number of MOOCs produced.

The proximity to the political centre is found negatively correlated with the number of MOOCs with correlation coefficients of -0.3113383 in both OLS and Tobit, which indicates that the closer to the political centre, the fewer numbers of MOOCs produced.

Table 10. OLS regression analysis results

NMC	Coef.	Std.Err	t	P>|t|	[95%Conf.	Interval]
Factor 1	0.5857016	0.1130429	5.18	0.000***	0.3578785	0.8135246
Factor 2	0.1365193	0.1130429	1.21	0.234	-0.0913038	0.3643424
Factor 3	-0.3113383	0.1130429	-2.75	0.009***	-0.5391614	-0.0835153
_cons	0.0408178	0.1118592	0.36	0.717	-0.1846196	0.2662552
Prob>F=0.0000; R^2=0.4492; Adj-R^2=0.4117					*p<0.1;**p<0.05; ***p<0.01	

Table 11. Tobit regression analysis results

NMC	Coef.	Std.Err	t	P>|t|	[95%Conf.	Interval]
Factor 1	0.5857016	0.1082304	5.41	0.000***	0.3677144	0.8036887
Factor 2	0.1365193	0.1082304	1.26	0.214	-0.0814678	0.3545064
Factor 3	-0.3113383	0.1082304	-2.88	0.006***	-0.5293255	-0.0933512
_cons	0.0408178	0.107097	0.38	0.000	-0.1748867	0.2565223
Var(e.y)	0.7419901	0.075729			0.589464	0.8945161
Prob>Chi²=0.0000; Pseudo R^2=0.2102					**p<0.05; ***p<0.01	

2.5 Discussion and conclusion

2.5.1 Size

The six variables extracted for factor 1 were the number of post-doctor programs (84.96%), the number of teachers (77.53%), the number of students (70.95%), the years of existence (65.47%), the number of bachelor programs (61.5%) and the number of international students (55.5%). The number in parenthesis is the factor loadings. This cluster accounts for 43.498% of the variance and shared the general link to the size in common.

Size can be measured in many ways. Kalleberg and Van (1996) defined it as the number of employees in the organization. Carr and Pearson (1999) mentioned that the role of size should be identified and stressed due to its impact on the relationship between supply chain integration and sustainable performance. Moreover, many operational or strategic resources are associated with size, which could significantly impact the organization on delivering projects (Hong et al., 2019). Many studies have accentuated that size is an essential determinant for an organization and impacts the level of implementation for sustainability-oriented strategies and practices (Gallo & Christensen, 2011). Hörisch et al. (2015) has indicated that size is indeed critical for promoting sustainability management knowledge and large organizations take the advantage in possessing more capital resources such as financial and human resources to enable them to gather information, promote expertise and unlock potential benefits (Bowen, 2002). Besides, a firm's propensity to invest in R&D is positively associated with firm's size (Acs & Sudretsch, 1988), which simultaneously indicates size could be effective in producing new projects to an organization.

In spite of firms, the size of the institution is an important factor analyzed in higher education literature measured in therms of the number of students or faculty members (Martínez, 2013). Besides, the size is considered as one of the essential resources for universities as well, which can be viewed as a proxy for the institution's operational capabilities such as the ability to deliver academic instruction and degree programs as well as marketing capabilities such as the ability to attract students (Williams, 2014). Allen and Seaman (2014) identified larger US institutions are more likely to offer MOOCs. Besides, Ospina-Delgado et al. (2016) found the size could partially

impact the MOOC's production. Therefore, the universities with large size can be supported with superior operational capability to implement new projects such as MOOCs.

Additionally, the number of post-doctor programs and the number of teachers are two individual prominent variables for explaining factor 1, which could be linked to the potential research ability. Research as one of the activities in HEIs implies a meaningful and crucial role in national knowledge economies, where HEIs are widely considered critical institutional actors in the national innovation system (Jaeger & Kopper, 2014). Besides, knowledge-based outputs are exceptionally dependent on the knowledge available to the organizations, the basis and unique advantage created by the reach of knowledge has to be identified and maintained to ensure successful innovation (Adams & Lamont, 2003).

2.5.2 Lifelong learning

The selected variables extracted for factor 2 were the number of master program (96.63%) and the number of doctor program (95.56%). This cluster accounted for 16.301% of the variance and shared the general perception related the lifelong learning.

The interface of between lifelong learning and higher education has been considered increasing importance due to the expectation that people will engage in lifelong learning for updating professional skills and the expansion of higher education that increases in the proportion of the labour force comprised of graduates (Brooks & Everett, 2008). Lifelong learning emphasizes the learning process where people can formally or informally perform their learning activities related to knowledge and skills which are necessary for personal, social and employment-related demands (Taşçi & Titrek, 2019). MOOCs could be seen as an opportunity to redesign dynamic environments with currently learning style, which contributes to improving learning and lifelong learning (Ospina-Delgado et al., 2016). However, this factor in this study is confirmed as insignificant factor that impacts HEIs to produce MOOCs. As the existing literature demonstrates that the participants of lifelong learning are mainly graduates rather than other groups of people (Brooks & Everett, 2008) and the academic procrastination can be one of the barriers for HEIs in lifelong learning (Barnová & Krásna, 2018).

2.5.3 Proximity to political center

The selected variable extracted for factor 3 was the distance to Beijing (81.88%). The number in parenthesis is the factor loadings. This cluster accounted for 13.056% of the variance and shared the general link to proximity to the political centre.

Proximity has been well discussed related to organizational outcomes such as communication, social ties, innovation and knowledge creation (Boschma 2005; Catalini, 2018). Proximity is often interpreted as geographical proximity, defined as the spatial distance between individuals or organizations (Christensen & Pedersen, 2018). A vital cognizance is that knowledge creation and learning are essential for firms or regions to construct competitive advantages, and the process could be impacted by proximity (Amin & Wilkinson, 1999). Geographical proximity is often considered an external variable that could also stimulate the formation and evolution of institutions that may affect innovation (Boschma, 2005). Catalini (2018) pointed out the strategic trade-offs entailed with a spatial allocation should stress, and organizations should make a strategical choice by optimizing space based on current belief where opportunities are.

Additionally, the causal relationship between proximity to the political centre and managerial and innovative operation has been supported in studies (Berezin & Díez-Medrano, 2008; Funk, 2014). The political geography has a pervasive effect on the investment in organizations and

organizations located in the areas with strong control by the ruling party could experience greater opportunities and more risk (Kim et al., 2012). Beijing, political centre of China, is classified as an administrative-cultural city and dominated by the literati and indigenous bureaucracy (Ma et al., 2013). The study has confirmed proximity as a determinant that significantly impacts HEIs to produce MOOCs. Furthermore, this study found that the coefficient of proximity to the political centre is negative, which means HEIs closer to the political centre produced fewer MOOCs than those farther away. Whereas this finding does not concur with previous studies, in which a positive relationship was observed between political proximity and the rate of investment.

In view of the current educational context in China, although the Chinese government is committed to improving the education, there are considerable flaws in current educational process, such as educational equality, education cost and the uneven distribution of educational resources in China (Tang & Carr-Chellman, 2016). MOOCs create hopes in China as an educational innovation bridging the gap in educational equality. Besides, the universities located in Beijing can benefit from more opportunities and welfare brought by the political geography. Therefore, MOOCs become the hope of HEIs which are away from political centre without adequate educational resources to gather educational information and resources to replenish the inequality in HEIs and further decrease the educational cost.

2.5.4 Conclusion

The determinants that successfully impact MOOCs' production among Chinese HEIs are diverse as different factors are responsible. The benefits of sustainability and competitiveness in the delivery of MOOCs in the educational industry are known. There is a paucity of knowledge as to the factors that impact HEIs to produce MOOCs in the perspective of organizational strategy. Whereas the causes that lead to the presence of MOOCs always involve internal, external and strategic factors (Ospina-Delgado & Zorio-Grima, 2016). Hence, through this study, the determinants that significantly impact HEIs' success in producing MOOCs were classified into two clusters. These are size and proximity to the political centre. These findings lend support and align with studies in strategical management. Therefore, it is recommended that efforts should be intensified on size as HEIs with a larger size can possess more substantial research potential and perform better in their operational capability, which can initiate their objectives further or generate new competing resources such as producing MOOCs. Besides, proximity awareness should also be intensified to remedy the educational inequality and the uneven educational resource allocation.

2.6 Implications, limitations and future research directions

This study is the first attempt to explore and summarise the essential determinants behind MOOCs' success. Regarding theoretical implications, this study replenishes the research gap of strategic management in HEIs in the MOOC context and provides input into requirements for developing a strategic management model for the educational industry.

Moreover, this study adopts RBV as the theoretical framework and further expands the research scope of RBV in strategic management by providing empirical evidence. Furthermore, this study has extracted three new variables for future studies that explain the performances and strategy of HEIs. Focusing on the managerial implications, institutional resources are essential to operate new objectives for HEIs, and this study suggests HEIs should invest and leverage the fundamental resources to improve the comprehensive competitive advantages and capabilities further. Besides, MOOCs are knowledge-based products that highly depend on the knowledge available to the organisation. Therefore, HEIs should stress the role of knowledge management

that assists in converting and ensuring the accessibility of knowledge further to construct competence (Du Plessis, 2007).

Additionally, the university size would impact the procedure of producing MOOCs. Therefore, HEIs should make profound steps to increase the vital determinant. For instance, HEIs can affiliate with the academic centre, effectively enhancing overall productivity and facilitating cross-discipline, cross-sector, and inter-institutional productivity and collaborations (Ponomariov & Boardman, 2010). Besides, HEIs should also pay attention to the motivation of researchers as researchers' values and attitudes have been confirmed as essential factors towards research willingness (Schuelke, 2013). Furthermore, the national policy significantly impacts the research development in HEIs. In this sense, HEIs should organise the policy research team to study the policy precisely and develop accurate scenarios.

The limitation of this study could be the variables selected for this study. The literature demonstrates both the lack of empirical evidence and the operationalisation of variables regarding MOOCs addressing the context of HEIs. Therefore, the variables selected for measuring the MOOCs' success would differ from those in-country contexts and history due to the differences in culture and different parameters adopted for measuring success, which has also been advocated by a range of scholars (Welter, 2011). Thus, future studies can conduct more empirical studies to enrich the strategical management in HEIs and provide more effective variables for building a strategical management model.

Chapter 3

3 University teachers' perception of MOOCs: Moderating role of culture

3.1 Introduction

ICT advances have proven effective in supporting and reinforcing the new pedagogical practices and educational reform (Kreijns et al., 2013). ICT promotes the activity between teachers and students, concatenating the interaction of teachers and students utilising a mass of global information resources, which enables educational innovation (Kozma, 2003). Besides, integrating ICT with teaching practices significantly affects learning outcomes (Higgins, 2003; Meijer et al., 2008). Moreover, innovative HEIs are positively making productive investments to produce MOOCs (White et al., 2014), which provides teachers with new ways to tackle social learning addressing the global and diverse learning groups (Milligan, Littlejohn & Margaryan, 2013). Besides, ICT has been an essential factor of open education (Seely & Adler, 2008). Addressing the perspective of HEIs that respond to the open and online education movement, MOOCs are adopted for student recruitment, which is regarded as the most crucial primary objective and create flexible learning opportunities (Jansen & Schuwer, 2015).

Additionally, the working environment and culture have been significantly impacted by the information society and the development of ICT, which not only enables the work practice available without the constrain of physical location but also advanced the working way with the ability to incorporate work into free time (Törhönen et al., 2019). HEIs' goals for engaging in MOOCs have increased global access beyond physical and geographical boundaries to reach high-quality higher education content, especially to unique experts in a specific academic field (Holland Tirthali, 2014). Besides, competition among HEIs has motivated producing MOOCs (Nortvig & Christiansen, 2017). As HEIs have become increasingly international, many scholars and experts offer courses with educational institutions jointly, creating a nationally and internationally collaborating phenomenon, which is often emphasised as one of the most incredible opportunities related to MOOCs (Brown & Costello, 2015). Furthermore, more teachers enjoy the process of working within MOOCs for their attractiveness and innovation (Zheng et al., 2016). Teachers prefer MOOCs not only can they concatenate a mass of diverse students worldwide (Agarwal, 2012; Mackness et al., 2010), but also benefit from the procedures since many perspectives and teaching resources have been generated integrated into the residential courses (Belanger & Thornton, 2013), advancing their pedagogical presentation (Kolowich, 2013). Moreover, some teachers perceive the MOOCs' activity as leisure and engagement, which can be characterised by playfulness (Törhönen et al., 2019) since they merge work with play in terms of MOOCs, and this kind of combination is defined as PL (Sotamaa, 2007; Ferrer-Conill, 2018; Törhönen et al., 2019).

More recently, research has begun to focus on digitalising the working environments associated with "PL". Kozma (2003) and Kreijns et al.(2013) noticed that teachers are more often reluctant rather than willing to integrate ICT in their pedagogical practices. Tseng et al. (2018) mentioned MOOCs can be challenging for teachers to use. It is essential to understand the perception of teachers and how to facilitate their adoption of MOOCs, which is a critical step to promote teachers to work with MOOCs. However, the studies addressing the perspective of teachers towards MOOCs are sparse (Najafi et al., 2015). Therefore, we must answer the question: How do university teachers perceive MOOCs?

Simultaneously, more global and international cooperation is conducted and implemented among different HEIs, which enriches the phenomenon where national and global cultures are interplaying and becoming increasingly collective with the advancement of technology global sharing (Bissessar, 2018). Moreover, Hofstede cultural dimensions theory argues that culture is a psychological program shared by people in an environment that can distinguish a group of people from others (Huang & Crotts, 2019; Ng & Lim, 2019). Nonetheless, culture has been studied by numerous researchers in different academic fields to detect the potential difference in human behaviour (Beugelsdijk et al., 2017; Huang & Crotts, 2019; Rojo et al., 2020; Shao et al., 2020; Guritno et al., 2020; Vollero et al. 2020). Few comparative studies have been carried out integrating culture as a moderator in the MOOC context and according to values of Hofstede's dimensions. This study has collected data from universities in two different contexts of China and Spain to explore potential differences in teachers' behaviour towards MOOCs.

TPB and PL are utilised as a merged theoretical model to identify the factors that significantly impact teachers' perception and behaviour towards MOOCs. TPB is accepted by numerous researchers and utilised for studying human behaviour associated with three determinants of ATT, SN and PBC (Han et al., 2010; Chung et al., 2018). According to the definitions of ATT, SN and PBC (Ajzen, 1991; Kumar, 2019; Lopes et al., 2019), which can be considered as an intrinsic attitude and perception towards a specific activity. PL refers to a combination of play and labour considered playfulness and leisure (Goggin, 2011) and is considered the intrinsic attitude and perception perceived towards the work (Törhönen et al., 2019). Hence, in this research, PL is integrated as a mediating variable between the causal relationship of the three conceptual independent variables (ATT, SN and PBC) and the dependent variable, BI. To further detect the moderating effect of culture, this research considers culture as a moderator to verify the potential difference in perception and behaviour of university teachers in China and Spain towards MOOCs by utilising MGA.

The primary purpose of this research is to analyse the perception and BI of university teachers towards MOOCs and further explore whether culture may moderate and influence the perception and BI between university teachers in China and Spain. The findings of this research may facilitate the interpretation of human behaviour towards MOOCs and detect the moderating role of culture comparatively in MOOCs' context. Besides, this study can improve the current teaching management, and offering more quality MOOCs to the public simultaneously.

For accomplishing this objective, this study is structured into six parts: part one presents the general introduction, part two presents a literature review, part three presents hypothesised relationship, part four introduces the methodology, part five presents the results, and part six presents the discussion, conclusion and future research line.

3.2 Literature review and hypotheses

3.2.1 MOOCs

MOOCs are changing the way of lecturing and learning processes in HE around the world (Chan et al., 2018) along with its attraction including accessibility, affordability, massiveness and openness (Freitas et al., 2015; Khan et al., 2018; Askeroth & Richardson, 2019). Up to date, millions of students worldwide are enrolled to participate in MOOCs (Teo & Dai, 2019). Owing to advanced educational technology, anyone with the internet can access MOOCs connecting with learners worldwide without the constrain of place, pace, and time (Jansen et al., 2020). Furthermore, scholars have distinguished two MOOC branches (i.e., cMOOC and xMOOC)

(Maureen & Julien, 2014; Tseng et al., 2022), and summarised salient research themes and topics to the interdisciplinary nature of the research (Gasevic et al., 2014; Moreno-Marcos et al., 2018), which reveals seven categories: Course score, Dropout (Gregori et al., 2018; Hong et al., 2017; Li, 2018; Lyu et al., 2018), Forum posts (Bonafini et al. 2017; Crues et al., 2018), students' behaviour (Kizilcec et al., 2017; Li & Baker, 2018; Mulik et al., 2018; Lung-guang, 2019), students' motivation (Zhou, 2016; Kaplan & Haenlein, 2016; Higashi et al., 2017), MOOC content (Li et al., 2018; Luo et al., 2018), teachers' behaviour (Ramírez-Montoya et al., 2017; Askeroth & Richardson, 2019).

Many high-quality free courses in a wide range of academic programs are offered for students with a high unheard-of autonomy in learning processes by MOOC providers collaborating with prestigious universities (Hernández et al., 2014; Lung-Guang, 2019; Chen et al., 2020). In addition to the geographical issue of universities worldwide, HEIs have started providing students with MOOCs (Chen, 2014) where teachers and students can easily interact with each other to enhance the quality of the lecturing and learning process (Khan et al., 2018). In addition, many teachers enjoy the innovative way of working with MOOCs and researchers have conducted research on teachers' behaviour towards MOOCs. Askeroth and Richardson (2019) carried out a case study about instructors' perceptions of quality learning in MOOCs utilising semi-structured qualitative interviews. The findings from the study demonstrate that MOOCs can enhance quality learning through social constructivism and SRL approaches. Lai et al. (2018) proposed that flipped teaching has emerged as an innovative teaching and learning approach for higher education, creating a virtual space for online learning. Many teachers have incorporated MOOCs within flipping teaching due to its diverse resources, which are viewed as an effective teaching method and potentially affect teachers' continuance use. Najafi et al. (2015) included changes in the teaching practice of MOOC lecturers because they modified the teaching practice in credit courses by increasing opportunities for active learning and using MOOC resources. Chen et al. (2020) mentioned that MOOCs are also viewed as a quality approach for supporting teacher professional development. The findings indicate that refreshing domain understanding and practical problems are the leading reasons that teachers use MOOCs. Scherer et al. (2015) examined whether the PU of IT is related to self-efficacy, ICT use, and age. The finding showed PU is positively related to self-efficacy and ICT use, but is negatively related to teachers' age. Wong (2016) studies the drivers of primary teachers' acceptance of educational technology in Hong Kong and the results presented that PEOU and PU have minimal effects on teachers' intention, but the facilitating condition has been confirmed as a crucial driver.

3.2.2 TPB

TPB (Ajzen 1988,1991) is an extension of TRA (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980), and according to TPB (Ajzen, 1991), BI is associated with the following three factors: ATT, SN and PBC (Hssain et al., 2019; McBride et al., 2020). Attitude is the first essential determinant connected to BI and refers to an overall evaluation positively or negatively for the individual behaviour in a specific way (Ajzen, 1991; Ru et al., 2019). The existing literature shows that individual attitudes can influence BI (Khan et al., 2019; Cai et al., 2019; Ru et al., 2019).

SN refers to the social pressure around us that may impact our BI (Ajzen, 1991; Kumar, 2019). Furthermore, SN has a significantly positive relationship related to BI, which many researchers have confirmed (Khan et al., 2019; Cai et al., 2019; Ru et al., 2019; Hssain et al. 2019; McBride et al., 2020).

PBC refers to individual's perceptions of their capability on a certain behaviour (Ajzen, 1991; Lopes et al., 2019), which means PBC is viewed as individual's perceptions of their capability on certain behaviour. Moreover, the ease and difficulty are associated with individual BI and decision-making while performing a behaviour (Ajzen, 1991; Lopes et al., 2019; Khan et al., 2019). Besides, numerous studies have confirmed that PBC has a significantly positive effect on BI (Verma & Chandra, 2018; Lopes et al., 2019; Ru et al., 2019).

TPB is widely applied in research areas for predicting human BI (Madden et al., 1992; Si et al., 2020), such as in the field of sustainable transportation usage (Cai et al., 2019; Hossain et al., 2019), energy-saving (Lopes et al., 2019; Ru et al., 2019), green hotel (Verma & Chandra, 2018), tourism (Han et al., 2010), waste manage (Khan et al., 2019; Kumar, 2019), higher education (Cheon et al., 2012), communication (McBride et al., 2020), e-commerce activity (Trung et al., 2020) and psychology (Liu et al., 2020). To overcome the limitation of the classical ground TPB, scholars have tried to incorporate TPB with other variables or models to improve the prediction power. Lung-guang (2019) explored the decision-making determinants of students on whether to participate in a MOOC or not using the TPB and the model of SRL as an incorporated theoretical research model. The results demonstrated that a positive and high model fit of the new merged model and revealed the ATT towards the behaviour was not statistically significant and identified self-efficacy, goal setting and task interest as salient variables that influence the planned behaviour to engage in a MOOC. Kumar (2019) addressed young adults' e-waste recycling behaviour cross-culturally, adopting the TPB with adding new variables: Individual Responsibility, Awareness of Consequences, Sense of Duty and Convenience of Recycling. The findings suggested that the key variables that affect BI were ATT, SN, PBC and Individual responsibility. Si et al. (2020) identified the determinants that have an impact on users' sustainable usage intention on dockless bike-sharing, integrating the theory of planned behaviour with new variables, Awareness of consequence and Moral obligation, as a incorporated theoretical research model and the results revealed that PBC and Moral obligation significantly influence sustainable usage for dockless bike-sharing.

3.2.3 Playbour

The notion of play and labour are in an opposite and contradictory side in which play is defined as intense and absorptive, beyond the urgent needs of life, related to imagination and full of joy, as play provides a pause to the seriousness of daily life (Huizinga, 1938/1955). Labour refers to a protocol between employers and employees to generate values and profits through the progress of production (Thompson, 1989). However, Barbrook and Cameron (1996) indicated that the conflict between play and labour was melding with the emergence of a new economy where playfulness arose within the labour.

With the development of ICT, the working environment and cultures have been greatly transformed. Moreover ICT has advanced the working communication and patterns beyond the geographical constrain, allowing people to merge work within free time (Törhönen et al., 2019), and this kind of working transformation is called playbour (Sotamaa, 2007; Ferrer-Conill, 2018). The concept of PL refers to a combination of play and labour associated with the capitalist mode or value of production (Lund, 2015) and organization, considered playful, fun, and leisure (Goggin, 2011). Howcroft and Bergvall (2019) argued that PL is the ideological strategy of capital, which links entertainment, creativity and autonomy with labour. It is based on the assumption that if work is associated with fun, as the line between work and leisure becomes blurred, workers

would be more inclined to innovate and increase productivity. Hence, the intrinsic attitude and perception perceived towards the work may significantly impact working efficacy and productivity (Törhönen et al., 2019).

The concept of PL has always been associated with numerous activities with the formats and services in the digital economy (Scholz, 2012). Based on this type of labour, the production code or value are considered to rely on media contents and materials in digital formats (Van & Poell, 2013). People produce and share their elaborate content through the internet or online platforms such as YouTube and Twitter so that they can better connect with and engage in their worldwide social network to explore their passion and creativity, which is often viewed as a leisure activity and the outcomes can satisfy and lead the enjoyment to the content creators (Matikainen, 2015). Törhönen et al. (2019) explored the personal broadcasters' perception towards their content creation and the satisfaction gained from their outcomes. The findings demonstrated that digital entrepreneurial practice and activity existed in the work-oriented group and highlighted the workification of play activities. Annetta and Peter (2019) examined the consumer-firm relationship in an online co-cream platform addressing the perspective of PL, demonstrating that consumer and firm can co-exist in a way to make benefits to both consumers and firms.

3.2.4 Hofstede's cultural dimensions theory

National culture and cultural norms and beliefs have been considered a crucial environmental factor affecting individual behaviour, perception, and disposition (Markus & Kitayama, 1991; Steenkamp, 2000). Ng and Lim (2019) demonstrated that the predictive power of cultural distance could be improved to some extent through incorporating multiple cultural distance measures. Hofstede is one of the most frequently quoted social scientists due to identifying several dimensions of cross-culture (Beugelsdijk & Welzel, 2018). Hofstede's cultural dimensions theory (Hofstede, 1980) is proposed with six valuable dimensions: Power Distance refers to the degree of acceptance of the unequal distribution of power in a society or organization by a low-status person in a certain society. Uncertainty Avoidance refers to whether a society is subject to uncertain events and unconventional environmental threats through formal channels to avoid and control uncertainty. The individualism versus Collectivism dimension measures whether society as a whole is concerned with the interests of individuals or the collective interests. Masculinity versus Femininity dimension mainly depends on whether a society represents male qualities such as competition and more arbitrariness, or represents female qualities such as modesty, caring for others more, and the definition of male and female functions. The greater the value of the Masculinity Dimension Index (MDI: Masculinity Dimension Index), the more pronounced the masculinity tendency of the society, and the more prominent the masculinity; on the contrary, the more prominent the femininity of the society. The long-term versus Short-term dimension is introduced subsequently (Hofstede, 2001) and refers to how members of a culture can delay the satisfaction of their material, emotional, and social needs. The Indulgence versus Restraint dimension (Hofstede, 2011) refers to the degree to which a certain society allows people's basic needs and desire to enjoy life. The greater the value of Indulgence (self-indulgence), it means that the society as a whole has little restraint on itself, and the greater the social tolerance for self-indulgence, the fewer people will restrain themselves.

Although different approaches have been proposed for measuring cultural change (Schwartz, 1994; Lloyd & Trompenaars, 1993), such as The GLOBE project (House et al., 2004). None of these methods has exceeded the level of influence caused by the Hofstede framework. It allows

researchers to quantify the cultural change between countries. Hofstede's cultural dimensions may have a significant impact on explaining cross-cultural values (Khilf, 2016), which has been used for a large number of academic fields related to the workplace, behaviour, management, international business, tourism, cross-cultural psychology, performance issues during clinical placement, industry actions and country corruption (Kirkman et al., 2006; Taras et al., 2012; Beugelsdijk et al., 2017; Huang & Crotts, 2019; Rojo et al., 2020; Shao et al., 2020; Guritno et al., 2020; Vollero et al. 2020). Accordingly, Hofstede's cultural scores lay a solid foundation for the courses of cross-cultural corporate training, international business management and executive education (Taras et al., 2012). Therefore, the most common cultural distance operation is based on the difference in the Hofstede cultural dimensional scores between country pairs (Beugelsdijk et al., 2015). Concerning the criticism about Hofstede, the framework should be discarded because Hofstede's country scores appear outdated. Beugelsdijk et al. (2015) found an increase in Individualism and Indulgence versus Restraint and a decrease in Power Distance when testing the change of scores on the Hofstede national culture dimensions and the validity of the scores.

3.2.5 Incorporated theoretical framework

The development of ICT has advanced work patterns, working behaviour and perception (Törhönen et al., 2019), which causes a considerable influence on the higher education field, transforming the lecture way of teachers and the learning process of students (Chan et al., 2018). This study focuses on university teachers' perception towards MOOCs based on the TPB (Ajzen 1988,1991) to explore the core drives affecting intention motivation as well as to identify to some extent how the cultural factor may affect the way of their behaviour towards working with MOOCs based on the Hofstede's cultural dimensions theory (Hofstede, 1980). Addressing the TPB (TPB; Ajzen 1988,1991), ATT, SN and PBC are three variables that affect BI. Besides, more significant indicators should be explored (Moreno-Marcos et al., 2018) to improve the predictive power of theoretical models for MOOCs. Many scholars have integrated new variables or merged other classical ground theories with TPB (Lung-Guang, 2019; Lopes et al., 2019; Ru et al., 2019). Many studies have identified ATT, SN and PBC as significant predictors of BI and incorporated the three predictors to study human behaviour (Kianpour et al., 2017). Cheon et al. (2012) defined ATT towards behaviour as personal feeling about the performing behaviour positively or negatively to represent "the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question" (Ajzen, 1991, P188). SN refers to the social pressure around us which may have an impact on our behavioural intention to perform or not to perform the behaviour (Ajzen, 1991; Kumar, 2019) and PBC refers to individual's perception of their capability on a certain behaviour (Ajzen, 1991; Lopes et al., 2019). According to the definitions of ATT, SN and PBC, which can be considered a comprehensive intrinsic attitude and perception. Furthermore, this study integrates "PL" as a mediating variable since it is considered the intrinsic attitude and perception perceived towards the work (Törhönen et al., 2019), which can help better understand the ATT and motivation of university teachers towards MOOCs. This study has covered the data from two countries of Chian and Spain, and Hofstede's cultural dimensions may significantly explain cross-cultural values (Khilf, 2016), which is taken as a moderator variable in the merged research model. **Fig.1** shows the merged research model.
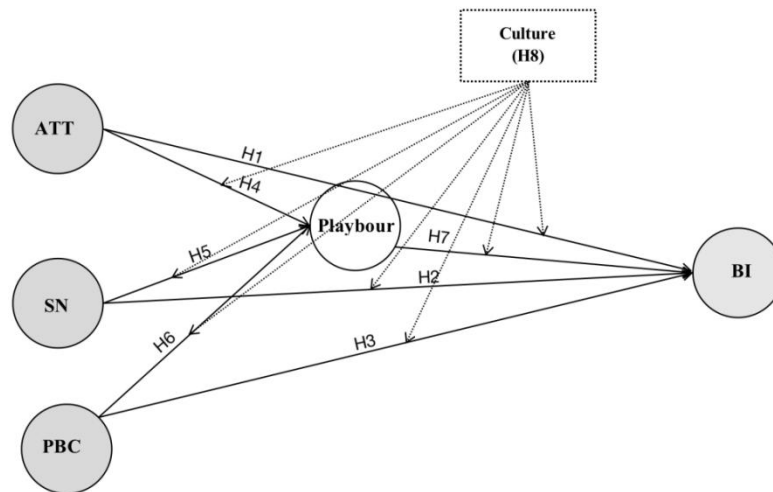
Fig.1. The proposed research model. The shaded circle constructs represent the variables of TPB. The non-shaded circle constructs represent the variables of Playbour. The non-shaded square construct represents the variable of Culture.

3.2.6 Hypothesized relationship

This study aims to explore the critical drives that impacts teachers' perception and BI towards MOOCs. Moreover, this study has investigated the potential differences in teachers' perception and behaviour moderated by culture between university teachers in China and Spain. Therefore, the first seven hypotheses are generated based on the statement above.

BI refers to one's willingness to perform a specific activity (Cristea & Gheorghiu, 2016), and ATT is considered the positive or negative propensity of individuals to respond to a certain action (Ajzen 1988,1991). In this study, ATT mainly refers to teachers' perceptions towards the usage of MOOCs. MOOCs have attracted a global audience, and many researchers have considered ATT as a crucial determinant for studying human behaviour in different fields (Kianpour et al., 2017; O'Reilly & Kumar, 2016). Moreover, numerous studies have shown that ATT is a crucial predictor of BI (Leonard et al., 2004; Raziuddin & Vaithuanathan, 2018), proving the positive effect on human behaviour (Wang et al., 2016; Zhang et al., 2012). In the current research, we propose the following first hypothesis:

H1: A teacher's attitude has a positive impact on behavioural intention.

Organisational behaviour theory stated that an individual's behavioural willingness is usually constrained by the external environment, and completely independent rational decision-making does not exist (Si et al., 2020). An individual is more likely to behave a manner like the important people around him/her (Khan et al., 2019); thus, the stronger SN perceived from influential people around, the greater likelihood to perform the behaviour (Si et al., 2020; Chen & Tung, 2014). The significant effect of SN on human behaviour has been proved as a critical predictor of intention (Chen & Tung, 2010; Lizin et al., 2017) when being taken into account to study human behaviour in different fields by many researchers (Poulter et al., 2008; Mayhew et al., 2009). Considering SN are proved as crucial determinants for explaining human behaviour and a positive connection between SN and BI, we propose the second hypothesis:

H2: A teacher's subjective norms positively impact behavioural intention.

Individual decision making is proved to associate with the individual's perceptions of their capability on certain behaviour and PBC, which is taken as the definition of PBC (Ajzen, 1991;

Lopes et al., 2019). It implies that the more confident they are in their capabilities or skills, the more willing and likely they are to perform a behaviour. Like ATT and SN, numerous studies have viewed PBC as an essential determinant and proved the significant relationship between PBC and human behaviour (Wan et al., 2014; Lizin et al., 2017). In MOOCs, when learners perceive they have confidence in abilities and learning skills, they are likely to perform the behaviour (Lung-guang, 2019). In this sense, our third hypothesis is:

H3: A teacher's perceived behavioural control positively impacts behavioural intention.

PL refers to a combination of play and labour considered playful, fun and leisure (Goggin, 2011) and is considered the intrinsic attitude and perception perceived toward the work (Törhönen et al., 2019). Concerning ATT is considered the positive or negative propensity of individuals to respond to a certain action or activity (Ajzen 1988,1991), which means after the action or activity, people may perceive and form the intrinsic attitude from the previous experience. Based on the literature review, few researchers have taken the relationship of attitude and PL into account while studying human behaviour; that is the reason why we suggest the fourth hypothesis:

H4: A teacher's attitude has a positive impact on Playbour.

Individuals are more likely to conform to people important to him/her, which indicates the stronger SN means a person may perceive feelings from the people important to him/her, the greater intrinsic perception can form differently to engage in a certain activity. As previously mentioned, PL is a combination of play and labour (Lund, 2015) and is considered the intrinsic attitude and perception aggregation towards an objective. The productive nature of labour may be the first feature of opposition between play and labour; the organisation of work is still the main structural daily activity based on organisation, hierarchy and control (Ferrer-Conill, 2018). As Fuchs (2015) argued, the very different understanding of the play as an agent and the labour as forced shows that labour is a human condition that cannot be fulfilled, which means people can be constrained and influenced by the people and working environment around. In this study, SN refers to the pressure and influence of university teachers when they perceive MOOCs, and thus the causal relationship between SN and PL can be proposed. However, according to the literature review, few researchers have proved the relationship between SN and PL. Therefore, we suggest the fifth hypothesis:

H5: A teacher's subjective norms have a positive impact on Playbour.

PBC, one of the three determinants which are based on a potential belief structure (Si et al., 2019), usually results in an advantageous or disadvantageous ATT in terms of a certain activity (Si et al., 2020), and it is a new construct that refers to the non-volitional part of behaviour introduced by Ajzen (1991). PL, as described, can be an aggregation of the perception and ATT towards a certain activity and argued as the ideological strategy of capital, which connects entertainment, creativity and autonomy with labour (Howcroft & Bergvall, 2019). It is based on the assumption that if people perceive work is associated with fun and leisure, then as the line between work and leisure becomes blurred, workers would be more inclined to innovate and increase productivity. Hence, in the MOOC context, if teachers perceive that they possess the ability and skills to work with MOOCs and consider MOOCs as fun and leisure-based work, teachers could be more willing to perform MOOCs volitionally instead of non-volitional acts. It is worth studying the causal relationship between PBC and PL since little research exists according to the literature review. In this research, we propose the sixth hypothesis:

H6: A teacher's perceived behavioural control positively impacts Playbour.

ATT, SN, and PBC can be considered intrinsic attitude and perception, resulting in human behaviour. In contrast, PL is considered the intrinsic attitude and perception perceived towards the work (Törhönen et al., 2019), linking entertainment, creativity and autonomy with labour. It assumes that if work is associated with fun, as the line between work and leisure becomes blurred, people would be more inclined to innovate and increase productivity. In the MOOC context, university teachers' ATT, SN, and PBC towards MOOCs may comprehensively affect university teachers' perception of MOOCs, whether it is leisure or not, and further influence university teachers' BI. In this sense, in this research, we propose the seventh hypothesis:

H7: Playbour has a positive impact on behavioural intention.

Research utilising numerous theoretical frameworks has found that workplace behaviour, attitudes and organisational outcomes are associated with national culture values (Kirkman et al., 2006). Hofstede's cultural dimension theory has established the main research tradition of cross-cultural psychology and has been used for reference by researchers and consultants in many fields such as business, management and education (Srite, 2006; Tarhini et al., 2015). In this study, further to the seven hypotheses proposed above, it follows that there may be differences between the university teachers in different cultural contexts due to Hofstede's cultural dimensions, which holds that culture may influence behavioural intention and research has suggested the Chinese and Spanish people possess very different perceptions of Hofstede cultural dimensions (Huang et al., 2019). Therefore, the eighth hypothesis in this research is:

H8: Culture moderates the relationships among teachers' attitude, subjective norms, perceived behavioural control, playbour and behavioural intention.

3.3 Methodology

3.3.1 Measurement instruments and questionnaire development

To test the eight research hypotheses, accurate and sufficient empirical data are crucial and essential. This study has adopted a questionnaire survey method to obtain the necessary data and focused on university teachers within different academic areas utilizing a five-point Liker scale anchored from "1: Strongly disagree" to "5: Strongly agree".

All the selected items for explaining the dimensions of Playbour, ATT, SN, PBC and BI were developed based on Törhönen et al. (2019), Ajzen (1991), Zhou (2016), Teo (2011), Wu (2019) and Lung-Guang (2019) as well as considering the question that what university teachers perceive MOOCs **(Table S4, See Appendix B)**. Concerning each theoretical construct and literature, four items are for PL, four are for ATT, four are for SN, three are for PBC, and three are for BI, respectively.

3.3.2 Data collection and demographic profile

Questionnaire contents are constructed and developed based on the proposed research model and previous research, except for the demographic questions. This questionnaire consists of basic information and a MOOC survey. Basic information refers to demographic questions mainly including gender, title, age, professional field, the number of MOOCs that have been enrolled, the number of MOOCs that have been completed, the number of MOOCs that have been integrated into residential courses and the hours spent on producing, distributing and promoting the MOOC contents. MOOC survey refers to the measurement of PL, ATT, SN, PBC and BI. Eighteen items are generated as independent variables and dependent variables.

The questionnaires are distributed through Google Forms and WJX in China and Spain,

respectively. With a specific objective, only university teachers who know MOOCs or have experience in working with MOOCs can answer the questionnaire. Considering the availability of resources, we selected two different contexts attending the Hofstede cultural dimensions. **Table 12** represents a nearly reverse position where we can consider further detecting the moderating effect of culture in terms of university teachers' perception and BI in the MOOC context.

Table 12. The values attained by China and Spain in Hofstede's Cultural dimensions[7]

Country	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long Term Orientation	Indulgence
Spain	57	51	42	86	48	44
China	80	20	66	30	87	24

All the questionnaires were recovered in universities and the criteria for university selection is based on whether the universities are famous and in the top rank in its country; whether the universities have online courses; whether the universities have set same or similar majors; whether the universities can grant bachelor, master and doctoral degrees; whether the size of the university is similar; whether the student-teacher ratio is normally distributed. Besides, the universities considered in this research should cover affluent disciplines: Arts and Humanity, Social Science and Law, Science, Technology Science. Additionally, considering match-pair of universities in China and Spain, 8 universities in China and 9 universities in Spain are selected because 6 out of 9 universities in Spain (Universitat Autònoma de Barcelona, Universitat de Barcelona, Universidad Rey Juan Carlos, Universidad de Oviedo, Universidad de Santiago de Compostela, Universidad de Alcalá) and 6 out of 8 universities in China (Tsinghua University, Southwest University of Political Science and Law, Shanghai Jiao Tong University, Fudan University, Nanjing University and Tongji University) are comprehensive public universities. 2 out of 9 universities in Spain (Universitat Politècnica de Catalunya BarcelonaTech, Universidad Politécnica de Cartagena) and Beihang University in China are featured as science and technology universities. Universitat Pompeu Fabra in Spain and Central University of Finance and Economics in China were selected because they are well-known in economics.

According to **Table S5 (See Appendix B)**, 1000 questionnaires were distributed to university teachers in China and Spain through Google Forum and WJX. 319 respondents replied to the email; 162 out of 319 are from China, and 157 out of 319 are from Spain. 84 out of 319, accounting for 26.3% of respondents, have experience in instructing MOOCs; 235, accounting for 73.7%, respondents know MOOCs without experience in instructing MOOCs. 52 out of 84 MOOC instructors are from China accounting for 61.9% (Male: 24/ 28.6% and Female: 28/ 33.3%), 32 out of 84 MOOC instructors are from Spain accounting for 38.1% (Male: 19/ 22.6% and Female: 13/ 15.5%). Regarding age, the minimum number is 23, the maximum number is 95, the mean is around 45.06, and the standard deviation is around 11.06, which presents that University teachers have known MOOCs of all ages.

Table S6 (See Appendix B) and **Table S7 (See Appendix B)** present among 319 university teachers, 76 (23.82%) are lectures, 105 (32.92%) are associate professors, 98 (30.72%) are professors, and 40 (12.54%) can be assistant lecturers and researchers. 79 (24.76%) are from the field of Arts and Humanities, 18 (5.64%) are from the field of Health Science, 38 (11.91%) are from the field of Science, 136 (42.63%) are from the field of Social Science, and Law and 48

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[7] Own elaboration based on Hofstede Insights:https://www.hofstede-insights.com/product/compare-countries/

(15.05%) are from the field of Technology Science. **Table S8 (See Appendix B)** and **Table S9 (See Appendix B)** present 158 out of 319 university teachers have been enrolled in a MOOC, and 161 have not. The sample's mean is 1.72, which indicates teachers would adopt MOOCs at least one MOOC to be enrolled but with a high drop-out rate as well. **Table S10 (See Appendix B)** shows that almost half of the university teachers have introduced MOOCs into their regular classroom courses. **Table S11 (See Appendix B)** and **Table S12 (See Appendix B)** present the hours on producing and instructing MOOCs of university teachers who are MOOC instructors currently. Moreover, the means are 2.24 hours per week on producing and 1.18 hours per week on instructing, which shows us university teachers would spend time working with MOOCs once they become instructors of a MOOC.

To analyse the possibility of non-response bias, this study has compared the number of questionnaires distributed with the number of completed research responses received: 1000 questionnaires were distributed to university teachers in China and Spain, respectively, through Google Forum. 162 and 157 are the numbers of completed research responses in China and Spain, presenting a 16.2% and 15.7% rate of non-refusal, respectively, which meets the acceptable range of 15%-20% mentioned by Menon et al. (1996). To further analyse the possible differences between the earlier and late respondents concerning those who answered the questionnaire first and those who answered after the first and second recall, the bivariate analysis is utilised, and **Table 13** shows there are no significant differences between earlier and late respondents in this study according to the values of the mean.

Table 13. Bivariate analysis

Group	Mean	Std. Dev.
Earlier respondents	3.1827957	0.9176496
Late respondents	3.1203008	1.0078299

3.3.3 Data analysis

SmartPLS (version 3) is utilized to analyze the retrieved empirical data and possesses the advantage of dealing with many independent variables simultaneously beyond the constrain of multicollinearity among the independent variables. The PLS approach effectively examines exploratory theories (Henseler et al., 2009), and PLS does not require a normal distribution of data and is appropriate for a small sample size (Fornell & Bookstein, 1982) compared with variance-covariance based SEM. To detect normality of data, the Shapiro-Wilk test (Vallasenor & Estrada, 2009) is applied for the data through Stata (version 14), and the results present most of the data are non-normal distributed since 10 of 18 P-values were smaller than 0.05 (**Table 14**). Thus, PLS path modelling is the appropriate approach for this paper, considering the results.

Table 14. Shapiro-Wilk Test of Normality

Variable	ATT 1	ATT 2	ATT 3	ATT 4
Prob>Z	0.23769	0.03174	0.01500	0.61916
SN 1	SN 2	SN 3	SN 4	PBC 1
0.03898	0.00065	0.33396	0.18813	0.00318
PBC 2	PBC 3	PL 1	PL 2	PL 3
0.00048	0.40271	0.00001	0.23054	0.00142
PL 4	BI 1	BI 2	BI 3	
0.00033	0.02173	0.00190	0.00230	

CFA and SEM, mainly PLS path modelling, were utilized for analyzing the obtained empirical data. To analyze convergent validity, the value and significance of factor loading, Cronbach's alpha, CR and AVE are adopted. To measure discriminant validity, two criteria are considered: AVE of each construct must be higher than their squared correlations with the other constructs (Fornell and Larcker, 1981), and the Heterotrait-Monotrait ratio. The bootstrapping method is implemented to examine the proposed research model and evaluate all the relationships between variables. Finally, the moderator effect of the culture will be analyzed through the implementation of MGA and MICOM is established and analyzed first.

3.4 The assessment of measurement model

3.4.1 Reliability assessment

Following the approach of other studies (Ifinedo, 2011; Alegre & Chiva, 2013), we must consider the common method bias issue. Harman test is first run through SPSS (version 26). If the explained variance of the first factor is obtained considering all the items are smaller than 50% then the analysis is free of measurement error. According to **Table 15**, the eigenvalue of the first factor in our case represents 35.749% of the variance, which is smaller than 50%.

Table 15. Common Method Bias Test

Total	% of Variance	Cumulative %
6.435	35.749	35.749

Concerning common method bias in PLS, the study of Mahmoud et al. (2021) and Kock (2015) recommended that if the values of inner VIF are more significant than 3.3, which means a model may be contaminated by common method bias. According to the results (**Table 16**), the proposed research model is free of common method bias since all the inner VIF values are great less than 3.3.

Table 16. Inner VIF Values

Construct	BI	PL
ATT	2.338	1.549
BI		
PBC	1.572	1.569
PL	1.708	
SN	1.990	1.988

Concerning content validity of the scales proposed for this paper, all the scales are developed on the relevant literature to assure the content validity of the measurement instrument (Cronbach, 1971). Boateng et al. (2018) proposed that evaluating experts for the scales is one of the approaches addressing the content validity. The scales adopted for this paper have been discussed with professional experts concerning how university teachers perceive MOOCs further to guarantee the content validity of the measurement instruments. Addressing ATT, we consider teachers' actual situation in their careers and expectations for MOOCs. Regarding SN, we consider the teaching requirements for teachers and the pressure around teachers towards MOOCs. Concerning PBC, we consider the feasibility of teachers when facing MOOCs. For PL, we considered and discussed the accurate perception perceived from MOOCs and for BI, we have consulted and discussed whether they would continue adopting MOOCs and what they expected from MOOCs in the future.

In spite of assessment of content validity, the reliability assessment of the measurement model is assessed through two aspects: (a) the values of Cronbach's alpha which is applied as an index for measuring the reliability of the internal consistency of a scale and 0.6 as the lowest acceptable threshold of the criterion for Cronbach's alpha ; (b) CR should be higher than 0.6 (Yang & Su, 2017; Cronbach, 1951; Nunnally & Bernstein, 1994). **Table 17** presents all the values of Cronbach's alpha are higher than 0.6, and the values of CR are higher than 0.8, which demonstrates the internal consistency of the proposed research model with a good reliability.

3.4.2 Validity assessment

The validity of the measurement model is assessed through convergence validity (factor loading and AVE) and discriminant validity (Gómez-Ramirez et al., 2019). Besides, AVE should be higher than 0.5 (Yang & Su, 2017; Chin, 1998; Chan et al., 2018). **Table 17** presents all the factor loadings are higher than 0.5 and the values of AVE are higher than 0.5, which indicates the research model with a good convergence validity. Referring to the Fornell and Larcker (1981) criteria, the values of the square roots of AVE are adopted to compare with the correlation coefficients among the potential constructs, and the value of the square roots of AVE must be higher than the values of all the potential constructs, instead of evaluating the square toot of the AVE, the correlation coefficients are calculated.

Table 17. Factor loading, Cronbach's alpha, CR, AVE of constructs

Construct	Item	Factor Loading	Cronbach's alpha	CR	AVE
ATT	ATT 1	0.605	0.671	0.800	0.503
	ATT 2	0.696			
	ATT 3	0.727			
	ATT 4	0.794			
BI	BI 1	0.816	0.874	0.924	0.802
	BI 2	0.931			
	BI 3	0.934			
PBC	PBC 1	0.892	0.715	0.846	0.654
	PBC 2	0.899			
	PBC 3	0.598			
PL	PL 1	0.789	0.824	0.882	0.651
	PL 2	0.799			
	PL 3	0.811			
	PL 4	0.828			
SN	SN 1	0.820	0.843	0.894	0.680
	SN 2	0.859			
	SN 3	0.757			
	SN 4	0.858			

Furthermore, the Heterotrait-Monotrait Ratio is proposed as a new assessment for justifying the discriminant validity, and the ratio must be less than 1 to pass the examination (Henseler et al., 2015; Gaskin et al., 2018).

Table 18 and **Table 19** present all the values of the square of roots of AVE are higher than the values of all potential constructs. Moreover, all the Heterotrait-Monotrait Ratio values are less than 1. The two results indicate an excellent discriminant validity of the measurement, and the

scales of this study is valid and reliable since all the constructs of this study are examined with good validity and reliability.

Table 18. Simple correlation matrix and discriminant validity

Construct	ATT	BI	PBC	PL	SN
ATT	0.709				
BI	0.649	0.896			
PBC	0.417	0.440	0.808		
PL	0.641	0.537	0.221	0.807	
SN	0.590	0.558	0.597	0.340	0.825

Table 19. Heterotrait-Monotrait Ratio

Construct	ATT	BI	PBC	PL	SN
ATT					
BI	0.836				
PBC	0.580	0.560			
PL	0.820	0.631	0.279		
SN	0.758	0.641	0.748	0.389	

3.5 Results

3.5.1 The structural model results

The R^2 values of each construct of the research model and the values of the Stone-Geisser test of predictive relevance (Q^2) (Geisser, 1975) are applied for assessing the predictive ability of the structural model in PLS. Falk and Miller (1992) proposed that the R^2 should be higher than 0.1, and Henseler et al. (2009) defined the value of Q^2 into 0.02, 0.15 and 0.35 as means small, medium and large effects. **Fig. 2** presents that the R^2 values of this research model are 0.414 and 0.508, and the Q^2 values are 0.251 and 0.397, respectively, which indicates the proposed structural model of this paper keeps a good model fit with tremendous predictive ability.
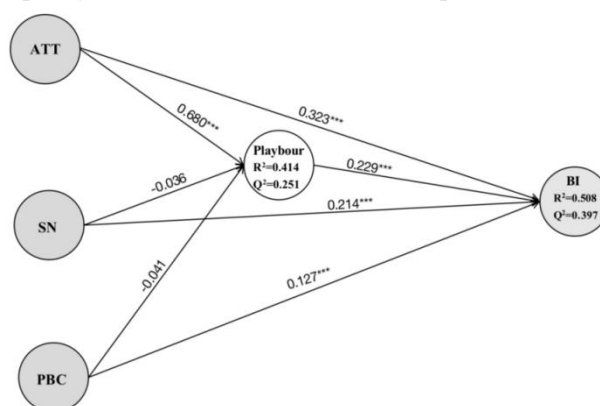
Fig. 2. Structural model PLS results

Simultaneously, **Fig. 2** and **Table 20** presents the verification results among the variables; all of the seven research hypotheses are examined, five out of seven are significantly supported, and two out of seven are not supported. Concerning the interpretation of the variation (R^2) between the constructs, ATT accounts for 68% of PL while SN and PBC are not statistically significant to PL. Regarding BI, ATT accounts for 32.3%, SN accounts for 21.4%, PBC only accounts for 12.7%, and PL accounts for 22.9%, respectively.

Table 20. The t-value of research hypotheses and path coefficients

No.	Research Hypotheses	Path Coefficients	t-value	P-value	Validated Result
H1	A teacher's attitude has a positive impact on the behavioral intention.	0.323	4.873	0.000***	Supported
H2	A teacher's subjective norms has a positive impact on the behavioral intention.	0.214	3.253	0.001***	Supported
H3	A teacher's perceived behavioral control has a positive impact on the behavioral intention.	0.127	2.339	0.020**	Supported
H4	A teacher's attitude has a positive impact on Playbour.	0.680	15.329	0.000***	Supported
H5	A teacher's subjective norms has a positive impact on Playbour.	-0.036	0.585	0.559	Not Supported
H6	A teacher's perceived behavioral control has a positive impact on Playbour.	-0.041	0.783	0.434	Not Supported
H7	Playbour has a positive impact on behavioral intention.	0.229	4.149	0.000***	Supported

*p<0.1;**p<0.05; ***p<0.01

3.5.2 The mediation test results

Despite the direct effects of ATT, SN and PBC on BI and following the practical steps of Baron and Kenny (1986), Malik et al. (2021) and Wong et al. (2021), the mediating role of PL in the relationships among ATT, SN, PBC and BI is investigated. **Table 21** shows, in particular, the significant indirect effect of ATT on BI mediated by PL is identified. Furthermore, the coefficient paths of SN and PBC to PL are not significant and the coefficient path of PL to BI is significant. Hence, the Sobel test is further conducted and the P-values show that PL does not mediate the relationships between SN and BI and PBC and BI, respectively.

Table 21. Results of mediation test

Independent variables	Mediator	Dependent variable	Path Coefficients	P-value	Result
ATT		BI	0.481	0.000***	Partial mediation
ATT		BI	0.323	0.000***	
ATT	(PL)	PL	0.680	0.000***	
PL		BI	0.229	0.000***	
SN		BI	0.201	0.002***	No mediation
SN		BI	0.214	0.001***	
SN	(PL)	PL	-0.036	0.559	
PL		BI	0.229	0.000***	
Sobel test: P-value: 0.82603254					
PBC		BI	0.125	0.014**	No mediation
PBC		BI	0.127	0.020**	
PBC	(PL)	PL	-0.041	0.434	
PL		BI	0.229	0.000***	
Sobel test: P-value: 0.88949915					

**p<0.05; ***p<0.01

3.5.3 The cultural dimension (MGA)

In order to test the moderating effect of culture in the model, the 319 university teachers participating in the survey are divided into university teachers in Spain (Group 1) and university teachers in China (Group 2) according to their nationality. The nationality is treated as a dichotomous variable respectively to explore further the impact of cultural variables on university teachers' perception of MOOCs to understand how university teachers with different cultural backgrounds would make decisions towards MOOCs. As the two samples are in two different groups with extreme cultural contrast accordingly, assumptions of measurement invariance are necessary to be verified first before testing the relationship between the constructs (Tarhini et al., 2015; Sinkovics et al., 2016), which eliminates the possibility that the observed differences would be caused by errors in the measurement model (Rialp et al., 2018). Thus, MICOM is established to verify the measurement invariance as recommended by Hair et al. (2012), through which the configurational invariance, the compositional invariance and the scalar invariance (the equality of composite means and variances) can be analyzed (Sinkovics et al., 2016). **Table 22** presents that all the items are invariant since all the P-values are not statistically significant. **Table 23** shows the compositional invariance and composite equality results, which proves a partial invariance of the measurement instrument because the equality of composite means has not been verified. Nevertheless, the moderating effect of culture on teachers' ATT, SN, PBC, PL, and BI can be evaluated (Muthen & Christoffersson, 1981; Byrne, 2006; Rialp et al., 2018). Based on this, the moderating effect can be evaluated, and it is necessary to conduct a multi-group analysis (Sinkovics et al., 2016).

Table 22. Configural invariance

Factor	Out Loading	P-value
ATT 1 ← ATT	0.112	0.394
ATT 2 ← ATT	0.158	0.091
ATT 3 ← ATT	0.004	0.982
ATT 4 ← ATT	0.042	0.413
BI 1← BI	0.042	0.473
BI 2← BI	0.003	0.878
BI 3← BI	0.000	0.973
PBC 1← PBC	0.107	0.663
PBC 2← PBC	0.014	0.649
PBC 3← PBC	0.057	0.804
PL 1← PL	0.101	0.156
PL 2← PL	0.033	0.602
PL 3← PL	0.075	0.231
PL 4← PL	0.046	0.371
SN 1← SN	0.020	0.803
SN 2← SN	0.003	0.951
SN 3← SN	0.082	0.380
SN 4← SN	0.041	0.291

*p<0.1;**p<0.05; ***p<0.01

Table 23. Compositional invariance and Composite equality

Factor	Compositional invariance		Equal mean		Equal variance		Composite equality
	Original Correlation	Permutation p-values	Original difference	Permutation p-values	Original difference	Permutation p-values	Measurement invariance
ATT	0.991	0.066	-0.733	0.000	-0.088	0.684	Partial
BI	1.000	0.778	-0.360	0.002	0.299	0.118	Partial
PBC	0.993	0.410	-0.637	0.000	0.156	0.252	Partial
PL	0.994	0.064	-0.338	0.000	0.049	0.788	Partial
SN	1.000	0.968	-1.119	0.000	0.155	0.278	Partial

*p<0.1;**p<0.05; ***p<0.01

Table 24 presents the verification of the relationship between the constructs and the results of the hypotheses further developed on the moderating effect of culture. Generally, PBC positively impacts BI in Group 1 and Group 2 respectively and the MGA results support H8 (the moderating effect of culture) since H3 is statistically significant supported. Besides, the results show that SN can positively impact BI in Group 1 and Group 2 respectively and the MGA results present that H2 can be accepted at a 90% confidence level.

Addressing the groups moderated by culture, the path coefficients of groups show the differences between Chinese teachers and Spanish teachers. Regarding the group of SN to BI, the path coefficient of Spanish 0.19 is higher than the path coefficient of China, which means the BI of Spanish teachers is more likely affected by SN than Chinese teachers. Concerning the group of PBC to BI, in terms of a single side of a Spanish teacher, the causal relationship between PBC and BI is not positively supported. However, the causal relationship between PBC and BI is positively verified regarding Chinese teachers. Additionally, the path coefficient of China is statistically higher than the path coefficient of Spain, which means the BI of Chinese teachers can be likely to be influenced by PBC compared with Spanish teachers. Regards the groups of ATT to BI, ATT to PL, SN to PL, PBC to PL, PL to BI, the path coefficients of these compared groups are almost identical, which means there are no potential differences moderated by culture among these groups.

Table 24. Causal hypotheses testing and multi-group comparison test results for culture

No.	Path	Group1 (Spain)		Group2 (China)		Path coefficients difference	P-value
		Path coefficients	P-value (bootstrap)	Path coefficients	P-value (bootstrap)	(PLS-MGA)	(PLS-MGA)
H1	ATT→BI	0.347	0.000***	0.327	0.000***	0.020	0.853
H2	SN→BI	0.349	0.001***	0.159	0.041**	0.190	0.075*
H3	PBC→BI	0.013	0.017**	0.271	0.000***	-0.259	0.004***
H4	ATT→PL	0.646	0.000***	0.653	0.000***	0.006	0.947
H5	SN→PL	-0.036	0.570	0.018	0.851	-0.054	0.683
H6	PBC→PL	-0.046	0.447	0.018	0.805	-0.064	0.618
H7	PL→BI	0.178	0.000***	0.233	0.000***	-0.055	0.589

*p<0.1;**p<0.05; ***p<0.01

3.6 Discussion and conclusion

3.6.1 Discussion

This research model is conducted on TPB, integrating playbour as a mediating variable and considering culture as a moderator variable. This study aims to understand the perception and behaviour intention of university teachers towards MOOCs and explore the critical drives that impact teachers' behaviour to work with a MOOC. Furthermore, addressing the perspective of culture, this paper has explored how university teachers with different cultural backgrounds perceive MOOCs and discussed the role of culture in the process towards MOOCs.

The empirical results show that attitude, subjective norms and perceived behavioural control are crucial determinants of explaining the behaviour intention of university teachers. Attitude accounts for 32.3% of behaviour intention, which indicates teachers' attitude can be seen as a most critical drive towards MOOCs. Blackmon (2016) discussed the motivations of MOOC instructors and the perceived usefulness of MOOCs could be the prominent point related to teachers' general perceptions and attitude towards MOOCs. Besides, the studies of Wong (2016) and Scherer et al. (2015) also identified perceived usefulness is an essential indicator to explain behaviour intention. Additionally, Teo et al. (2019) detected that subjective norms are effective in forming teaching willingness through ICT and this study has confirmed that subjective norms accounting 21.4% of BI also significantly impacts university teachers' behaviour intention towards MOOCs, which is also aligned to the study of Tseng et al. (2022) that identified social influence as a main determinant to impact teachers to adopt MOOCs. In addition to attitude and subjective norms, perceived behavioural control accounts for 12.7% of behaviour intention and Koukis et al. (2019) mentioned the adoption of MOOCs helps teachers to participate in collaborating writing and connecting new teaching practices, which makes teachers confident and have the opportunity to actively participate in MOOCs to apply new pedagogical approaches and evaluate their achievement.

As the mediating effect of playbour towards attitude is statistically proved, this study allows us to stand out the vital role which accounts for 22.9% of behaviour intention and has a great significance for explaining university teachers' intrinsic attitude in terms of working with MOOCs. Furthermore, this study also indicates that attitude perceived through previous experience on MOOCs has a significant effect in accounting for 68% of playbour. However, the mediating effects of playbour towards subjective norms and perceived behavioural control are not significant. This could be explained by the years of teaching service of teachers, which could means teachers with shorter years or longer years of teaching service have different perceptions towards new educational technology (Teo, 2014). Another reason for the nonsignificant effects is the sample composition. Using MOOCs to teach is similar to utilitarian task rather than hedonic task and teachers use MOOCs to increase personal reputation and help them to achieve tenure (Hew & Cheung, 2014). Most of the sample consisted of associate professor and full professor (63.64%) and they do not have the social pressure on MOOCs.

Additionally, this study has also detected and confirmed the moderating effect of culture on teachers' perceived behavioural control and subjective norms in different cultural contexts. Addressing Spanish teachers who are more likely affected by subjective norms than Chinese teachers means the social relationship and pressure around them are more likely to drive Spanish teachers to form behaviour intention toward MOOCs. Whereas Chinese teachers are more concerned about whether they can perform MOOCs, and once they consider they possess the

ability to take MOOCs, they will form the behaviour intention.

3.6.2 Conclusion

Attitude, subjective norms and perceived behavioural control are found statistically positive as crucial determinants toward MOOCs. According to the literature of playbour and TPB, few researchers consider playbour as a mediating variable, which sheds light on incorporating playbour in the proposed research model and exploring the mediating effect. The model's validity and model fit have been confirmed and the positive relationship between the attitude and playbour is also proved, which further enriches the field of TPB. To overcome the limitation of culture to some extent, this study has collected data from both China and Spain simultaneously. The findings show that culture has a tremendous moderating effect in explaining university teachers' subjective norms and perceived behavioural control towards the behaviour intention of MOOCs.

In terms of managerial implication, the findings of this paper are of great significance for higher education administrators because attitude, subjective norms and perceived behavioural control are positively confirmed, which suggests addressing behaviour intention of working with MOOCs, teachers can be affected by their previous attitude towards MOOCs. To better promote the MOOC movement among university teachers, the administrators should carry out more training on MOOCs for university teachers to further strengthen the skills for working with MOOCs and teachers' perception of MOOCs to constitute further playbour. Additionally, administrators should utilize the advantages of MOOCs to allow teachers to benefit from them and further realize the advantages and conveniences of using MOOCs while considering MOOCs as an innovative teaching way.

Regarding culture, administrators should pay close attention to and, given the findings of this study, regarding Spanish teachers who are more likely to be affected by subjective norms. To better attract more Spanish university teachers to engage the MOOC team and improve the perception towards MOOCs, administrators can integrate the relevant content of MOOCs in the teaching outline and encourage teachers to adopt MOOCs and apply them to traditional classroom-based courses actively. It is well acknowledged that MOOCs can overcome geographical restrictions, teachers could be allowed not to attend classes in especially locations to perceive the advantages of MOOCs better while working with MOOCs. Regarding the side of Chinese teachers, they are much more likely affected by perceived behavioural control, and as such, to better encourage teachers to perform MOOCs, the administrators should provide teachers adequate support to reduce the negative side of perceived behavioural control.

3.7 Contributions, limitations and future research directions

This study has investigated culture could moderate Spanish and Chinese university teachers' perception and behaviour intention towards MOOCs. This study contributes to TPB and playbour literature by offering empirical evidence on how culture affects teachers, perception and behaviour intention towards MOOCs, and detecting the differences between Spanish and Chinese teachers. This study also provides further evidence of the impact of culture on people's perceptions and decision-making. It suggests researchers could consider playbour as a mediating factor and culture as a moderating factor when conducting research related to TPB.

First, this study did not integrate cultural variables into the proposed research model and was conducted only if Hofstede's findings (2001; 2011) were valid. Further studies can be conducted on exploring the potential moderators through incorporating cultural variables into the framework to verify the cultural differences and other potential influences such as national characteristics.

Second, due to the data capacity limitation, the questionnaire was only answered by university teachers both in Spain and China who know well about MOOCs or have experience in instructing MOOCs, which only provides us with a small population. Besides, the findings of this study could not be generalized due to the convenience sampling. Furthermore, according to the descriptive analysis, only 26.3% of university teachers in Spain and China have instructed MOOCs, which allows shedding light upon the studies on how to improve university teachers' willingness on producing and instructing MOOCs.

Chapter 4

4 Undergraduates' perception towards MOOCs : Moderating role of culture

4.1 Introduction

MOOCs have become one of the most conspicuous trends in HE, with millions of registered learners and numerous courses produced worldwide (Christensen et al., 2013; Baturay, 2015). With the advancement in ICT, learners can participate in MOOCs and obtain certifications without time and space barriers (Abeer & Miri, 2014; Aldowah et al., 2019; Bhagat et al., 2019). Additionally, with COVID-19 pushing education institutions into online purposely temporary substitutes, new learning practices are providing the conditions for the popularisation of MOOCs. The functionality and usefulness of MOOCs have increased ICT awareness among learners (Lung-Guang, 2019), and also in instructors, who are expected to gradually incorporate educational value into the online learning environment (Gilfoil & Focht, 2015). Furthermore, many online contents are designed as complementary resources to regular face-to-face classroom courses (Zhang, 2016; Annabi & Wilkins, 2016), also to satisfy more diverse learning objectives of participants (Bayeck, 2016; Radford et al., 2015; Macleod et al., 2015; Sun et al., 2019).

As the acceptance of MOOCs grows, the phenomenon has not only placed students in a broader context of open, online, and global education (Lung-Guang, 2019) but also affects teachers and education institutions (Yepes-Baldo et al., 2016). Research has shown that although MOOCs have been widely accepted as an educational innovation assisting in the evolution of the flipped classroom (Byerly, 2012; Kamat et al., 2013), researchers have paid little attention to what student needs from MOOCs (Zheng et al., 2015). In addition, motivation has been considered a critical element associated with various learning consequences, impacting the learning process in education (Chen & Jang, 2010). Previous studies primarily focus on the role of demographic and psychological factors in learners' acceptance, such as gender, culture, personal innovativeness and self-efficacy (Mohammadi, 2015; Zhou, 2016; Fianu et al., 2018; Hsu et al., 2018). Yet potential factors that affect learners' acceptance of MOOCs are not well identified regarding their experience and continuous use of a technical system (Tao et al., 2019). Similarly to Tao et al. (2019), this study aims to fill the research gap and further provide MOOC designers and managers with grounded guidance on promoting learners' acceptance. PU and PEOU have been proved crucial determinants that impact individual BI towards new technology (Tao et al., 2019; Chen & Lin, 2018). A considerable number of variables remain unexplained, which notably include the possible connections of psychosocial factors to technology perception, thus providing a research gap for this study. Besides, coordinated by regional or central governments (Eva & Perez-Esparrells, 2019), the Spanish higher education system is relatively less marketised than many other European countries (Jayadeva et al., 2021). In an education system designed to be on-site and synchronous, MOOCs promise playing an innovating and disruptive role.

In light of this, TAM (Davis, 1989) and TPB (Ajzen, 1991) are employed as an incorporated framework for exploring the factors impacting students' acceptance of MOOCs. TAM can account for as high as 30%-50% of human behaviour (Holden & Karsh, 2010; ŠUmak et al., 2011). Thus, we consider TAM for measuring learners' experiences towards technical systems due to the advantage of robustness and high predictive power towards information systems (Tao et al., 2019). On the other hand, TPB is accepted as one of the best social psychological theories, emphasising the psychological aspects of human behaviour (Han et al., 2010; Chung et al., 2018). Therefore,

we consider TPB for measuring the psychological aspects of students and further explore the factors that impact the acceptance intention of MOOCs. Besides, previous studies demonstrate that TAM and TPB are complementary, advocating an incorporated model rather than using them alone, particularly when IT usage is envisaged (Glavee-Geo et al., 2017). Since this study focuses on students' behaviour towards MOOCs, which is an instance of acceptance of innovative technology in the education domain integrated with IT system and personal characteristics, an incorporated model of TAM and TPB is proposed.

4.2 Literature review and hypotheses

4.2.1 Student engagement in MOOCs

Weinhardt and Sitzmann (2019) defined MOOCs as an instructional approach for providing learners opportunities to reach online courses freely worldwide. With the advancement in ICT, online courses present another way to deliver educational content to learners, connecting instructors and learners across some common topics (Lung-Guang, 2019). Furthermore, the MOOC phenomenon extended the sphere scope of HEIs geographically. They become the leading suppliers of MOOCs, use a variety of pedagogies, and offer diverse subjects for learners worldwide (Alraimi et al., 2015).

The reviews of previous research show relevant studies mainly focus on six categories: certificate earner (Xu & Yang, 2016), dropout (Gregori et al., 2018), scores prediction (Moreno-Marcos et al. 2018), forum posts classification (Bonafini et al. 2017), the relevance of content (Li & Baker, 2018) and student behaviour (Lung-Guang, 2019). In addition, learners' motivation towards MOOCs should be the relevant perspective underlying the studies. Zhang (2016) argued, "various difficulties face the MOOC revolution, but how to motivate students to learn from MOOCs and how to increase their engagement are the key challenges to both teachers and platforms." Focusing on this perspective, researchers conducted studies from different perspectives to understand the connection between motivation and students' behaviour and further propose appropriate solutions. Zhang (2016) designed an experiment based on the regulatory focus theory, and the results showed proper matching significantly increased students' motivation to engage in a MOOC. They perceived MOOCs as helpfulness but not enjoyment. Lung-Guang (2019) incorporated self-regulated learning and TPB as a research framework to investigate students' conduct from a cognitive perspective. The results showed that self-efficacy, goal setting and task interest are substantial factors in forming planned behaviour for engaging in a MOOC. Zhou (2016) and Sun et al. (2019) explained students' engagement in MOOCs from self-determination through an incorporated research model. The results showed that students' autonomy should be a crucial determinant of intrinsic motivation, increasing students' psychological engagement in MOOCs. Whereas most of the previous studies primarily focus on psychosocial factors, few are concerned about the effective design and implementation of online learning, which is closely related to learners' experience and continuous usage of a technical system (Tao et al., 2019). To fill this research gap, Tao et al. (2019) considered the framework of TAM to explore factors affecting students' acceptance regarding interface design, content quality and emotional arousal. The results showed PU, PEOU, and perceived enjoyment are crucial factors affecting students' behaviour, but a considerable percentage of variables remain unexplained, and users' perception of technology could change when affected by psychosocial factors, which provides a research gap for this study. Ospina-Delgado et al. (2021) examined the perceptions of students and graduates concerning International Financial Reporting Standards via

a MOOC and three main factors were identified: perceived utility, design and disadvantages.

4.2.2 Hofstede's cultural dimensions theory

Culture is considered as a crucial factor that can influence an individual's perception and decision making (Huang et al., 2019), and it has been widely studied in the academic field (Srite, 2006), but little research has been conducted to connect culture to new technology adoption (Teo & Huang, 2018). To detect a cultural effect on students' perception and BI, Hofstede's cultural dimension theory is utilized widely in the academic fields of business, management, education and so forth (Srite, 2006; Tarhini et al., 2015). Although different methods of measuring cultural change have emerged (Schwartz, 1994; Trompenaars, 1993; House et al., 2004), these approaches have not yet reached the level of influence of the Hofstede framework, which enables researchers to quantify cultural differences between countries. Hence, the most common way of measuring cultural distance is based on the difference in Hofstede's cultural dimensions scores between countries (Beugelsdijk et al., 2015). Hofstede (1980) first collected data from 72 countries from 1967 to 1973 to constitute the cultural framework and initially identified four aspects of national culture:1) Individualism/collectivism, which expresses the extent to which society treats people as individuals taking care of themselves (high individualism) or mainly as a close-knit community member (low individualism); 2) Power distance, which reflects the degree to which people in a society expect and accept the uneven distribution of power; 3) Uncertainty avoidance, which measures the comfort level of social members in unstructured situations (a culture of high uncertainty avoidance is characterized by a strong need for predictability and control of the environment); 4) Masculinity/femininity, reflecting the society's emphasis on caring for others, unity and quality of life (femininity), as opposed to achievement and success (masculinity). Later, the fifth and sixth dimensions were added: long-term orientation and indulgence and restraint. Their scores are based on the World Value Survey (WVS) items and data. Cultures that score high in the long-term orientation tend to be future-oriented and accept delayed satisfaction of material and social needs (this culture is characterized by solid perseverance and frugality). In contrast, the short-term orientation relates to more traditions and social obligations (Hofstede & Minkow, 2010).

Regarding the criticism of the Hofstede framework, many researchers advocate that Hofstede's cultural dimension framework should be discarded as Hofstede's country/region scores seem to be outdated. It was found that the score in Individualism and Indulgence versus Restraint has increased averagely, while the power distance has decreased (Beugelsdijk et al., 2015). It is worth mentioning that these changes did not change the relative position of countries to each other. Therefore, despite changes in values, the relative positions and differences between countries are stable, and the results of these authors imply that Hofstede's global strategic cultural research should not be abandoned just because Hofstede's country score seems outdated.

4.2.3 TPB

TPB (Ajzen, 1991) was proposed to predict human behaviour and has been considered as one of the most preeminent theories among social cognition theories associating with three determinants of ATT, SN and PBC as well as positing the causal relationship between individual's BI and actual behaviour. Among the three critical determinants of TPB, ATT refers to an individual assesses the particular behaviour positively or negatively (Moon, 2021); SN refers to the perceived social pressure that may have an impact on an individual's BI towards a specific activity (Ajzen, 1991; Taing & Chang, 2021); PBC refers to an individual's perception of own

capacity to perform and engage in a given activity (Hagger et al., 2021). TPB has been widely applied into different research domains by researchers to study human behaviour (Si et al., 2020), such as transportation (Hossain et al., 2019), tourism (Han et al., 2010), communication (McBride et al., 2020), e-commerce activity (Trung et al., 2020), psychology (Liu et al., 2020) and finance (Taing & Chang, 2021).

To highly improve the predictive power of the research model and thus to overcome the limitation of TPB in a particular social context, many researchers have added new variables into TPB. Verma and Chandra (2018) applied TPB with two additional constructs of moral reflectiveness and conscientiousness to predict customers' intention to visit green hotels. Taing and Chang (2021) added demographics as control variables to investigate the tax compliance intention of citizens. Du and Pan (2021) added "personal moral norm" as a new variable to investigate and identify crucial indicators of energy-saving behaviours. Moon (2021) integrated TPB with two additional variables, past behaviour and dining frequency, and two moderators of gender and age, to predict the intention of customers to visit green restaurants. Yang and Wu (2021) replaced SN with the descriptive norm and injunctive norm to how health information on social media influences Chinese people's perspectives. Regarding MOOCs' behaviour, Lung-Guang (2019) studied students' behaviour and decision-making to engage in a MOOC through an emerged theoretical model of TPB and SRL.

4.2.4 TAM

TAM proposed by Davis (1989) and developed on TRA (Fishbein & Ajzen, 1980) has been widely applied in different academic contexts as a ground theory to predict an individual's willingness and intention to adopt a specific technology (Teo & Dai, 2019). PU and PEOU are two constructs related to ATT since PU and PEOU are posited as the determinants of technology usage as PU refers to an individual's perception towards a particular technology that can improve the performance on his or her jobs. In contrast, PEOU refers to a belief that an individual can manage a particular technology free of effort (Davis, 1980). Jang et al. (2021) employed an extended TAM with three new constructs of technological pedagogical and content knowledge, social norms and motivational support to predict teachers' willingness to introduce new technologies of Augmented Reality and Virtual reality for instruction. Yang et al. (2021) proposed an extended TAM with three new constructs of drivers' sense of direction, navigation application affinity and distraction perception to explore the factors influencing drivers' intention to use mobile navigation applications. Addressing the perspective of e-learning, TAM has been considered a preeminent theory to interpret behaviour (ŠUmak et al., 2011). Unal and Uzun (2021) connected the constructs of SN and Output quality to the construct of PU. They connected the constructs of Perceptions of external control, Perceived enjoyment, Technological complexity and Self-efficacy to the construct of PEOU to identify the factors that influence students' intention to use Edmodo. In a blended learning situation, Francom and Nuatomue (2011) utilized TAM to compare Google classroom with D2L Brightspace. Alfadda and Mahdi (2021) examined how gender and experience might influence students' reactions and adoption of Zoom application in language learning.

4.2.5 Incorporated theoretical framework

TAM and TPB are two theories that possess and develop from the same fundamental theory TRA. They are viewed as the two most critical ground theories in explaining individual behaviour towards information technology and system adoption, such as MOOCs (Song et al., 2017; Zhang

et al., 2017; Abdullah & Ward, 2016; Lung-Guang, 2019). In addition, previous studies demonstrated that the models of TAM and TPB are complementary, and the results show the incorporated model has better exploratory power than using TAM or TPB alone in terms of IT usage (Glavee-Geo et al., 2017). When adopting new technology, individual behaviour could be strongly affected by psychosocial factors and people exceptionally closed to the individual (Lee & Wan, 2010). However, TAM mainly emphasizes the design of systems and improves the efficiency of employees further and does not involve other factors that could impact users' attitudes towards new technology (Rauniar et al., 2014). Besides, the roles of customers' confidence and ability are critical to be considered and involved regarding new technology acceptance (Ramadan et al., 2017). This paper also focuses on the psychological aspects of students towards MOOCs simultaneously. Hence, TPB was involved along with TAM for the development of the research model.

Previous studies found PU and PEOU are essential indicators of online course acceptance (Selim, 2003; Sun et al., 2008; Yang & Su, 2017) and the perception of results has been confirmed as a crucial factor that impact attitude (Wang et al., 2011). Thus, we consider the attitude a mediating variable between learners' experience towards new technology and BI in this study. Furthermore, a growing body of researchers focused on integrating the two theories as a comprehensive framework to study behaviour towards IT usage and e-service acceptance and found the evidence for the incorporated model (Glavee-Geo et al., 2017; Yang & Su, 2017; Wang et al., 2020; Choe et al., 2021). Thus, based on the support of previous empirical studies, we proposed TAM and TPB as an incorporated research model for this study and **Fig. 3** shows the conceptual model, including seven constructs that explain the causal relationships among PU, PEOU, ATT, SN, PBC and BI, as well as the moderating effect of culture.
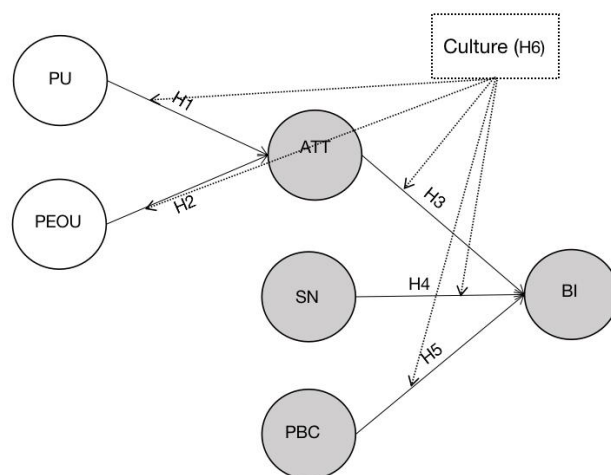
Fig.3. The proposed research model. The shaded constructs represent the variables of TPB. The non-shaded constructs represent the variables of TAM. The non-shaded square construct represents the variable of Culture.

4.2.6 Hypotheses

Rooting the incorporated theoretical model of TAM and TPB allows us to perceive better how students respond to the adoption of MOOCs and explore the factors of culture that may moderate and influence their perception and behavioural intention towards MOOCs in different cultural contexts. Therefore, we propose the six hypotheses as follow:

PU is one of the crucial variables of TAM, which is defined as the perception that an individual keeps towards a particular activity that would enhance his/ her job performance (Davis,

1989). ATT refers to an individual's feeling towards performing a particular behaviour (Fishnein & Ajzen, 1980). Furthermore, in TAM, PU is posited to predict ATT and the findings of Unal and Uzun (2021) demonstrated that PU has a positive effect on ATT. Wong et al. (2021) stated that PU significantly affects an individual's ATT towards using personal protective equipment. Hence, in this research, the hypotheses are proposed as follows:

H1: A learner's perceived usefulness positively impacts the attitude towards using MOOCs.

PEOU is another crucial variable of TAM and is defined as the perception of whether an individual would charge a particular technology free of effort (Davis, 1989). Moreover, numerous researchers have confirmed that PEOU keeps a significant effect on ATT. Alfadda and Mahdi (2021) found that PEOU has a significant and positive effect on students' ATT towards computer use. Hence, in this research, the hypotheses are proposed as follows:

H2: A learner's perceived ease of use positively impacts the attitude towards using MOOCs.

ATT, SN and PBC are three crucial variables of TPB and are posited to predict BI (Verma & Chandra, 2018; Trung et al., 2020; Liu et al., 2020; McBride et al., 2020; Du & Pan, 2021; Taing & Chang, 2021). ATT refers to an individual who assesses the specific behaviour positively or negatively (Moon, 2021); Du and Pan (2021) confirmed ATT has a positive influence on the intention of energy-saving behaviour and MOON (2021) also confirmed ATT has a significant impact on intention to visit green restaurants. Hence, in this research, the hypotheses are proposed as follows:

H3: A learner's attitude towards using MOOCs positively impacts behavioural intention.

SN refers to the perceived social pressure that may impact an individual's BI towards a particular activity (Ajzen, 1991; Taing & Chang, 2021). Hagger et al. (2021) found that SN keeps a positive impact on BI and Luang-Guang (2019) verified the significant relationship between SN and BI to adopt MOOCs for students. Hence, in this research, the hypotheses are proposed as follows:

H4: A learner's subjective norm positively impacts behavioural intention.

PBC refers to an individual's perception of their capacity to perform and engage in a given activity (Hagger et al., 2021). Si et al. (2020), in their paper, revealed the significant impact on users' sustainable usage intention caused by PBC, and Ru et al. (2019) addressed the perspective of environmental matter and found PBC could influence young people's intention to reduce PM2.5. Hence, in this research, the hypotheses are proposed as follows:

H5: A learner's perceived behavioural control positively impacts behavioural intention.

Researchers have applied Hofstede's cultural dimensions in a variety of empirical studies associated with national culture values (Kirkman et al., 2006; Tarhini et al., 2015), and the authors hypothesise that national culture could affect human behaviour as culture is defined as the collective programming of the mind which distinguishes a group of people from others (Hofstede, 2011). Tarhini et al. (2015) studied the differences in intention to use educational Simple Syndication between Lebanese and British students based on Hofstede's cultural dimensions and hypothesised culture moderates the student's behaviour. As such, in this study, further to the five hypotheses proposed above, it follows that there may be potential differences between students in different cultural contexts.

H6: Culture moderates the relationships among learners' perceived usefulness, ease of use, attitude, subjective norms, perceived behavioural control and behavioural intention.

4.3 Methodology

4.3.1 Measurement instruments

This study considers an approach of a questionnaire survey to collect the requested data, and the content of the questionnaire is constructed into two parts. Part 1 is for the demographic information that includes gender, age, number of MOOC diplomas, academic field, academic year, parent's educational background and whether taking part-time job; part 2 is for MOOC survey that includes the items of PU, PEOU, ATT, SN, PBC and BI. Five-point Liker scale from "1: Strongly disagree" to "5: Strongly agree" was adopted to process the questionnaire items for undergraduates with different academic backgrounds. All the items for measuring and explaining the constructs of PU, PEOU, ATT, SN, PBC and BI are based on extant literature and suggestions of experts on how students perceive MOOCs **(Table S13, See Appendix C)**. Hence, nineteen items are proposed: four items for ATT, three items for PU, three items for PEOU, three items for SN and three items for PBC and three items for BI accordingly.

4.3.2 Data collection and demographic profile

The questionnaires were distributed in Spain and China, with the specific objective only for undergraduates. Considering the availability of resources, two different contexts were selected referring to the Hofstede cultural dimensions, and **Table 25** shows an extreme reverse position in which this study could consider the moderating effect of culture regarding undergraduates in the MOOC context.

Table 25. The vales attained by China and Spain in Hofstede's Cultural dimensions[8]

Country	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Long Term Orientation	Indulgence
Spain	57	51	42	86	48	44
China	80	20	66	30	87	24

The criteria for selecting Chinese and Spanish universities are based on: whether the universities set similar majors; whether the universities can grant bachelor, master and doctoral degrees; the similarity of university size; the similarity of student-teacher ratio. Hence, the universities selected are well-known to the public covering affluent disciplines and experiences in online courses.

Regarding the Spanish students, the questionnaires were distributed in Universitat Autònoma de Barcelona, Universitat de Barcelona and Universitat Politècnica de Catalunya BarcelonaTech in Barcelona following convenience sampling (Taherdoost, 2016). The participants were voluntary, and when those students who have experience in MOOCs showed interest, we provided them with a detailed explanation of the research objective. A total of 300 questionnaires were distributed, and 260 questionnaires were retrieved. After excluding the incomplete questionnaires, 245 out of 300 qualified questionnaires were obtained. Regarding the Chinese side, the questionnaires were distributed to the students who have experience in MOOCs through WJX, an online questionnaire platform, to the undergraduates in Fudan University, Zhejiang University, China University of Petroleum and Capital Normal University. 1000 students are expected to participate in the online survey. Finally, 525 responses were retrieved after excluding the incomplete questionnaires, and a

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totally of 525 out of 1000 qualified questionnaires were obtained.

The distribution ratio of Spain and China in the data is reasonable since the current population of Spain is 46,770,949, and the current population of China is 1,444,282,054[9], which presents the total population of China is nearly 30 times higher than the total population of Spain. According to **Table S14**, **Table S19** and **Table S20 (See Appendix C)**, a total of 770 students have answered the questionnaire. Among them, 245 are from Spain, and 525 are from China. Regarding gender, 322 out of 770 are males, and 448 out of 770 are females, and the gender distribution ratios of Spain and China in the data are acceptable as the recent reports of Spain and China respectively show among the undergraduates from 2020-2021 in Spain, females accounted for 55.6% and males accounted for 44.4%[10] while among the undergraduate in 2020 in China, females accounted for 52.04%, and males accounted for 47.96%[11]. Addressing the Spanish side, 89 out of 245 are males accounting for 36.32, and 156 out of 245 are females accounting for 63.68%. Addressing the Chinese side, 233 out of 525 are males accounting for 44.38%, 292 are females accounting for 55.62%. Among them, the first-year students are 248, accounting for 32.21%, the second-year students are 174, accounting for 22.6%, the third-year students are 192, accounting for 24.92% and the fourth year students are 156, accounting for 20.26%. Students from Arts and Humanity are 323 accounting for 41.95% and students from Health Science are 76 accounting for 9.87%, students from Science are 89 accounting for 11.56%, students from Social Science and Law are 205 accounting for 26.62%, and students from Technology science are 77 accounting for 10%. **Table S15 (See Appendix C)** shows the scale of students' ages from 17 to 38, and most of the students fall between 18 and 22, accounting for 88.06%. According to **Table S16** and **Table S17 (See Appendix C)**, the educational background of mothers who hold bachelor's or above is 317 accounting for 41.17%, and fathers who hold a bachelor degree and above are 332, accounting for 43.12%. Regarding the educational background of parents in Spain, mothers and fathers who have the degree of bachelor and above are 119 (48.57%) and 115 (46.94%) respectively while addressing the educational background of parents in China, mothers and fathers who have the degree of bachelor and above are 203 (38.66%) and 217 (41.33%) respectively. **Table S18 (See Appendix C)** shows that 76.23% of the students do not have certificates of MOOCs and 23.77% of students have certificates at least one, and the most significant number of certificates is 28. Regarding part-time jobs **(Table S21, See Appendix C)**, 341 students have part-time jobs accounting for 44.29%, and 429 are free of part-time jobs accounting for 55.71%.

To analyze the possibility of non-response bias, we compare the number of questionnaires distributed with the number of responses retrieved to generate an appropriate estimation of active refusals. Concerning the data collection in Spain, 300 students participated in the questionnaire survey, and after excluding the incomplete questionnaires, a total of 245 out of 300 qualified questionnaires were obtained, which presents a 62.7% rate of non-refusal. As for data collection in China, 1000 students are expected to participate in the online questionnaire survey, and 525 responses were retrieved after excluding the incomplete questionnaires; 525 out of 1000 qualified questionnaires were obtained, which presents a 52.5% rate of non-refusal. Furthermore, the two results both satisfy and overcome the range of 15-20% stated by Menon et al. (1996). Likewise, to further analyze the possible differences between earlier and late respondents concerning those who

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[9] Own elaboration based on worldometer: https://www.worldometers.info/world-population/population-by-country/

[10] Own elaboration based on datos y cifras del sistema universitario español. Publicación 2020-2021:
https://www.universidades.gob.es/portal/site/universidades/menuitem.21ef60083f296675105f2c10026041a0/?vgnextoid=9b09b8b26dec7710VgnVCM100000
1d04140aRCRD&vgnextchannel=b93dd58bc3350710VgnVCM1000002006140aRCRD

[11] Own elaboration based on wutongguo: https://www.wutongguo.com/report/223.html

answered first the questionnaire and answered after the first or second re-call, the bivariate analysis was conducted, and **Table 26** shows there is no significant difference between the earlier and late respondents in this study regarding the similar mean values in the two groups.

Table 26. Bivariate analysis

Group	Mean	Sta. Dev.
Early respondents	3.7345538	0.91271377
Late respondents	3.6306306	1.00835

4.3.3 Data analysis

SmartPLS (version 3) is utilised to analyse the obtained data holding the advantage of dealing with numerous independent variables simultaneously beyond the limitation of multicollinearity issues among the data (Lung-Guang, 2019). Factor loading, Cronbach's alpha, CR, and AVE are employed to examine the convergent validity, and the measurement model and MGA are utilised to detect the moderating effect of culture. CFA and SEM, particularly PLS, are utilised to analyse the convergent and discriminant validity of the measurement model; to examine the proposed theoretical research model and assess the relationship among the constructs using the bootstrapping approach to evaluate all the proposed hypotheses whether positively supported or not. Compared with the variance-covariance based structural equation modelling, PLS-SEM is effective in evaluating exploratory theories (Henseler et al., 2009) and a normal distribution of data is not necessary and even can handled well with small sample sizes (Fornell & Bookstein, 1982). The Shapiro-Wilk test is widely utilised to verify the normality of data (Villasenor & Estrada, 2009). The results in **Table 27** evaluated by the Shapiro-Wilk test show the data are not narmally distributed since the P-value of most variables is less than 0.05. Thus PLS is considered the most appropriate method for this study.

Table 27. Shapiro-Wilk Test of Normality

Variable	ATT 1	ATT 2	ATT 3	ATT 4
Prob>Z	0.00001	0.00001	1.00000	0.00002
SN 1	SN 2	SN 3	PBC 1	PBC 2
0.01524	0.00015	0.01650	0.00801	0.00002
PBC 3	PU 1	PU 2	PU 3	PEOU 1
0.02097	0.00000	0.00000	0.00045	0.00000
PEOU 2	PEOU 3	BI 1	BI 2	BI 3
0.00006	0.00002	0.00009	0.00227	0.00068

4.4 The assessment of measurement model

4.4.1 Reliability assessment

Following the method of other studies (Ifinedo, 2011; Alegre & Chiva, 2013), the common method bias issue should be stressed in PLS-SEM. To deal with it, Harman's single factor test was run through SPSS (version 26), and the eigenvalue of the first factor presents 46.619% of the variance **(Table 28)**, and the value is smaller than 50%, which shows there is no common method bias in this study and the analysis is free of measurement error (Hair & WC, 1998).

Table 28. Common Method Bias Test

Total	% of Variance	Cumulative %

13.053	46.619	46.619

Regarding the content validity of the scales for this study, the scales are selected based on the relevant literature to assure the validity of the measurement instrument (Cronbach, 1971). Additionally, one of the practical approaches is to assess the content validity through professional experts (Boateng et al., 2018), and all the scales considered in this study have been discussed and evaluated by professional experts concerning the question of how students perceive MOOCs further to assure the content validity of the measurement instrument.

In spite of assessment of content validity, the reliability assessment model is assessed through two aspects: (a) Cronbach's alpha is considered an indicator for measuring the reliability of the internal consistency of a scale (Oviedo & Campo-Arias, 2005) and the acceptable threshold should be higher than 0.6 (Cronbach, 1951; Nunnally & Bernstein, 1994); (b) the values of CR that should be higher 0.6 (Fornell & Larcker, 1981; Bagozzi & Yi, 1988). **Table 29** presents that all values of Cronbach's alpha are higher than 0.7, and CR of the constructs are higher than 0.917, which indicates the internal consistency of the proposed research model with a good reliability.

Table 29. Factor loading, Cronbach's alpha, CR, AVE of constructs

Construct	Item	Factor Loading	Cronbach's alpha	CR	AVE
ATT	ATT 1	0.798	0.852	0.900	0.693
	ATT 2	0.860			
	ATT 3	0.838			
	ATT 4	0.834			
BI	BI 1	0.872	0.865	0.917	0.787
	BI 2	0.902			
	BI 3	0.877			
PBC	PBC 1	0.816	0.757	0.861	0.673
	PBC 2	0.807			
	PBC 3	0.837			
PEOU	PEOU 1	0.885	0.846	0.907	0.764
	PEOU 2	0.882			
	PEOU 3	0.856			
PU	PU 1	0.845	0.735	0.850	0.656
	PU 2	0.861			
	PU 3	0.716			
SN	SN 1	0.858	0.820	0.892	0.735
	SN 2	0.871			
	SN 3	0.842			

4.4.2 Validity assessment

The validity of the measurement model is assessed through convergence validity (factor loading and AVE) and discriminant validity (Gómez-Ramirez et al., 2019). Besides, the factor loading that should be significant and higher than 0.5 as the lowest threshold and AVE should be higher than 0.5 (Yang & Su, 2017; Chin, 1998; Chan et al., 2018). **Table 29** presents that most of the factor loadings are higher than 0.8 except ATT1 (0.798) and PU3 (0.716), and the highest value is 0.902, which indicates the model is reliable when all items' factor loading is higher than 0.6, and the AVE is more significant than 0.6, and the highest value is 0.787 indicating the

measurement model has an excellent convergence validity. In addition, it is essential to establish discriminant validity to ensure that the results are definite and there are no statistical differences in the results (Henseler et al., 2015), and the discriminant validity refers to each construct must be different from other constructs (Hair et al., 2014; Gómez-Ramirez et al., 2019). Adopting the correlation coefficient between the square root of AVE and all possible constructs to compare, the value of the square root of AVE must be stronger than the value of all possible constructs to show that there is discriminant validity in the measurement. According to **Table 30**, all the values of the square of roots of AVE are more robust than the values of all the potential constructs, which indicates an excellent discriminant validity of the measurement.

Table 30. Simple correlation matrix and discriminant validity

Construct	ATT	BI	PBC	PEOU	PU	SN
ATT	0.833					
BI	0.578	0.887				
PBC	0.643	0.665	0.820			
PEOU	0.690	0.605	0.707	0.874		
PU	0.787	0.553	0.624	0.706	0.810	
SN	0.514	0.476	0.481	0.472	0.522	0.857

Additionally, the Heterotrait-Monotrait Ratio is proposed as additional criteria for evaluating the discriminant validity, and the values of HTMT must be less than 1 to assure the discriminant validity of data (Henseler et al., 2015; Gaskin et al., 2018) and **Table 31** shows the values are less than 1.00, which further assures the excellent discriminant validity of the measurement.

Table 31. Heterotrait-Monotrait Ratio

Construct	ATT	BI	PBC	PEOU	PU	SN
ATT						
BI	0.673					
PBC	0.801	0.820				
PEOU	0.811	0.707	0.885			
PU	0.991	0.704	0.852	0.915		
SN	0.610	0.559	0.603	0.564	0.671	

4.5 Results

4.5.1 The structural model results

The predictive ability of the structural model can be assessed through R^2 value of each endogenous construct that should be higher than 0.1 (Falk & Miller, 1992) and the Stone-Geisser test of predictive relevance (Q^2) (Geisser, 1975), whose values are divided into 0.02, 0.15 and 0.35 as small, medium and large effects respectively (Henseler et al., 2009). The values of R^2 of this study are 0.655 and 0.496, respectively. The values of Q^2 are 0.45 and 0.387, respectively according to **Fig. 4**, which indicates the structural model of this paper has a great predictive ability. Additionally, **Fig.4** presents the results of PLS and the relationship of variables verified by bootstrapping.
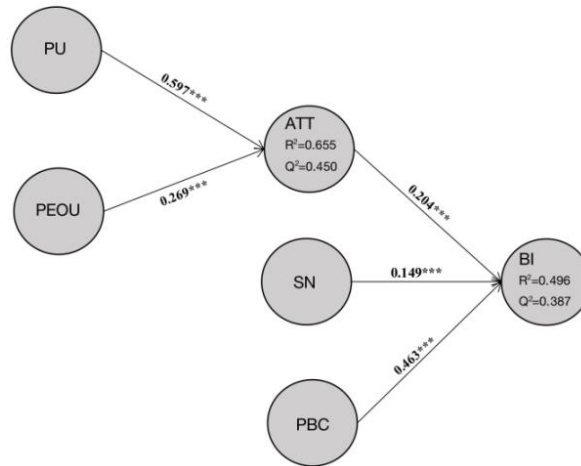
Fig. 4. Structural model PLS results

Table 32 shows the verification results among the constructs and all of the five research hypotheses are positively supported. And the path coefficients are from 0.149 to 0.597. Regarding the variation (R^2) between the constructs, the R^2 of ATT associated with PU and PEOU equals 0.655, and the R^2 of BI connected with ATT, SN and PBC equals 0.496. The structural model in **Fig.4** also indicates 59.7% of ATT is affected by PU, 26.9% of ATT is affected by PEOU, 20.4% of BI is affected by ATT, 14.9% of BI is affected by SN, and 46.3% of BI is affected by PBC respectively.

Table 32. The t-value of research hypotheses and path coefficients

No.	Research Hypotheses	Path Coefficients	t-value	P-value	Validated Result
H1	A learner's perceived usefulness has a positive impact on the attitude towards using MOOCs.	0.597	14.760	0.000***	Supported
H2	A learner's perceived ease of use has a positive impact on the attitude towards using MOOCs.	0.269	6.780	0.000***	Supported
H3	A learner's attitude towards using MOOCs has a positive impact on the behavioral intention.	0.204	4.961	0.000***	Supported
H4	A learner's subjective norm has a positive impact on the behavioral intention.	0.149	3.953	0.000***	Supported
H5	A learner's perceived behavioral control has a positive impact on the behavioral intention.	0.463	11.819	0.000***	Supported
					**p<0.05; ***p<0.01

4.5.2 The cultural dimension (MGA)

In order to test the moderating effect of culture in the model, the 770 students participated in the survey divided into Spanish students (Group 1) and Chinese students (Group 2) according to their nationality. Moreover, nationality is treated as a dichotomous variable to detect further the moderating effect of culture on students' perception and BI to understand how students with different cultural backgrounds would make decisions towards MOOCs.

Before proceeding to MGA to determine the moderating effect of culture, MICOM has to be first established to assess the measurement invariance (Hair et al., 2017; Tarhini et al., 2015; Sinkovics et al., 2016) to eliminate the possibility that the observed difference is caused by an

error in the measurement model (Rialp et al., 2018). The configurational invariance, the compositional invariance and the scalar invariance (the equality of composite means and variances) can be analyzed through the MICOM procedure (Sinkovics et al., 2016). Following the approach of Sinkovics et al. (2016) and Moon (2021), the MICOM procedure comprises three steps: (1) configural invariance, (2) compositional invariance, (3) the equality of composite mean values and variances. Working with SmartPLS allows us to avoid the necessity to build configuration invariance since the data processing and algorithm settings used for the groups are identical in PLS models, the configuration invariance (Step 1) has been established (Moon, 2021). For verifying the compositional invariance (Step 2), the SmartPLS Permutation procedure was utilized, and the results for culture presented in **Table 33** shows the compositional invariance is established. As the requirements for configuration invariance and compositional invariance of the three-step MICOM procedure have been met, a partial measurement invariance can be established, which allows us to proceed with MGA (Sinkovics et al., 2016; Moon, 2021). Based on this, the moderating effect of culture can be evaluated through MGA.

Table 33. Configural invariance and Compositional invariance

Factor	Configural invariance	Compositional invariance			Measurement invariance
		Original Correlation	Permutation p-values	Compositional invariance?	
ATT	Yes	1.000	0.138	Yes	Partial
BI	Yes	1.000	0.092	Yes	Partial
PBC	Yes	1.000	0.912	Yes	Partial
PEOU	Yes	1.000	0.274	Yes	Partial
PU	Yes	1.000	0.566	Yes	Partial
SN	Yes	0.999	0.480	Yes	Partial

Table 34 presents the verification of the relationship between the constructs and the results of the hypotheses further developed on the moderating effect of culture. Generally, PU, ATT and PBC can positively impact BI in Group 1 and Group 2 respectively and the MGA results support H6 (the moderating effect of culture) as the p-values of H1, H3, and H5 are statistically significant support. Besides, the results show PEOU positively impacts BI in Group 1 and Group 2 respectively and the MGA results present that H2 can be accepted at a 90% confidence level.

Table 34. Causal hypotheses testing and multi-group comparison test results for culture

No.	Path	Group1 (Spain)		Group2 (China)		Path coefficients difference (PLS-MGA)	P-value (PLS-MGA)
		Path coefficients	P-value (bootstrap)	Path coefficients	P-value (bootstrap)		
H1	PU→ATT	0.362	0.000***	0.670	0.000***	-0.308	0.000***
H2	PEOU→ATT	0.365	0.000***	0.223	0.000***	0.142	0.096*
H3	ATT→BI	0.322	0.000***	0.110	0.022**	0.212	0.014**
H4	SN→BI	0.148	0.014**	0.151	0.003***	-0.003	0.971
H5	PBC→BI	0.223	0.000***	0.594	0.000***	-0.371	0.000***

*p<0.1;**p<0.05; ***p<0.01

4.6 Discussion and conclusion

4.6.1 Discussion

This paper aims to understand the perception of university undergraduate students and behaviour intention towards MOOCs. The two classical theories of TAM and TPB are utilized and emerged as a proposed research model positively supported by the empirical data. Perceived usefulness and perceived ease of use are statistically effective in influencing and explaining the intrinsic attitude towards MOOC as perceived usefulness and perceived ease of use account for 59.7% and 26.9% of attitude accordingly carrying a high value of R^2 (0.655), which indicates the functionality of technology can well impact students' intrinsic attitude and perception. Besides, attitude as a mediating variable is confirmed to mediate the relationship among the perceived usefulness, perceived ease of use and behaviour intention since attitude positively accounts for 20.4% of behaviour intention. Compared with attitude, subjective norms accounting for 14.9% and perceived behavioural control accounting for 46.3% are also positively confirmed to influence behaviour intention towards MOOCs. Although attitude and subjective norms are statistically confirmed to influence students' behaviour intention towards MOOCs, perceived behavioural control as a non-volitional part of behaviour takes up most of the proposition among the constructs, which means students are more likely to construct their behaviour intention based on their actual conditions.

The differences observed between the two groups allow us to interpret culture's moderating effect on Spanish and Chinese students regarding perceived usefulness, perceived ease of use, attitude, subjective norms, perceived behavioural control and behaviour intention. Addressing the path coefficients of the groups of perceived usefulness to attitude, the path coefficient of China is 0.308 higher than the path coefficient of Spain, which means perceived usefulness more likely influences Chinese students' attitudes. Addressing the path coefficients of the groups of perceived ease of use to attitude, the path coefficient of Spain is 0.142 higher than the path coefficient of China, which means Spanish students' attitude are slightly more susceptible to perceived ease of use. Furthermore, concerning the groups of attitude to behaviour intention, the path coefficient of Spanish students is 0.212 higher than Chinese students, which means the Spanish students' behaviour intention are more likely affected by attitude. For the groups of perceived behavioural control to behaviour intention, the path coefficient of Chinese students are 0.371 higher than the path coefficient of Spanish students, which means perceived behavioural control has more direct influences on Chinese students. Regarding the groups of subjective norms to behaviour intention, the path coefficients of the two groups are almost identical, which means subjective norms has almost the same influence on behaviour intention of Chinese students and Spanish students. In this regard, there is no difference between the two groups.

4.6.2 Conclusion

Regarding the theoretical implication, this study has explored students' perception of MOOCs and the factors that may affect their intuitive perception, thus further affecting their BI towards MOOCs. This research has confirmed the incorporated theoretical research model of TAM and TPB, which is in accord with precious studies (Choe et al., 2021; Obaid, 2021; Yang & Su, 2017; Wang et al., 2020). Moreover, this study further contributes to the TAM-TPB framework literature by providing empirical evidence of two countries. Perceived usefulness and perceived ease of use are confirmed to significantly impact students' attitude, forming their perception of the new education technology, which is consistent with the studies of Yang and Su

(2017) and Wang et al. (2020). In this study, although attitude is verified as a positive mediator, perceived behavioural control is confirmed much stronger than attitude and subjective norms in terms of the impact on behaviour intention, which means students would perceive the ability of themselves first before performing MOOCs. Additionally, the moderating effect of culture has been confirmed between Spanish students and Chinese students, which contributes to the cross-culture research filed.

Concerning the managerial implications, the findings of this paper are of significant importance to MOOC suppliers as the causal relationships among perceived usefulness, perceived ease of use, attitude, subjective norms and perceived behavioural control are positively confirmed. Students have perceived the functionality and benefits of MOOCs, and perceived behavioural control is much more significant than attitude and subjective norms. Maheshwari (2021) explored the factors affecting students' intentions towards online learning and found perceived enjoyment of students could be affected by ICT infrastructure, internet speed and access to the internet, which is similar to the finding that technology is a crucial factor for e-learning adoption (Vanitha & Alathur, 2021). Rivera-Vargas et al. (2021) also demonstrated that students have important concerns regarding the functional support towards online-learning. Thus, MOOC suppliers should explore more multi-functional and convenient approaches to optimize the operating and learning system for students to overcome the learning constraints to some extent to attract and active students to participate in MOOCs and occupy a share in the education market further.

The effect of culture should be stressed by MOOC suppliers as MOOCs are open for learners all around the world, and given the findings of this study, for the aspect of Spanish students, the easiness of performing MOOCs is of great concern to them to form a plausible perception towards MOOCs and further to form the BI towards MOOCs. As such, MOOC suppliers should further cultivate the technical support for MOOC users to perceive MOOCs more conveniently and free of effort to perform MOOCs. Differing from the Spanish side, Chinese students concern more about the usefulness of MOOCs, which is consistent with the findings of Jiang et al. (2021). Therefore, MOOC suppliers should enrich the MOOC contents and introduce more MOOC channels to fulfil the diversity of learning groups. Furthermore, the instructors should be encouraged to use videos, audio, and instant messages to generate student feedback (Maheshwari, 2021). Most importantly, seeking the opportunities to cooperate with prestigious HEIs and involving more outstanding teachers to develop and improve the quality of MOOCs are necessary and inevitable for MOOC suppliers.

4.7 Contributions, limitations and future research directions

Regarding the limitations of this study, firstly, due to the limitation of data collection, this study only involves undergraduate students in Spain and China, which may impact the research results. Hence, the follow-up research can consider including students with different academic years to enrich the scale of the research groups. Second, attitude is confirmed as a desirable mediator in this study but makes less impact on the behaviour intention than perceived behavioural control. Hence, the follow-up research can consider how to improve the students' attitude to engage in MOOCs in education and psychology to motivate students better to enrol in MOOCs. Third, the approach for collecting data should be modified by future researchers as this study used two approaches of convenience sampling and online questionnaires to collect data which may cause a particular impact on the results. Besides, the findings of this thesis could not generalized because of the convenience sampling.

Chapter 5

5. General conclusion

5.1 Conclusion

As discussed above, in the growing market of MOOCs, MOOCs have significantly impacted the three stakeholders of HEIs, teachers and students. Besides, MOOCs appear as an innovative product of HEIs to satisfy diverse objectives of the public and simultaneously create and enhance the competitive advantages among rivals in the marketplace. After reviewing the existing profound literature, most studies focus on students' behaviour and motivation to explain the phenomenon of high dropout in MOOCs. Whereas only a few studies related to teachers' behaviour and perception towards MOOCs and little literature provides empirical evidence about the potential interest relationship between MOOCs and HEIs addressing HEIs' strategical management. Therefore, the primary goals of this thesis are to identify the potential determinants that lead HEIs to succeed in MOOCs, explore the factors that impact teachers' perception of MOOCs and the factors that impact students' BI towards MOOCs. In general, this thesis can be split into two sides: the supply side, including HEIs and teachers, and the demand side, which is mainly related to students. By proposing hypotheses derived from existing literature and conducting statistical analyses for the empirical data, we have discovered some inspiring evidence that could contribute to the research field and implications related to MOOCs.

This study has fulfilled the the four research objectives proposed in Chapter 1 and the main findings of this research can be divided into three perspectives associated with HEIs, teachers and students. Firstly, addressing HEIs, two determinants are identified to impact HEIs to produce MOOCs, which are size and proximity. Secondly, concerning teachers' side, ATT, SN and PBC are found as essential determinants impacting teachers to work with MOOCs. Besides, PL is confirmed as a significant mediator in the research model. Thirdly, regarding the students' side, PU and PEOU are proven as positive variables affecting students' attitude. Besides, SN and PBC are also confirmed as significant variables to impact students' BI towards MOOCs. Fourthly, concerning the cultural backgrounds of teachers and students, the potential difference caused by culture has been detected in the perspectives of teachers and students.

Regarding Chapter 2, the perspective of HEIs: the educational institution is a type of organisation differing in the initial missions and faces intensifying competition in the marketplace under the globalisation process. Therefore, MOOCs have been considered an innovative tool to aid the evolution of the HE system (Byerly, 2012) and a vital advantageous strategy for designing university profiles and curriculum portfolios in the modern competitive university marketplace (Gore, 2013). Numerous universities have utilised MOOCs as an approach for worldwide outreach to expand their educational domains (Annabi & Wilkins, 2016; Shapiro et al., 2017). This thesis takes 51 universities from China as the research objectives, and according to Table 5 in Chapter 2, the mean value of the numbers of MOOCs produced is 79.6, and the maximum is 340, which reveals the reality that universities have assimilated MOOCs as part of development portfolio. As aforementioned, little empirical evidence has been conducted on HEIs' strategical management of MOOCs and identifying the underlying determinants of MOOC success. Therefore, this thesis is the first attempt to collect indicators affecting MOOC production in HEIs regarding strategic management based on the RBV.

By conducting EFA, OLS, and Tobit regression, two significant determinants are identified:

size and proximity to the political centre. The findings are in accord with the existing literature of RBV focusing on the resources which are variable, rare, inimitable and non-substitutable of an organisation to determine the strategic resources an organisation can use to achieve its sustainable and competitive advantage (Bromiley & Rau, 2016). HEIs bear the role of conducting research and delivering the knowledge to the public. Moreover, knowledge is difficult to replicate in the information society due to its uniqueness and is a critical resource for a university to compete in the fierce educational marketplace. As discussed in Chapter 2, size effectively impacts the relationship between supply chain integration and sustainable performance. For HEIs, size is considered an essential resource for operating and delivering instruction and programs. Besides, knowledge-based outputs are exceptionally produced and developed based on the knowledge available to the organisations (Adams & Lamont, 2003); the uniqueness of the knowledge should be created and maintained to ensure MOOCs' innovation is flourishing. Tranfield et al. (2004) stated that creating new knowledge would consume diverse resources, which further stresses the importance of the size when HEIs consider MOOCs a part of market strategy among rivals. In this respect, size is robust determinant to support the HEIs to operate MOOCs' production. Those HEIs with larger size can result in more competitive advantages in producing MOOCs to ensure their market advantages among rivals further.

Additionally, proximity has been well documented related to organisational outcomes, for instance, knowledge creation (Boschma 2005; Catalini, 2018). Catalini (2018) stated that organisations should make a strategical scenario by optimising space based on the opportunities concerning spatial allocation. This thesis finds HEIs closer to the political centre produced fewer MOOCs than those farther away, demonstrating MOOCs have been utilised as strategic resources to replenish the educational equality and the uneven distribution of educational resources caused by proximity.

Regarding Chapter 3, the perspective of teachers: teachers are the main force for producing MOOCs. With the advancement in ICT, the work environment has been significantly impacted, giving teachers the ability to incorporate work into their free time (Törhönen et al., 2019). More studies focus on the digitalisation of the work environment, and researchers noticed that not all teachers prefer integrating ICT into teaching practice (Kozma, 2003; Kreijns et al., 2013). However, only a little literature has been explored regarding teachers' perception of MOOCs, and this thesis has replenished the research gap by integrating the new merging conception of "playbour" into TPB. The findings show ATT, SN and PBC are statistically confirmed crucial determinants that impact teachers' BI to work with MOOCs directly, which is consistent with previous studies employing TPB (Wang et al., 2016; Lizin et al., 2017; Lung-guang, 2019; Si et al., 2020). The finding also presents the empirical evidence for PL acting the role of mediator as ATT is partial mediated by PL.

As discussed in the literature, attitude refers to an overall evaluation positively or negatively for performing a specific activity (Ajzen, 1991; Ru et al., 2019), subjective norms refers to the social pressure around us that may impact our BI (Ajzen, 1991; Kumar, 2019) and perceived behavioural control refers to individual's perception of their capability on a certain behaviour (Ajzen, 1991; Lopes et al., 2019). Playbour refers to a combination of play and labour associated with the capitalist mode or value of production (Lund, 2015) and organisation, considered playful, fun, and leisure (Goggin, 2011). Besides, Playbour is considered the intrinsic attitude towards the work that may significantly impact working efficacy and productivity (Törhönen et al., 2019). The

findings show that only attitude is effective in forming Playbour of teachers and further significantly influences the BI of teachers through Playbour indirectly, which shows the intrinsic attitude acting as perception collections is mainly influenced and constructed by self-perception in the social environment. Therefore, teachers' attitudes perceived towards MOOCs are crucial for establishing a positive intrinsic attitude and simultaneously, the intrinsic attitude would result in BI for working with MOOCs.

Regarding Chapter 4, the perspective of students: MOOCs are designed for worldwide learners with diverse backgrounds. However, this thesis only focuses on undergraduates of university. Students are the primary beneficiary interest in the MOOC movement where HEIs and teachers design and supply numerous online courses addressing students' demands. Moreover, the existing literature has achieved abundant fruits related to students' MOOC behaviour (Kaplan & Haenlein, 2016; Zhou, 2016; Lung-guang, 2019; Tao et al., 2019; Sun et al., 2019; Wang et al., 2019). This thesis has adopted the framework of incorporated TAM and TPB as the research model, where TAM is for measuring students' experience in MOOCs and TPB is measuring the psychosocial factors of students.

Researchers demonstrated that experience plays a crucial role in explaining e-learning acceptance (Al-alak & Alnawas, 2011). Related research shows computer-related experience significantly affects students' BI to use various e-learning technologies or systems (Purnomo & Lee, 2013). Furthermore, individuals with higher ICT related experience are more likely to form favourable perceptions towards the PU and PEOU of an e-learning system (Lee & Lehto, 2013). In this regard, PU and PEOU are confirmed as significant indicators and consistent with previous research explaining the acceptance of technology and forming the intrinsic attitude towards using MOOCs (Tao et al., 2019; Salimon et al., 2021). Especially, PEOU, compared with PU, is a stronger predictor of ATT in this study, which is precisely opposite to the findings of Yang and Su (2017) and Okazaki and Renda (2012). In other words, PEOU is a relatively effective indicator in influencing students' ATT towards MOOCs, and when students can process the system and navigate the platform without much effort and time, a positive intrinsic attitude would be established. In addition to PU and PEOU, the finding of ATT is consistent with Yang and Su (2017), which indicates the previous perception has been confirmed as a crucial factor that impacts attitude (Wang et al., 2011). Namely, ATT are collections of students' perceived experiences and further influence students' BI towards MOOCs, which means a more positive attitude results in stronger BI and motivates students to continue with MOOCs. Furthermore, SN and PBC are found to significantly impact students' BI towards MOOCs. SN is not stronger than ATT and PBC in accounting for BI, which is in accord with the study of Wang et al. (2020). However, SN is still found to have a positive effect on BI, which means students observe and perceive the learning of their friends, classmates, peers or family members in MOOCs, they will have a stronger BI to perform MOOCs. In addition to ATT and SN, PBC positively affects students' BI towards MOOCs, which is in accord with the study of Luang-Guang (2019). In other words, when students perceive themselves with more confidence to perform MOOCs, their BI will become more positive (Yang and Su, 2017).

Regarding the moderating role of culture, we know that MOOCs are burned for the world, and cultural fusion is inevitable. Therefore, Chapter 3 and Chapter 4 have considered the role of culture as a moderator and further detect the potential differences in human behaviour caused by culture. As mentioned, many academic studies have emphasised the role of culture and detected

the potential difference in human behaviour (Beugelsdijk et al., 2017; Huang & Crotts, 2019; Rojo et al., 2020; Shao et al., 2020; Guritno et al., 2020; Vollero et al. 2020). This thesis also verifies the potential difference caused by culture, addressing the context of MOOCs.

Concerning the teachers' side, Chinese teachers are more influenced by PBC, which means once they perceive they possess the ability to work with MOOCs confidently, they will form the BI towards MOOCs. Whereas Spanish teachers are more likely affected by SN, the social relationship and pressure around them are more likely to drive them to form BI toward MOOCs. Concerning the students' side, Spanish students are more likely influenced by PEOU, while Chinese students are more susceptible to PU regarding ATT. Addressing BI, Spanish students are more likely affected by ATT, while PBC more likely influences Chinese students. Additionally, SN has been verified almost the same effect on Chinese and Spanish students, which means there is no difference between the two groups in terms of cultural effect.

5.2 Implications

As mentioned earlier, the findings of this thesis have important implications for theoretical discussion and managerial implications. The thesis contributes to the theory development as it is essential to understand the underlying determinants behind MOOCs' success in HEIs and the factors that impact teachers' and students' behaviour intention towards MOOCs. In addition, the cultural dimension has also been investigated empirically. Alongside this, the thesis provides comprehensive recommendations for managerial implications in the future in terms of taking practical steps for operating MOOCs. The theoretical and managerial implications are summarised in the following sections.

5.2.1 Theoretical implications

Regarding the theoretical implications, this thesis in Chapter 2 sets out an understanding of underlying essential determinants that lead HEIs into success. This Chapter is established on the RBV that has been employed in studying the crucial internal resources of an organisation to obtain competitive advantages in the marketplace (Barney et al., 2001). However, little empirical evidence is related to the HE market in the MOOC context, and this thesis contributes to replenishing the research gap and expanding the research scope of RBV by providing empirical analysis. Moreover, three new factors of size, lifelong learning and proximity to political centre are proposed after EFA, which can be efficient variables for studying the strategic management of HEIs, even though only two factors of size and proximity to political centre are statistically available in this thesis. In this sense, the advantage of using RBV is to determine and leverage the essential internal resources at different levels (Ainuddin et al., 2007; Kong & Prior, 2008), to draw on the perception of the managers in order to make accurate decisions in the marketplace, and to understand the crucial institutional resources that influence the competitiveness of the organisation in the marketplace.

An additional substantial theoretical implication of this thesis is that the author have confirmed the theoretical nature and enriched the theoretical framework of TAM and TPB in Chapter 3 and Chapter 4, respectively. Chapter 3 is the first attempt to incorporate the concepts of Playbour into TPB to comprehensively understand and interpret teachers' perceptions. New research scales are designed and presented to fit the proposed research model, an essential reference for studying human behaviour. Moreover, the new research model has been well validated by the empirical data, which can expand the research model of TPB and be adopted by future research. Besides, Playbour is a vital conception for studying individual perception towards

ICT, but only minor literature concerns this crucial element. Therefore, this thesis provides empirical research evidence related to Playbour.

Regarding Chapter 4, following the suggestions of previous studies, this Chapter adopts the incorporated model of TAM and TPB for the MOOC context. In the academic research, most researchers only consider either TAM or TPB as a basic theoretical framework to conduct research; however, previous studies demonstrate that the models of TAM and TPB are complementary, and the results show the incorporated model has better exploratory power than using TAM or TPB alone in terms of IT usage (Glavee-Geo et al., 2017). Therefore, this thesis further enhances the suggestion that the incorporated model of TAM and TPB should be considered when carrying on the research related to IT usage.

Another important implication of this thesis is related to Hofstede's cultural dimensions theory. As aforementioned, culture is an essential element when studying human behaviour within a different cultural context. Many studies have emphasised the role of culture and detected the potential difference in human behaviour. Therefore, Chapter 3 and Chapter 4 of this thesis have identified the moderating effect of culture in China and Spain's two different cultural contexts, which expands the research scope for MOOCs and enriches the cross-culture research. Furthermore, prior scholars have come up with similar findings on the potential effect caused by culture based on Hofstede's cultural dimensions theory (Rojo et al., 2020; Shao et al., 2020; Guritno et al., 2020; Vollero et al. 2020). In this sense, this thesis has emphasised applying Hofstede's cultural dimensions theory to understand the potential effect caused by culture in human behaviour towards MOOCs. Furthermore, this thesis has confirmed the applicability of Hofstede's cultural dimensions theory in the MOOC context and provided empirical evidence in the cultural research of China and Spain.

5.2.2 Managerial implications

Regarding managerial implications, the thesis suggests that HEIs have to invest the essential resources to leverage the size and generate competitive advantages (Ainuddin et al., 2007). Moreover, the resources that are more than tangible assets can be considered intangible assets, including financial and capital assets, reputation, human capital, management skills, organisational process, and information and knowledge (Fuchs et al., 2000; Barney et al., 2001). As discussed before, MOOCs as knowledge-based outputs are exceptionally dependent on the knowledge available to the organisations; the basis and unique advantage created by the reach of knowledge has to be identified and maintained to ensure successful innovation (Adams & Lamont, 2003). In this sense, HEIs have to emphasise the knowledge management process as Du Plessis (2007) noted that knowledge management plays an invaluable role in innovation as knowledge management assists in creating tools and platforms, converting knowledge, facilitating collaboration, ensuring the availability and accessibility of knowledge, identifying knowledge gaps, constructing competencies.

Moreover, research ability, as the prominent explaining variables for Factor 1 , plays a vital role in affecting HEIs to produce MOOCs. HEIs should invest more in developing research capability, and affiliation with the academic centre effectively enhances overall productivity and facilitates cross-discipline, cross-sector, and inter-institutional productivity and collaborations (Ponomariov & Boardman, 2010). Besides addressing the research motivation of researchers, the quality of human capital in a researchers' department is a significant influence on industry involvement, and university administrators should pay attention to the researchers' values and

attitudes about research autonomy and intellectual freedom, which have been considered important factors in forming researchers willingness (Schuelke, 2013).

In addition, the national policy environment is essential for the development of university research, and three groups of policy instruments have been employed: legal policy, financial policy, and information policy (Nguyễn, 2014). In this sense, university administrators should be in the wake of the policy and interpret it precisely to make appropriate planning adjustments for the overall comprehensive research capacity.

Concerning teachers, this thesis has found that obtaining a positive attitude and perception towards MOOCs is influential in forming Playbour and further helps improve the BI. Meanwhile, social pressure and self-evaluation are crucial factors for constructing BI to work with MOOCs. These findings have several implications for university administrators. First, university administrators should invest in improving the technical skills of teachers to operate MOOCs, which can be done by offering training programmes, which will help improve teachers' confidence that they can participate in the MOOCs and indeed in working with MOOCs. Second, university administrators should structure new encouragement policies to be passionate about working with MOOCs since such policies could increase the number of teachers and their willingness to engage in MOOCs. Third, university administrators should invest in prolific curriculum contents and resources for teachers as references, making it easier and more convenient for teachers to produce MOOCs. Finally, university administrators should highlight the advantages and potential benefits of working with MOOCs through social media.

Additionally, this thesis has observed the potential differences between the teachers from China and Spain, which shed light on that the focus of the policy implemented by university administrators can vary. University administrators should focus more on promoting positive self-evaluation regarding teachers from China by offering technical training programmes and adequate policy support. University administrators should concentrate on facilitating teachers to work with MOOCs through social media and public opinions for teachers from Spain.

In terms of students, this thesis has identified that the previous technical experience of learners is essential in forming a positive attitude and further impacts students' BI. Therefore, first, MOOCs managers should consider what students use MOOCs for and design MOOCs for ease-of-use interfaces in the process. In addition, most students take MOOCs as a complementary resource to residential classes, which indicates students' perception of usefulness should be intensified as the basis, and managers should design more models to satisfy the diverse needs of students, such as games and quizzes. Second, MOOCs managers should focus on establishing students' positive attitudes, and, as this study verifies, attitude can effectively manage that initiative by triggering the perceived usefulness and perceived ease of use. Therefore, it is suggested that leveraging the ease-of-use interfaces and ensuring the usefulness of MOOCs could be a crucial aspect of the business strategy in the MOOC platforms, and the usefulness perceived by users should be one of the primary objectives for MOOCs. Third, the survey shows only 26 students have obtained the MOOCs' certificates, which presents the truth with a high dropout rate in MOOCs. Hence, MOOCs managers could design a bonus mechanism to encourage students further to complete the enrolled courses and reduce the high dropout rate. Last, MOOCs managers should intensify the construction of social opinions when enrolling students and are advised to concentrate on viral marketing, creating an environment for proactive volitional word-of-mouth (Choe et al., 2021). Promoting learner-driven messages in social communities is also suggested

and can be achieved online to spread the benefits and fun of MOOCs. Such volitional recommendations should improve students' behaviour intention by generating more chances for students to be influenced and, consequently, lead to higher intentions towards MOOCs.

5.3 Limitations and future research directions

The present thesis is subject to several limitations for future studies to consider. First, the literature demonstrates both the lack of empirical evidence and the operationalisation of variables regarding MOOCs addressing the context of HEIs. The variables selected for measuring the MOOCs' success would differ from those country contexts and history due to the differences in culture and different parameters adopted for measuring success, which has also been advocated by a range of scholars (Welter, 2011). This feature has made it hard to compare the results of this thesis with other publications; thus, this thesis suggests future studies could continue the trend to involve more crucial variables and develop a more comprehensive framework to further the understanding of MOOCs' success in HEIs.

Second, this thesis does not integrate cultural variables into the proposed research model and is conducted only if Hofstede's findings are valid. Thus, this thesis suggests that future studies can consider cultural variables and explore potential moderators by incorporating cultural variables into the framework to verify cultural differences and other potential influences such as national characteristics.

Third, due to the data capacity limitation, the questionnaire is only answered by university teachers in China and Spain who know well about MOOCs or have experience instructing MOOCs, which only provides us with a small sample. Thus, this thesis suggests that future studies include a larger sample to explain the more complex relationship. Furthermore, the descriptive analysis shows that only 26.3% of university teachers in China and Spain have instructed MOOCs, which allows shedding light upon future studies on how to improve university teachers' willingness on producing and instructing MOOCs. Besides, as aforementioned, experience is an essential factor in forming attitude; this thesis focuses more on the psychosocial dimension of teachers ignoring the role of technical experience; thus, this thesis suggests that future studies can incorporate the role of experience based on this framework to further the discussion and conclusion.

Fourth, this study only involves students who have experience in MOOCs, and it is necessary to understand those students who have never taken MOOCs and deepen the interpretation. Thus, this thesis suggests that future studies can conduct qualitative research to deepen the understanding. Moreover, this thesis has no information related to class types during the COVID-19. Thus this thesis suggests future research could involve questions about whether students' courses are residential, online learning, or mixed during COVID-19. It would be essential to better understand students' inclination to participate in a MOOC. Furthermore, the questionnaire conducted for this thesis only involves students who have experience in MOOC, ignoring the type of MOOCs that are synchronous or asynchronous. Thus this thesis suggests future studies could involve the students' previous experience with synchronous and asynchronous distance courses, which would help understand the inclination towards MOOCs.

Last, the approach for collecting empirical data for Chapter 3 and Chapter 4 should be modified by future studies as this study used two approaches of convenience sampling and online questionnaires to collect data which may cause a particular bias on the research results. Furthermore, the findings of this thesis cannot be generalized due to the convenience sampling.

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Appendix A: tables and figures for Chapter 2

Table S1. Papers published of MOOCs in China from 2012 to 2021

Year	Number of publications		Year	Number of publications	
	CNKI	WOS		CNKI	WOS
2012	2	2	2017	331	125
2013	71	4	2018	270	100
2014	338	32	2019	182	95
2015	511	69	2020	124	79
2016	449	102	2021	81	95

Discipline involved of MOOCs research in China from 2012 to 2021

Discipline (number of publications)	Discipline (number of publications)
Educational Theory and Educational Management (1921)	Computer Software and Computer Applications (580)
Higher Education (450)	Foreign Language and Literature (239)
Library Information and Digital Library (170)	Medical Education and Medical Marginal Disciplines (153)
Adult Education and Special Education (69)	Vocational Education (58)
Chinese Language (35)	Computer Hardware Technology (26)
Physics (24)	Physical Education (22)
Trade and Economic (21)	Secondary Education (20)
Internet Technology (20)	Accounting (13)
Mathematics (19)	Light and Handicraft Industry (11)
Power Industry (11)	Chemical (11)
Civil and Commercial Law (9)	Public Security (9)
Biology (8)	Physical Geography and Surveying and Mapping (8)
Organic Chemicals (8)	Automation Technology (8)
Radio Electronics (7)	Tourism (6)
Telecom Technology (6)	Mechanical Engineering (6)
Jurisprudence and Legal History (6)	Building Science and Engineering (6)
Industrial General Technology and Equipment (6)	Music and Dance (6)
Fine Art, Calligraphy, Sculpture and Photography (5)	Environmental Science and Resource Utilization (5)
Literary Theory (5)	Publication (5)
Material science (5)	Military (4)

Table S2. Papers focusing on HEIs with Resource based view (RBV)

Year	Author (s)	Focus	Theory	Objective	Methodology	Key findings
2005	Powers & McDougall	HEIs	RBV	This study investigates the effects of particular resources sets on two commercialization activities in HEIs: the number of start-up companies formed and the number of initial public offering (IPO) firms to which a university had previously licensed a technology.	Quantitative	This study finds that a set of university financial, human capital, and organizational are found to be significant predictors of one or both outcomes.
2006	Hu et al.	HEIs	RBV	This analyzes the impacts of IT usages of IT resource on different levels of IT usage in Shanghai HEIs	Quantitative	Basic usage plays an vital role to support HEIs' teaching and research activities. Besides, Managerial IT usage has a close relationship with application systems used in various departments of HEIs.
2012	Huang & Lee	HEIs	Industrial organisation theory & RBV	To cope with the fierce competition, a sector-specific model of competitive advantage for HEIs is developed.	Quantitative	Institutional performance depends on the match between the state of the environment surrounding the HEIs and their use of resources.
2014	Hussein & Mourad	HEIs	Rogers' innovation adoption model & RBV	This paper aims to examine the factors that affect the adoption of technological innovations in HEIs.	Quantitative	In addition to the attributes of the innovation, all university-based factors as well as one service provider factor, namely, need for interaction, were identified to have a significant influence on the adoption of technological innovations in HEIs.
2015	Bobe & Kober	HEIs	RBV	To develop a framework and instrument to measure the organisational capabilities of HEIs.	Quantitative	Heads conceive of the development of capabilities within their departments along the core operating functions of research, teaching, and networking.

Year	Author (s)	Focus	Theory	Objective	Methodology	Key findings
2015	Wardini	HEIs	RBV	This paper briefly discusses the empirical implications of resources-based theory for the development of human capital in intensive knowledge-based organisations such as a university and the impact to organisation performance in terms of providing value adding outcomes for the university's stakeholders.	Qualitative	Firstly, the development of human capital in open university (OU) is primarily influenced by the organisational culture and leadership; Secondly, the open and distance learning systems in which OU operates has resulted in a sustained and competitive advantage for OU and applied to human capital practice through integrative and coordinative mechanism towards the intended 'value add' aimed at by the university.
2016	Wilkins	HEIs	Industry based view & RBV	This paper is to propose a framework that the strategic decision makers in HEIs can refer to when evaluating opportunities to develop branch campuses in foreign countries.	Qualitative	Managers should consider the institution's objectives, the institution's VRIO resources and dynamic capabilities, environmental, industry, and organisational factors, stakeholder preferences and the availability of accurate and useful data when evaluating possible locations for a new branch campus.
2016	de Lucena et al.	HEIs	The knowledge management & RBV	To analyse if the knowledge is a strategic resource and source of competitive advantages from the perspective of teachers.	Qualitative	Most of the teachers consider the knowledge resource as competitive parity because they classify it as valuable only.
2017	Franco & Haase	HEIs	RBV	This paper analyzes the key success factors underlying inter-organisational partnerships in the university sport sector.	Qualitative	Five generic success factors emerged: relationships, partner selection, complementarity, sporting performance and organisation, which are likely to determine the success of partnerships in the field of university sport.

Year	Author (s)	Focus	Theory	Objective	Methodology	Key findings
2017	Kim & Kraft	HEIs	Natural RBV	This paper hypothesizes that dedication to environmental legitimacy is a driver for university-wide innovativeness and reputation.	Quantitative	This paper has found that a HEI's dedication to environmental legitimacy would increase its innovativeness and serves as the foundation for the outcomes of stakeholder integration including innovativeness and reputation going beyond cost savings.
2018	Pereira et al.	HEIs	RBV	This paper identifies a set of competences and resources to contribute to develop and conceptualize and IT Value Management Capability Model (ITVM).	Qualitative	This paper has revealed that HEIs could leverage a wide range of ITVM competences and enablers to support the development of an organizational ITVM capability, important to achieve value creation of IT-enabled investments.
2019	de Campos et al	HEIs	RBV	This paper analyzes the data from Brazilian HEIs and discovers knowledge innovatively in the education area.	Quantitative	This paper presents HEIs with similar, dissimilar or complementary resources. Besides, the identification allows HEIs become more entrepreneurial and behave more collaboratively.
2020	Berbegal-Mirabent et al.	HEIs	RBV	The purpose of this study is to analyse how different patterns of production factors consumption of Spanish universities lead to specific technology transfer (TT) profiles (outcomes).	Quantitative	Results indicate that there is no unique formula of resource consumption that leads to a specific portfolio of TT outcomes. These results seem to reflect the characteristics and competencies added by universities, along with the characteristics of their socioeconomic context.
2021	Sanders & Wong	HEIs	RBV	This papers explores international partner selection among HEIs in Hong Kong, Singapore and Japan.	Qualitative	This study has identifies twelve attributes that influence international partner selection for HEIs.

Year	Author (s)	Focus	Theory	Objective	Methodology	Key findings
2021	Hameed et al.	Education	Flow theory & RBV	To identify the role of entrepreneurship education in environmental sustainability as measured by the launch of green ventures.	Quantitative	This study has identified that the entrepreneurship education evokes commitment to the environment, subsequently leading towards university green entrepreneurship support, environmental motivation, and green entrepreneurial behavior. Besides, university green entrepreneurship support also significantly influences green venturing.
2021	Ashaari et al.	HEIs	Information processing theory & RBV	This paper aims to understand the utilisation of big data analytics capability for data-driven decision-making to achieve better performance from Malaysian HEIs.	Quantitative	This paper has revealed that data-driven decision making could positively play an essential role in the relationship between big data analytic capability and performance of HEIs.

Table S3. Sample

International rank	University
15	Tsinghua University
23	Peking University
34	Fudan University
47	Shanghai Jiao Tong University
93	University of Science and Technology of China
124	Nanjing University
246	Wuhan University
256	Tongji University
260	Harbin Institute of Technology
263	Sun Yat-sen University
279	Beijing Normal University
303	Xi'an Jiaotong University
323	Southern University of Science and Technology
377	Nankai University
387	Shanghai University
387	Tianjin University
392	Beijing Institute of Technology

International rank	University
396	Huazhong University of Science and Technology
432	Xiamen University
446	University of Science and Technology Beijing
449	Beihang University
462	South China University of Technology
485	Shandong University
493	Jilin University
493	Southeast University
501-510	East China Normal University
531-540	Northwestern Polytechnical University
531-540	Sichuan University
571-580	China University of Geosciences
581-590	Renmin University of China
591-600	Dalian University of Technology
601-650	East China University of Science and Technology
601-650	Hunan University
601-650	Jinan University
601-650	Shenzhen University
651-700	Beijing University of Technology
651-700	Central South University
651-700	Soochow University
701-750	China Agricultural University
701-750	Nanjing University of Science and Technology
701-750	University of Electronic Science and Technology of China
751-800	Beijing Jiaotong University
751-800	Chongqing University
751-800	Northwest University (China)
801-1000	Beijing Foreign Studies University
801-1000	Harbin Engineering University
801-1000	Lanzhou University
801-1000	Shanghai International Studies University
801-1000	Wuhan University of Technology
801-1000	Xi'an Jiaotong Liverpool University

Appendix B: questionnaire, tables and figures for Chapter 3

Table S4. Questionnaire

Construct	Items	Authors
ATT	1. I can incorporate my moral perspectives into courses when producing MOOCs.	Wu (2019)
	2. I can transfer knowledge to students in more detail through MOOCs.	
	3. I look forward to developing skills that are required to produce MOOCs.	
	4. I think producing MOOCs is extremely entertaining.	Törhönen et al. (2019)
SN	1. Because of teaching management, I am required to produce MOOCs.	Wu (2019)
	2. Because of teaching management, I am encouraged to integrate MOOCs into regular classroom courses.	Teo (2011) Zhou (2016)
	3. People around me have already taken MOOCs as an advanced teaching tool earlier than me.	
	4. People who influence my behavior think I should adopt MOOCs.	
PBC	1. I have enough time to produce MOOCs.	Ajzen (1991)
	2. I have enough time to instruct MOOCs.	Lung-Guang (2019)
	3. I have the required technology to produce MOOCs.	Zhou (2016)
BI	1. I intend producing MOOCs for teaching in the future.	Ajzen (1991)
	2. I expect teachers around me will adopt MOOCs in the future.	Lung-Guang (2019)
	3. I expect teachers around me will produce MOOCs in the future.	
Playbour	1.I think producing MOOCs is extremely serious.	Törhönen et al. (2019)
	2.I think producing MOOCs is extremely instrumental.	
	3.I think producing MOOCs is extremely creative.	
	4.I think producing MOOCs is extremely innovative.	

Table S5. Gender, Age, MOOC instructor or not

	China				Spain					
	Male		Female		Male		Female		Total	
Gender	92	28.8%	70	21.9%	98	30.7%	59	18.5%	319 (100%)	
MOOC instructors	24	28.6%	28	33.3%	19	22.6%	13	15.5%	84	26.3%
Non-MOOC instructors	68	28.9%	42	17.9%	79	33.6%	46	19.6%	235	73.7%
Age	Mean		Std. Dev.		Min		Max		Obs	
	45.05643		11.06342		23		95		319	

Table S6. Title

	Lecture		Associate Professor		Professor		Other	
Freq. & Percent	76	23.82%	105	32.92%	98	30.72%	40	12.54%

Table S7. Professional Field

	Arts and Humanities		Health Science		Science		Social Science and Law		Technology Science	
Freq. & Percent	79	24.76%	18	5.64%	38	11.91%	136	42.63%	48	15.05%

Table S8. MOOCs enrolled

	0	1	2	3	4	5	6	7	8	10	12	14	15	18	20	30	60
Freq.	161	59	42	16	11	15	2	1	1	3	1	1	2	1	1	1	1

Mean		Std. Dev.		Min		Max	
1.727		4.51		0		60	

Table S9. MOOCs completed

	0	1	2	3	4	5	8	10
China & Spain	222	49	28	10	5	3	1	1

Table S10. MOOCs for regular courses

	Never		Rarely		Sometimes		Frequently		Always	
Freq. & Percent	170	53.29%	37	11.6%	73	22.88%	24	7.84%	14	4.39%

Table S11. Hours on producing MOOCs per week

	0	1	2	3	4	5	6	7	8	9
Freq.	231	13	9	7	12	8	8	1	6	2
	10	12	15	20	24	25	30	35	40	
Freq	6	1	3	3	1	2	3	1	2	

Mean		Std. Dev.		Min		Max	
2.248		5.973		0		48	

Table S12. Hours on instructing MOOCs per week

	0	1	2	3	4	5	6	7	8	12	16	24	36
Freq.	224	23	27	12	13	7	3	2	1	3	1	2	1

Mean		Std. Dev.		Min		Max	
1.179		3.358		0		36	

Appendix C: questionnaire, tables and figures for Chapter 4

Table S13. Questionnaire

Variables	Items	Main References
PU	1. MOOCs have many types of advanced technical channels (PC side, mobile side, different browsers, etc.).	Davis (1989);
		Chin et al. (2008);
	2. MOOCs have many types of teaching methods which make me enjoy the study. (video, ppt, case, literature, etc.).	Venkatesh & Goyal (2010)
	3. MOOCs allow me to manage learning progress according to my own learning situation.	
PEOU	1. I think I can set learning goals according to my own situation.	Davis (1989);
	2. I think I have free choice of study course according to my own wishes.	Chin et al. (2008)
	3. I think I can learn specific sections of the course according to my personal needs.	
ATT	1. MOOCs have multiple functional modules which allow me to choose what I prefer to.	Ajzen (1991);
		Venkatesh & Goyal (2010);
	2. I think MOOCs study is useful.	Venkatesh et al. (2011)
	3. I think MOOCs study is enjoyable.	
	4. I think MOOCs study is interesting.	
SN	1. I use MOOCs because many social medias have reported the benefits and advantages of using MOOCs.	Ajzen (1991);
		Luang-Guang (2019)
	2. I use MOOCs because many schools are promoting the use of MOOCs.	
	3. I use MOOCs because people around are using MOOCs (Eg. friends, classmates, teachers, etc).	
PBC	1. I think I have multiple ways to obtain specific knowledge to digest the class.	Ajzen (1991);
		Luang-Guang (2019);
	2. I think I have necessary network, computer and email to use MOOCs.	Zhou (2016)
	3. I think I can pass the courses designed on MOOCs easily.	
BI	1. In the future, I will use MOOCs as an additional study course.	Ajzen (1991);
	2. In the future, I will recommend MOOCs to my friends.	Zhou (2016);
	3. In the future, I will share my own MOOCs leanrning experience to my friends.	Luang-Guang (2019)

Table S14. Gender

	Spain		China		Total
	Male	Female	Male	Female	
Freq.	89	156	233	292	770
Percent	36.32	63.68	44.38	55.62	100

Table S15. Age

	17	18	19	20	21	22	23	24	25	26	27	28
Freq.	2	88	173	169	148	100	35	26	14	3	3	3
Percent	0.26	11.43	22.47	21.95	19.22	12.99	4.55	3.38	1.82	0.39	0.39	0.39

	29	30	33	34	36	38	Total	Mean		Std. Dev.	
Freq.	1	1	1	1	1	1	770	20.53896		2.139884	
Percent	0.13	0.13	0.13	0.13	0.13	0.13	100	Min	17	Max	38

Table S16. Mother's Education Background

	Primary	Junior	High	Bachelor	Master	Doctor	Post-Doctor	Total
Freq.	98	120	235	221	89	7	0	700
Percent	12.73	15.58	30.52	28.70	11.56	0.91	0	100

Spain	Primary	Junior	High	Bachelor	Master	Doctor	Post-Doctor	Total
Freq.	33	6	87	107	7	5	0	245
Percent	13.47	2.45	35.51	43.67	2.86	2.04	0	100

China	Primary	Junior	High	Bachelor	Master	Doctor	Post-Doctor	Total
Freq.	65	114	148	114	82	7	0	525
Percent	12.38	21.71	28.19	21.71	15.61	1.33	0	100

Table S17. Father's Education Background

	Primary	Junior	High	Bachelor	Master	Doctor	Post-Doctor	Total
Freq.	104	90	244	213	107	9	3	770
Percent	13.51	11.69	31.69	27.66	13.90	1.17	0.39	100

Spain	Primary	Junior	High	Bachelor	Master	Doctor	Post-Doctor	Total
Freq.	43	3	84	96	13	6	0	245
Percent	17.56	1.22	34.29	39.18	5.31	2.45	0	100

China	Primary	Junior	High	Bachelor	Master	Doctor	Post-Doctor	Total
Freq.	61	87	160	117	94	3	3	525
Percent	11.61	16.57	30.48	22.29	17.9	0.57	0.57	100

Table S18. Number of Certificates of MOOCs

	0	1	2	3	4	5	6	7	8	9	10	12	14	20	28	Total
Freq.	587	90	47	19	8	5	3	1	2	1	2	1	1	2	1	770
Percent	76.23	11.69	6.10	2.47	1.04	0.65	0.39	0.13	0.26	0.13	0.26	0.13	0.13	0.26	0.13	100

Table S19. Academic Field

	Arts and Humanity	Health Science	Science	Social Science and Law	Technology Science	Total
Freq.	323	76	89	205	77	770
Percent	41.95	9.87	11.56	26.62	10.00	100

Table S20. Academic Grade

	First Year	Second Year	Third Year	Fourth Year	Total
Freq.	248	174	192	156	770
Percent	32.21	22.60	24.94	20.26	100

Table S21. Part-time Job

	Yes	No	Total
Freq.	341	429	770
Percent	44.29	55.71	100