**MOOCs and Education Access:
Evidence from New Zealand**

By

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Abstract

Massive Open Online Courses (MOOCs) are free online courses available for anyone to enrol in and are aimed at unlimited participation (Siemens, 2013). One aim of MOOCs is to increase the accessibility of tertiary education to people who would not usually have access to it.

The past decade has seen a rapid development of these courses with a stream of research focused on this new teaching innovation. While there has been research on how MOOCs are developed and why students enrol in MOOCs, there has been relatively less research focused on the accessibility to students in different countries, including those that could be considered less economically developed.

This study used a mixed-methods research approach to examine the relationship between MOOCs and the education access of these courses for students, internationally. Quantitative and qualitative data were gathered from both the students' and lecturers' perspectives of two MOOCs taught in a New Zealand university. Quantitative data on the students' demographics and motivations were provided by the EdX platform. These data indicated that most students enrolled in the two MOOCs were from developed countries. Correlation analysis and multivariate regression were used to examine the relationship between students' participation rate and development level in the country where the students were studying. The statistical results indicate that students from developed countries were more likely to enrol in the MOOCs than students from developing countries.

Given that MOOCs aim to engage diverse groups of students globally, qualitative data in the form of interviews were used to address the following questions: What are the lecturers' motivations to teach these MOOCs; which groups of students did the lecturers target in their teaching; and how did the lecturers adapt the courses to cater for the learners' diversity? The lecturers anticipated that most MOOCs students were from developed countries and had tertiary degrees. Although the lecturers applied several approaches to engage diverse groups of students, their demographics were largely

aligned with the lecturers' expectations. The role of the MOOCs in increasing accessibility to higher education for students who were traditionally excluded was limited.

Keywords: Massive Open Online Courses (MOOCs), accessibility, students, lecturers, the University

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MOOCs and Education Access: Evidence from New Zealand

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Glossary

The terms and the abbreviations used in this study are sorted below alphabetically.

Term	Definition
Country of origin	The country where students were living when the data were collected
CSV	Comma-separated values
Developing and Developed countries	The World Bank classifies countries into low-, lower-middle-, upper-middle- and high-income groups based on income level. The upper-middle- and high-income groups taken together are referred to as “developed countries”. This research used the classification of the World Bank (2018).
Education access	Accessibility to higher education for students who are traditionally excluded in the non-MOOC setting
ICT	Internet and Communication Technology
IT	Information Technology
Lecturer A Lecturer B Lecturer C Lecturer D	The MOOCs lecturers who were interviewed
MOOC(s)	Massive Open Online Course(s)
MOOC1 and MOOC2	Refers to the two MOOCs provided by the University

OER	Open Educational Resources
OCW	Open Course Ware
Participation rate	The number of enrolled students divided by the population of the country
The University	The University that provides the two MOOC courses used in this study
UNESCO	United Nations Educational, Scientific and Cultural Organization
Verification Purpose	Students who paid for the verified certificate of the MOOCs were identified as having the verification purpose in this study
WDI	World Bank Development Indicator Database

Chapter 1 Introduction

In this introductory chapter, background information for this research is provided. I start by defining the characteristics of MOOCs, followed by the rationale for this research. The significance of the research is highlighted with reference to key theoretical perspectives in the literature. An overview of MOOCs in New Zealand is also presented in this chapter. The thesis structure is outlined in the concluding section of this chapter.

1.1 What are MOOCs?

This section will describe MOOCs' characteristics and what distinguishes them from other courses of study. Massive Online Open Courses (MOOCs) are university-level courses that allow unlimited participation through the internet (Kaplan & Haenlein, 2016). Those courses are provided by universities worldwide and are based on the concepts of openness and distance learning. In terms of openness, these courses are freely available to anyone interested. In terms of distance learning, the courses aim to attract students who are separated by space and time (Kaplan & Haenlein, 2016).

There are several key differences between MOOCs and traditional university courses. First, MOOCs are available for an unlimited (massive) number of students rather than a particular number of students. Second, MOOCs are freely available with open registration for anyone interested. Third, MOOCs are only available online rather than attending the course in person on a university campus.

MOOCs are generally designed to allow some interaction among students and between students and teaching staff through the forums and the discussion board (Kaplan & Haenlein, 2016).

To summarize, MOOCs have the following features.

Massive: MOOCs have a large number of enrolments. The scale of 'massive' is relative. Earlier MOOCs had around 2000 enrolments, but the well-known platforms' courses have

exceeded 100,000 registrants (Siemens, 2013). Scalability is a significant feature of MOOCs (Yuan & Powell, 2013).

Open: The openness of MOOCs is about the accessibility of the courses. All MOOCs are freely available for students who want to learn within the course as a guest. A small amount of payment for a verified certificate is available for students who want to gain a completion certificate.

Online: MOOCs are only available online. All activities, course content and interaction happen online (Siemens, 2013).

Courses: All courses have a start and end date; all discussions and interactions occur during this time. The content is fully available even when MOOCs are archived. There is no requirement for students to complete MOOCs if they are not enrolled for a verified certificate. The courses have open-ended outcomes (Chen, 2014).

Further information on the history and types of MOOCs is discussed in Chapter 2.

1.2 The rationale for this research

It is believed that MOOCs will reimage and transform the landscape of education (Musthafa & Nasimudheen, 2014; Schuwer et al., 2015). However, whether MOOCs could deliver on the promise of broadening education access is still much debated. This study set out to further advance the understating of MOOCs' role in widening education access by examining this issue within the context of two MOOCs provided by a New Zealand university. According to Lambert (2020), most of the existing studies are qualitative in nature. This study employs mixed methods to answer the research questions. Combining the qualitative and quantitative study sheds new light on MOOCs' role in widening education access.

This study examines whether MOOCs contribute to increasing the accessibility of higher education from both students' and providers' perspectives. This thesis set out to study two related questions: 1) the influence of the University MOOCs on education access, and 2) the motivations of the lecturers to provide MOOCs. The University studied in this research is one of the first group of universities to provide MOOCs in New Zealand.

One key rationale for studying the topic is the lack of literature on MOOCs from non-US and non-European perspectives. A much-debated question in the literature is whether MOOCs could widen education access to students, particularly for traditionally disadvantaged students. The published research is focused mainly on the courses provided by universities from the US or the United Kingdom (UK). The course content, the difficulty level, and the course's emphasis are inevitably influenced by the MOOCs' country of origin. New courses provided by other countries may differ from those offered by the US and UK, which sheds new light on the debated questions in the literature. This research explores the role of MOOCs in broadening education access for students in different countries. To be more specific, this study uses data from two MOOC courses provided by a New Zealand university on EdX to explore whether MOOCs are designed for targeted groups and whether the uptake of MOOCs by students increases education access internationally.

Based on the data from two MOOCs from New Zealand, this research provides insights from non-US and non-European courses. This research thus tests the general applicability of the main conclusions established in the literature.

Moreover, much of the current research in this field is qualitative and descriptive in nature. More quantitative research is needed to broaden the scope of MOOCs research. The availability of MOOC data from platforms such as EdX has facilitated the investigation of MOOCs' role in increasing education access. There has been renewed interest in using new MOOC data to test the findings in the previous literature. This research uses a mixed research method and provides a more quantitative-based answer for the much-debated question in this field.

Finally, it is important to study whether the designers or lecturers considered the diversity of the students who might enrol in the courses when they design and teach the courses. This may help find out whether MOOC instructors intend to make the courses more accessible to diverse students. This thesis also contributes to understanding MOOCs lecturers' motivations to provide MOOCs. The thesis provides deeper insight into the lecturers' role in widening education access and the motivations of staff in developing MOOCs.

1.3 MOOCs in New Zealand universities

New Zealand has a long history of providing access to education by distance (Anderson & Simpson, 2012). Several New Zealand universities have joined the international MOOCs platform to provide MOOCs to global students.

Victoria University of Wellington was the first university in New Zealand to partner with EdX¹ to offer a variety of courses under the name the WellingtonX. The university states the free courses will “offer learners the flexibility to study at one of New Zealand’s oldest and most prestigious tertiary institutions from wherever they are”. In 2020, seven MOOCs were offered by the university. In the next few years, the university will deliver various online courses, including MOOCs, SPOCs (small private online courses) and MicroMasters® courses².

The University of Canterbury (UC) offered six MOOCs partnered with EdX under the name UCX. UC states that one of the key objectives is to provide accessible, flexible and future-focused learning opportunities for students. Joining the EdX platform has enabled UC to do so. The MOOCs were presented through high-quality video segments and emphasised learning rather than assessment³.

The University of Waikato provided MOOCs partnered with FutureLearn⁴. There are three courses about data mining provided by this university. The university states that the MOOCs they provided showcase some of the most distinctive elements of the

¹ EdX is an American non-profit MOOCs platform created by Harvard and MIT.

² This information is from the website of Victoria University of Wellington <https://www.wgtn.ac.nz/engage/public/lifelong-learning/edx-wellington>.

³ This information is from the website of University of Canterbury <https://www.canterbury.ac.nz/study/online/moocs/>.

⁴ FutureLearn is a for-profit MOOC United Kingdom learning platform hosted by the Open University and SEEK ltd, partnered by 12 top universities.

University of Waikato and offered knowledge and expertise that students struggled to find anywhere else⁵.

Massey University has joined the Australian Open2Study⁶ organization to provide online courses since 2013 (Gordon et al., 2014). Massey University has become the first New Zealand tertiary provider to join an international consortium offering open online courses⁷.

The University of Auckland has partnered with FutureLearn and provided two MOOCs (Data to Insight: An Introduction to Data Analysis and Visualisation; Logical and Critical Thinking)⁸.

In addition, New Zealand institutions, such as Otago Polytechnic, have collaborated with Open Educational Resources universitas (OERu) to provide open educational resources to global students (Shrivastava & Guiney, 2014).

I discuss the history and development of MOOCs further in Chapter 2.

1.4 The structure of the thesis

This thesis is composed of six chapters. It is organized in the following way as shown in Figure 1-1.

The thesis begins with the introduction chapter. This chapter first identifies the research gap in the MOOC literature and points out this research's main contributions. It also introduces the development of MOOCs in New Zealand.

⁵ This information is from the website of University of Waikato
<https://www.waikato.ac.nz/study/futurelearn>.

⁶ Open2Study is an online teaching and learning system developed by Open Universities Australia (OUA).

⁷ This information is from the website of Massey University
<https://www.massey.ac.nz/massey/about-massey/news>.

⁸ This information is from the website of FutureLearn
<https://www.futurelearn.com/partners/the-university-of-auckland>.

Figure 1-1 Structure of the thesis

The second chapter provides a review of the literature on the role of MOOCs in increasing education access and the motivations of stakeholders such as the university and lecturers to offer MOOCs. The literature review is categorized into three sections. The first section reviews the history and the development of MOOCs. The second section reviews the literature about the relationship between MOOCs and education access. The third section considers research that investigates the motivations of the lecturers and institutions to participate in MOOCs.

The third chapter describes and justifies the use of the mixed methodology. The methodology chapter starts with presenting the overall ideas of the research questions, research setting, and research design, followed by the research data collection methods, data cleaning procedure, and data analysis details. The ethical considerations are also introduced in this chapter.

The main findings are reported in Chapter 4 and Chapter 5. Chapter 4 reports findings from the analysis of the quantitative data collected from two MOOC courses. The findings are presented in the form of two case studies. For each case, both the exploratory and

regression analyses are employed to identify the students' characteristics and motivations to enrol in the MOOCs. The findings reported in this chapter address the issue of the characteristics of students who are likely to enrol in MOOCs.

Chapter 5 presents findings from analyzing the qualitative data. The data were collected from interviews with four MOOCs lecturers. The findings are presented by different themes. This chapter identifies MOOCs lecturers' and the University's motivations to provide MOOCs. Challenges and achievements for these lecturers to be involved in MOOCs are also identified in this chapter. These findings aim to explore whether MOOCs lecturers regarded providing more higher education opportunities to those excluded from traditional education as one of their motivations.

Chapter 6 provides a discussion of the findings. Suggestions to further improve the positive role of MOOCs in increasing education access are provided. Limitations of this research and suggestions for further research are discussed in this chapter.

Chapter 2 Literature Review

2.1 Introduction

The last decade has seen the rapid development of the MOOC, which has led to the proliferation of research on MOOCs in the following areas: 1) the development of MOOCs; 2) the relationship between MOOCs and education access; 3) the motivations of institutions and MOOC lecturers to provide MOOCs, and 4) the motivation of students to learn using MOOCs. The first part of this chapter provides some background information about MOOCs by discussing MOOCs' history and development. This review then focuses on literature underpinning the three main aspects of MOOCs that are considered in this thesis: namely, the relationship between MOOCs and education access, the motivations of institutions and MOOCs lecturers to provide MOOCs, and the motivation of students to learn from MOOCs. I will now outline the strategies used to search for relevant literature for inclusion in this chapter.

To search the literature on MOOCs, I used multiple methods. (1) Targeted searching within specific leading academic journals using keywords: I searched the top 10 ranking journals according to Scimago Institutions Rankings⁹ in the E-learning discipline in 2019. (2) I also searched for the main journals that are directly linked to distance learning. These journals are as follows: *Journal of Distance Learning*, *Journal of Distance Education*, *The European Journal of Open, Distance and E-Learning (EURODL)*, and *the International Review of Research in Open and Distributed Learning*. (3) I searched in Google Scholar to find papers with a high citation rate. (4) I used the journal databases recommended by the Victoria University of Wellington library in the discipline of Education (A+Education, ERIC, and Psych Info).

To ensure the most recent and important literature was covered, I limited the publication date to articles since 2012 because MOOCs are a relatively recent development. I then searched the items using different combinations of the following words: MOOCs, Massive

⁹ The website is <https://www.scimagojr.com/>.

open online courses, online course, access, accessibility, motivations, instructors, lecturers, students, New Zealand.

From the thousands of articles that resulted from this search, I eliminated duplicate articles and removed articles with irrelevant topics. I selected the research to be included by reading the article's title first and then reviewing the abstracts. This search aimed to find relevant literature over a recent time period (2013 to 2020), conducted in different countries and using various research methods.

2.2 The development of MOOCs

MOOCs' development is rooted in the concept of openness in education, sharing knowledge without necessarily paying for it. Advocates of MOOCs argue that knowledge should be shared freely across social status, demographics, and geographical borders (Yuan & Powell, 2013).

2.2.1 The background of MOOCs

The concept of open education was raised in the early 21st century. Based on this concept, institutions started offering Open Educational Resources (OER) online without any fee for accessing these resources (Rhoads, 2015). OpenCourseWare (OCW), established by the Massachusetts Institute of Technology (MIT) in 2002, was a typical representative of OER. MIT OCW is a web-based publication of virtually all MIT course content, open and available worldwide. MIT OCW was initially developed to upload the syllabus and materials into a single website. The video content was limited and was just a recording of the in-class lecture and the videos were not designed in an online study friendly MOOC format. With the help of commercial platforms, such as EdX, Coursera, and Udacity, MOOCs' content and format have been tailored into a more online-friendly format.

With the movement of open education, the Open University in the United Kingdom launched Open Learn in 2006. Open Learn is a platform to provide a wide range of free educational resources for academic study or life, including free courses, articles and interactive games, videos and audios, posters, and booklets. The providers of Open Learn believe that the key barriers to starting education are access, lack of confidence, and cost. Open Learn states that the aim of providing those free resources is “to break down

barriers to education by reaching millions of learners each year”¹⁰. The development of sharing educational materials online and the use of new teaching technology prompted MOOCs' emergence.

OER tended to only provide course materials by uploading recorded lectures and course content. In comparison, MOOCs open the entire learning procedure to learners: learners participate fully by interacting with course materials and through discussions with the teaching staff and their peer-learners.

OER focuses on how far their open educational resources could reach around the world, while MOOCs not only do not limit how open the courses are, but also pay attention to the depth of the learning effects by providing quizzes, examinations, and interactions (Zhang et al., 2019). Although those activities are alternative choices for students, they provide a way to assess students' learning effects. Table 2-1 summarizes the similarities and differences between OER and MOOCs.

¹⁰ This information is from the website of OpenLearn
<https://www.open.edu/openlearn/get-started/about-us>.

Table 2-1*Similarities and differences between OER and MOOCs*

		OER	MOOCs
Similarity	Provide free online learning materials		
Differences	Course materials	classroom-based course recordings	Videos were recorded for MOOCs and regularly updated when the course is running
	Interaction	Not available	Available
	Assessment	No assessment	Not necessary Assignments and tests were provided
	Time	Available any time without a start and end date	Has a start and end date Materials are fully available after the course has finished

2.2.2 The development of MOOCs

2.2.2.1 Early development

MOOCs are a relatively new stream of education innovation that continues the open education movement. Dave Cormier coined the term MOOC in 2008 to describe a course called 'Connectivism and Connective Knowledge (CCK08)' (Cormier, 2008), provided by George Siemens and Stephen Downes at the University of Manitoba in Canada. The course was designed as a university credit course for students at the University of Manitoba while, at the same time, the course was opened online for students from around the world. All course content was provided online without the payment of fees. Students were not

registered in this online course for gaining credit and there was no requirement for them to complete the course; they enrolled out of interest. Online students could participate through collaborative tools, such as blog posts. As a result, 24 students took the course for credit in the university and about 2,200 non-credit learners participated in the free online course (Siemens, 2013). This course was credited with being a successful new way to provide online courses (Rhoads, 2015).

After the first MOOC, an increasing number of university lecturers put their university courses online to share knowledge and the number of students studying in MOOCs grew (Rhoads, 2015). MOOCs were emerging as a popular way to learn and in 2012, *The New York Times* marked this year as 'The Year of the MOOC' because several for-profits and non-profit MOOC platforms and elite universities created platforms to provide MOOCs (Pappano, 2012). Platforms created in that year included for-profit platforms such as Udacity and non-profit platforms such as EdX. Harvard University and MIT created EdX, which provides university-level courses with a wide range of disciplines to students worldwide without payment¹¹¹². Google developed an open platform for making MOOCs called 'Google builder', allowing users to create their own MOOCs (Zheng et al., 2018). FutureLearn is a for-profit MOOC UK learning platform hosted by the Open University and SEEK ltd, partnered by 12 top universities¹³. The early development of MOOCs has seen a growing number of courses, enrolments, platforms and joint institutions. After presenting the early development of MOOCs, the following subsection will provide the current situation of MOOCs.

2.2.2.2 The current situation

MOOCs have been growing rapidly around the world. According to the EdX 2020 impact report (EdX, 2020), 5747 instructors from more than 145 EdX partnered universities have joined the platform to offer MOOCs. EdX has provided 3189 online courses (including 319 programmes). Those courses have attracted 80 million unique enrolments

¹¹ The source is the website of EdX <https://www.edx.org/about-us>.

¹² This information is from Wikipedia <https://en.wikipedia.org/wiki/EdX>.

¹³ This is from the website of FutureLearn <https://www.futurelearn.com/>.

from more than 196 countries. 1.6 million certificates have been issued by EdX (EdX, 2020). Although most EdX courses (2749 courses) were delivered in English, EdX does provide courses in another 20 languages.

Coursera has also grown rapidly since it was launched in 2012. By 2020, Coursera has had 150 university partners and 50 industry partners across 55 countries and offered 5840 online courses. In total, 70 million learners with 59 million enrolments were served by Coursera (Coursera, 2020). Chief Executive Officer Jeff Maggioncalda pointed out that an unprecedented demand was seen during the COVID-19 pandemic in 2019. Since mid-March 2019, compared with the same period in the last year, the increase in learners and course enrolment was 353% and 444%, respectively (Coursera, 2020).

Udacity is also a for-profit organization offering MOOCs. Compared with Coursera and EdX, Udacity focuses on skills-related courses. Udacity states it aims to train the world's workforce in the careers of the future. Udacity partners with leading technology companies to learn how technology is transforming industries and to teach the critical technical skills that companies are looking for in their workforce¹⁴. Udacity now provides more than 200 programmes, mainly, but not limited to, artificial intelligence, cloud computing, data science, business, and auto systems.

2.2.3 Types of MOOCs

Based on the pedagogical models, scholars have now classified MOOCs into three categories: cMOOCs, xMOOCs and quasi-MOOCs (Daniel, 2012; Rodriguez, 2012; Siemens, 2013), with cMOOCs and xMOOCs being the most well-known types of MOOCs.

cMOOCs, also known as 'network-based' MOOCs, are the earlier MOOCs form based on a connectivist pedagogical model (Siemens, 2013; Yuan & Powell, 2013). This learning model has learning materials that are aggregated and remixed by students rather than pre-selected by the teaching staff. Learning is a process of pursuing, sharing, and connecting. Learners can use different platforms (such as blogs and Moodle) to post, discuss, or share knowledge about a theme given by the lecturer. Students may attempt

¹⁴ The the source of this information is the website of Udacity
<https://www.udacity.com/us>.

to connect with each other to answer questions. In terms of students' activity, cMOOCs are more open (Siemens, 2013; Zheng et al., 2018), focusing more on the connection between learners.

xMOOCs are courses provided by traditional universities on the MOOCs platforms. This model's concept is that the teachers are experts who deliver knowledge and students are knowledge consumers. Compared with cMOOCs, xMOOCs have a more traditional course structure with lectures and a clear syllabus. The learning process is primarily a process of obtaining knowledge and skills from the course materials pre-selected by the course designers (Siemens, 2013). It is an individual learning process in a single platform. The assignments are computer-graded online due to the massive enrolments, and the students' interaction is limited to asking for help. xMOOCs are more focused on the content of the courses and are also known as 'content-based MOOCs'.

Quasi-MOOCs are web-based tutorials that support students to learn specific tasks and, according to Siemens (2013), are technically not courses. Compared with cMOOCs and xMOOCs, quasi-MOOCs have a looser course structure. Khan Academy and MIT's OCW are examples of quasi-MOOCs.

The types of MOOCs are evolving rapidly, and there are now many other forms of MOOC, for example, SPOC (Social Online Open Course or Small Private Online Course), DLMOOC (Deep Learning MOOC), MOOL (Massive Open Online Labs), MobiMOOC (Mobile MOOC), DOCC (Distributed Open Collaborative Course), PMOOC (Personalized MOOC), and MOOR (Massive Open Online Research) (Zheng et al., 2018). Each form of MOOC represents an online education concept and an innovation of online courses and, although the forms of MOOCs are different, they all carry out the concept of free, online, and open (Zhu & Liu, 2014).

In conclusion, MOOCs' emergence is rooted in the concept of open education, arising from the movement of Open Educational Resources (OER).

2.3 MOOCs and education access

Education access is defined as the accessibility to higher education in this research. The definition of the term is provided in Chapter 1. MOOCs are a recent popular distance education environment that provides open content for anyone (Esposito, 2012) and are

a point in the evolution of open educational resources (Mazoue, 2013). In this section, academia's attitude changes over time about MOOCs' role in improving higher education access is analysed. Lambert (2020) describes this change as a hope-pessimistic-hope change, which has three stages described below.

At stage one, scholars had an optimistic expectation that MOOCs would increase the accessibility to higher education as MOOCs started getting more and more popular among learners. MOOC platforms shared a common mission to broaden access to education; for example, one of the biggest platforms, Coursera, states its initial vision is “to provide anyone, anywhere with access to the world’s best education”¹⁵. EdX has the same mission to “increase access to high-quality education for everyone, everywhere”¹⁶.

Initially, MOOCs were considered a new way that had the potential to increase education access to high-quality courses from elite universities around the world because they were open and low-cost (Pappano, 2012). Pappano (2012) notes that “the shimmery hope is that free courses can bring the best education in the world to the most remote corners of the planet” (p. 2). The three largest MOOC platforms (EdX, Coursera, and Udacity), all launched in 2012, have huge numbers of people registered in their courses (Ho et al., 2014). For example, HarvardX and MITx launched 17 MOOCs on the EdX platform from 2012 to 2013, with 841,687 registrations from over 25 countries. Ho et al. (2014) indicate that the aims for increasing education access were being met.

At stage two, the initial optimism was dashed as more and more studies showed that MOOCs do not help to broaden education access as MOOCs learners tend to be well-educated, employed, and from developed countries. Since their inception, the question of who enrolls in MOOCs, where they are from, and their previous qualifications have been of interest to researchers. However, by analyzing the enrolled students’ demographic data, most studies showed the opposite results to what the MOOC advocates expected.

An example of these studies was undertaken by Emanuel (2013), who collected data from a survey conducted by the University of Pennsylvania on MOOCs users, with 34,779

¹⁵ The source of this information is the website of Coursera <https://about.coursera.org/>.

¹⁶ The source of this information is the website of EdX <https://www.edx.org/about-us>.

responses from more than 200 countries and territories. This study found that nearly half (44.2%) of students had a degree beyond bachelor level, and almost 70% of them were employed. Based on these findings, Emanuel (2013) concludes that “MOOCs seem to be reinforcing the advantages of the ‘haves’ rather than educating the ‘have-nots’” (p. 342). Subsequently, more and more studies have reported similar results to Emanuel (2013), pointing out that enrolment demographics showed that most MOOC learners were well-educated, employed, and from developed countries (Laurillard, 2016; Stich & Reeves, 2017; Tang & Carr-Chellman, 2016; van de Oudeweetering & Agirdag, 2018).

Researchers who focused on students relatively underserved by tertiary education also reported that MOOCs' contribution in broadening education access was limited as there were barriers preventing students from completing the courses. Stich and Reeves (2017) report that while underserved students were more likely to take MOOCs for educational improvement, they were also less likely to complete MOOCs than privileged students. They conducted a study of MOOC users in six MOOCs offered by the University of Michigan. Participants who self-identified that they could not afford a formal education were assigned to the targeted group. The remaining participants were assigned to the compared group. By analyzing students' demographics and comparing students' performances from the two groups, this study found that, although students from the targeted group had significantly lower completion rate, they had significantly higher completion rate with certificates. van de Oudeweetering and Agirdag (2018) also report similar findings from their study, showing that the completion data indicates that privileged learners are more likely to complete MOOCs than comparatively disadvantaged students. These findings indicate that underserved students may consider MOOCs to improve their educational levels. They desire the completion certificates, but there were still other barriers that prevented them from completing MOOCs.

One reported barrier is the fees. Offering MOOCs presents a financial dilemma for institutions. There is a cost involved in delivering high-quality education to large community membership. This cost has resulted in commercial platforms changing from free to the fee-charging format and making parts of the course inaccessible for non-fee-paying students. Increasing the charges prevents students from participating in those courses. Ganimian and Murnane (2016) reveal that reducing school costs increases students' attendance and attainment in developing countries. The low cost of attending

MOOCs gives the potential to increase education access for students from disadvantaged socioeconomic backgrounds. However, if the charges are low, the sustainability of creating high-quality courses will be endangered, and the quality of the courses will be compromised (Daniel, 2012).

Another line of research indicates that researchers are sceptical about MOOCs' role in promising education access. MOOCs have played a limited role in expanding education access in many countries, especially in countries with large populations, such as India and China. Musthafa and Nasimudheen (2014) suggest that both non-government educational organizations and government should promote the use of MOOCs at a large scale to widen higher education access in India. Pollack Ichou (2021) concludes that MOOCs will do little to cover global educational gaps until they can provide access to those most lacking in education. Tang and Carr-Chellman (2016) depict a less-than-encouraging picture in using MOOCs to reduce educational inequality in China. They note that MOOCs were still not known in many less-developed regions in China, which should be the main target if the aim is to make MOOCs more accessible. Adam (2019) argues that the popular MOOC platforms follow Western-centric epistemologies and might have a negative effect on the local knowledge system. Thus, MOOCs should include more marginalized voices so they can contribute more to accessibility. It seems that most of the research shows that MOOCs can do little in terms of increasing higher education access. If the findings of these studies are generalizable, the providers of MOOCs may need to consider making more tailored changes to realize the potential of MOOCs to widen education access fully.

However, there is increasing evidence that some MOOCs have been designed to serve specific groups, which sheds new light on MOOCs' role in education access. Lambert (2020) conducted a systematic literature review of 46 research papers from 2014 to 2018 on the question of how prevalent and successful MOOCs and open education programmes were in enabling social inclusion and student equality. Lambert (2020) found that some promising changes and practices might increase MOOCs' ability to target socioeconomically disadvantaged and under-represented groups. Increasingly, course designers take specific needs into account when they design the courses (Goldberg et al., 2015). Three groups of people are generally considered as less advantaged in the MOOCs setting: (1) People with low skills and low confidence (Strawn, 2015), (2) people with a

disability (Florian & Black-Hawkins, 2011), and (3) people who do not use English as their first language (Sanchez-Gordon & Luján-Mora, 2017). Several studies focused on how MOOCs can be used to serve those groups. Examples of this research focus are how to make MOOCs more accessible to non-native speakers of English (Sanchez-Gordon & Luján-Mora, 2015); and an Australian study on the use of Open Educational Resources for regional and disadvantaged learners (Wills et al., 2016). Another study investigated MOOCs' value in higher education in two developing countries, India and China (Trehan et al., 2017). The results show MOOCs' popularity in these two countries is growing, and MOOCs have the potential to increase the accessibility of these countries' higher education if more technical support from the MOOC provider is available, and learners realize the value of MOOCs.

Some MOOCs were offered as a project developed by educational institutions jointly with the MOOCs platforms (Boga & McGreal, 2014; Laurillard, 2016). Those MOOCs were open to all but targeted specific groups and they aimed to help people improve their skills in a particular field. Those projects were usually intended to serve students traditionally excluded from tertiary education. These include courses that develop Internet and Communication Technology (ICT) in developing countries, including teacher professional development (Laurillard, 2016), job skills in Tanzania (Boga & McGreal, 2014), and understanding of computer science in West Africa. Each of these examples is described in more detail below.

More courses are focusing on ICT education while at the same time solving staff shortage problems in many developing countries. An example of how MOOCs were used to improve teachers' professional development was a MOOC, ICT in Primary Education, hosted by the University of London International Programmes, funded by the UNESCO Institute of IT (Information Technology) in Education and developed on Coursera. This course aimed to improve ICT education at the primary school level by attracting teachers and policymakers in primary education. As a result, more than 9000 teachers from 174 countries registered. Laurillard (2016) analyzed this UNESCO case. The results showed that MOOCs could indirectly serve disadvantaged students by improving teachers' professional skills who engaged in ICT education in primary school. This programme showed that MOOCs designed for specific groups had the potential to contribute to UNESCO's goal of 'Education For All'.

Further joint projects aim to improve education access and enhance job skills in developing countries by using MOOCs. Boga and McGreal (2014) examined the challenges and strengths of using MOOCs in developing countries by studying a Tanzanian project developed by the World Bank, the Tanzanian government, and Coursera. The report identified that the accessibility of digital technologies and culture, and language were two challenges of implementing MOOCs in Tanzania. The infrastructure of this country was underdeveloped, and the learners' English were not good enough to complete an online course. The strengths were identified from two aspects: the technical infrastructure being created in this area and the existing device (mobile phone) used. The Tanzanian project used Coursera to deliver ICT skills tailored to the Tanzanian job market. Cooperation like this provided the opportunity to increase the education access of MOOCs.

Another example of how MOOCs were used to provide for more diverse students was Computer Science 50 (CS50). CS50 is a popular introductory course on computer science, which was available both on-campus (at Harvard University and Yale University) and online (on EdX) provided by Harvard University in 2015. The Burkina Faso Institute of Technology in West Africa used CS50 as part of the classroom curriculum to support the institution's classroom teaching¹⁷. This example signifies the potential of MOOCs to increase education access for students from remote areas.

The use of MOOCs in the three projects provides a potential way for MOOCs to increase students' education accessibility by serving traditionally disadvantaged students from developing countries or in remote areas.

2.4 Motivations to provide and to learn from MOOCs

Motivation is vital in learning, including e-learning (Kim et al., 2015). The motivation to provide MOOCs comes from the institutions themselves and the staff within those institutions. Students' motivations to enrol in MOOCs are also addressed in this section.

¹⁷ This is from EdX's 2020 Impact report.

2.4.1 Motivation of students

Researchers have widely investigated students' motivations to study in a MOOC. Researchers focused on two kinds of motivations for students: students' motivation to enrol and their motivation to complete MOOCs. Key research is summarized below to illustrate the different findings over time.

Belanger et al. (2013) reported on the development and delivery of the first MOOC from Duke University. The authors investigated students' motivations to enrol in the course using a pre-course and post-course survey with 3576 respondents. The pre-course survey results showed that fun and enjoyment were the most important reasons. Students were given other options to select in the post-course survey. The results showed students were motivated by the following factors in descending order: interest in the topic (87%), extending current knowledge (53%), professional development (44%), interest in how MOOCs are taught (34%), and to supplement other university classes (26%).

In a literature review, similar results were presented by Hew and Cheung (2014). This study reviewed 25 empirical articles published before July 2013 on the topic of students' and instructors' use of MOOCs. Four reasons for students to enrol in MOOCs were found: the desire to learn and extend current knowledge, curiosity about MOOCs or the topic, a personal challenge to complete a MOOC, and obtaining completion certificates.

Xiong et al. (2015) classified students' motivations to sign up for MOOCs into three dimensions: intrinsic, extrinsic, and social aspects. Intrinsic motivation is students' personal interest in participating in MOOCs, including curiosity about the topic and desire for new learning experiences. Extrinsic motivation is the motivation to gain external rewards from learning in MOOCs, including obtaining new skills or credentials. Social motivation includes expectations about the social experiences of connecting with others.

Shapiro et al. (2017) analyzed students' motivation to take or complete a MOOC through 36 interviews. The results show the most commonly mentioned reason was students' desire to learn and extend their knowledge of the topic (92%), coded as 'knowledge motivation' in this research, followed by 'work motivation', as job-related factors were commonly mentioned (64%) by interviewees. The next three motivations were 'for convenience, for fun, for personal interest'. The least-mentioned motivations were 'high-

quality course materials' and 'easier to understand'. This suggests that students did not enrol to gain access to high-quality course materials.

Most of the findings from interviews by Shapiro et al. (2017) reinforced and augmented the findings of Hew and Cheung (2014) and Belanger et al. (2013) findings. One important difference was whether students were motivated by obtaining a completion certificate from MOOCs. Participation in MOOCs to obtain certificates was one of the motivations for students in the Hew and Cheung (2014) study. However, in the other two studies, this was a relatively less evident motivation. Compared with Belanger et al. (2013), the research by Shapiro et al. (2017) had stronger extrinsic motivations and weaker intrinsic motivations.

A more recent study of students' motivation and their completions by Zhang et al. (2019) used students' demographics and motivation as predictors of their completion in a MOOC. Students' responses in a pre-course survey provided data on their motivation. Students were asked to rate the importance of the given reasons on a scale of 1–5 (1 as not at all important, 5 as absolutely critical). Participants ranked 'I have friends taking this course' as the most important reason for them to take this course, followed by 'the MOOC professor', 'the institution', and 'personal interest'. The study suggested that students are more likely to attend the course for social motivation and extrinsic motivations.

However, different findings were reported by Romero-Frías et al. (2020). Correlation analysis was used to explore how students' motivation affected their participation in MOOCs. The results indicate that students with high intrinsic motivation were more likely to accept new technology and be more active in MOOCs. However, extrinsic motivation also plays an important role in achieving the goal of finishing the course and obtaining credits.

To sum up, scholars identified students' motivations to enrol or to complete a MOOC as intrinsic motivation, extrinsic motivation, and social motivation. Studies indicated that intrinsic factors drove all learners to study MOOCs, but not all learners reported extrinsic motivation (Romero-Frías et al., 2020). Students who studied sciences, technology, engineering, and mathematics (STEM) courses may have had stronger extrinsic motivation than students who studied other topics (Shapiro et al., 2017). Intrinsic and extrinsic motivations are not exclusive (Romero-Frías et al., 2020). Students may start

with any of them and develop other motivations during the learning process. Students also study MOOCs for social factors, such as learning with friends or colleagues; however, social factors were relatively less studied but included in some studies (Xiong et al., 2015; Zhang et al., 2019).

For MOOC students, intrinsic motivation includes the pursuit of knowledge: students have the desire to learn more and extend their knowledge on the course topic (Belanger et al., 2013; Hew & Cheung, 2014; Shapiro et al., 2017). Two kinds of personal interest were identified as intrinsic motivations. Students enrolled in MOOCs because they were interested in the course topic (Belanger et al., 2013; Hew & Cheung, 2014) or interested in how MOOCs were taught (Belanger et al., 2013).

Extrinsic motivations include: Professional motivation: students who mainly aimed to acquire related skills for their current or future careers (Belanger et al., 2013; Shapiro et al., 2017). Obtaining a completion certificate: students who participated in MOOCs to get certified or a credential by completing the courses (Hew & Cheung, 2014; Shapiro et al., 2017). Professor or institution motivation: students who signed up for MOOCs because of the institutions or the professor's reputation (Zhang et al., 2019). Entertainment: Students took MOOCs for fun (Belanger et al., 2013; Shapiro et al., 2017). MOOC features: students who took MOOCs because of their flexibility, high-quality materials and free charge (Belanger et al., 2013; Shapiro et al., 2017). Social motivation is the connection motivation: students who enrolled or stayed in MOOCs because their friends or colleagues also enrolled in the same course (Xiong et al., 2015; Zhang et al., 2019).

This subsection reviewed students' motivation to learn MOOCs. The next subsection will review literature focused on why the institutions and the lecturers provide MOOCs.

2.4.2 The motivation of institutions to produce MOOCs

MOOCs are freely available online for students and are provided by worldwide institutions through MOOCs platforms. The motivation for institutions to offer free online courses has been studied by researchers based on the data collected from different geographical locations.

After reviewing literature and interviewing 83 MOOCs experts, Hollands and Tirthali (2014) identified six goals for institutions to develop or deliver or use MOOCs: extending

reach and access; building and maintaining brand; increasing profits; improving educational outcomes; innovation; and research on teaching and learning. Subsequently, Hollands and Tirthali (2014) conducted a further study to examine whether these goals were achieved. The results show that institutions were experiencing partial success in achieving each of these goals except for improving profit.

By analyzing relevant policy and interviewing academic curriculum leaders, O'Connor (2014) identifies institutional promotion and reputation, recruitment and improving market share, and technological developments and innovations as significant considerations for three Australian universities to develop MOOCs. These results are consistent with Hollands and Tirthali (2014) because all of these three factors are included in the six goals they reported.

In the following year, Najafi et al. (2015) investigated why the University of Toronto offered MOOCs by interviewing staff. Contributing to open educational resources (OERs) and engagement with new teaching technology were reported as two major reasons for the university to develop and deliver MOOCs.

Researchers in Norway identified similar motivations. Tømte et al. (2017) highlight five central motivations for adopting MOOCs in Norwegian higher education. These motivations are to strengthen the quality, increase access, market the education and research of higher education institutions (HEIs) and recruit students, increase cooperation, and reduce costs. Compared with research by O'Connor (2014) and Hollands and Tirthali (2014), this research adds 'increase cooperation' as one of the institutional motivations.

Research by Len-Urritia et al. (2018) reinforces those results by collecting MOOCs professors' experiences from Spanish and British universities to understand their opinions about MOOCs' role in higher education institutions. The results show that most of the participants in this study regarded MOOCs as an opportunity to provide highly accessible knowledge for all learners. This study also points out that, although providing free education was identified as an opportunity for higher education institutions (HEIs) to offer MOOCs, this did not seem to be a top motivation for HEIs to do so (Len-Urritia et al., 2018).

In New Zealand, research produced similar findings. Wilson et al. (2014) identify two main benefits for Massey University to offer MOOCs. The initial motivation was to increase the university's visibility and to attract new enrolments by offering a 'taster course'. Another driver was to build the university's capacity to run large-scale courses and expand the course offerings.

According to Rhoads (2015), universities have two main motivations to provide MOOCs. Firstly, higher education institutions' mission to spread knowledge has made it natural for universities to provide MOOCs. Secondly, the increasing competition among international universities has made MOOCs a suitable platform for advertising and recruiting students. The popularity of issuing online certificates to MOOC users is also evidence to support the fact that the universities were using MOOCs as a platform to recruit more students (Rhoads, 2015).

To sum up the research on universities' motivation to offer MOOCs, first, institutions aim to attract new enrolments by increasing the visibility of the institution globally by providing online courses through global MOOC platforms (Hollands & Tirthali, 2014; O'Connor, 2014; Rhoads, 2015; Tømte et al., 2017; Wilson et al., 2014). Second, institutions believe that offering MOOCs helps improve teaching and learning strategies by engaging with emerging teaching technology. These benefits include building the capacity of offering large-scale courses, expanding course offerings (Wilson et al., 2014), improving online teaching and learning skills (Najafi et al., 2015), and strengthening educational outcomes (Hollands & Tirthali, 2014; O'Connor, 2014). Third, another purpose for offering MOOCs is that institutions believe that providing the massive courses may contribute to increasing higher education accessibility by spreading knowledge for learners around the world (Hollands & Tirthali, 2014; Len-Urritia et al., 2018; Najafi et al., 2015; Rhoads, 2015; Tømte et al., 2017). Fourth, a financial reason for offering MOOCs is to increase profit by reducing cost (Hollands & Tirthali, 2014; Tømte et al., 2017); however, this goal was not achieved (Hollands & Tirthali, 2014). Fifth, other research (Hollands & Tirthali, 2014; Najafi et al., 2015; Tømte et al., 2017) indicates that MOOCs can help enrich university staff research fields by providing more research opportunities.

2.4.3 The motivations of MOOCs instructors/lecturers

Instructors play an important role in MOOCs. However, fewer studies have paid attention to MOOCs instructors' perspective than the studies focused on students (Blackmon, 2018). Some research has used surveys or interviews to collect first-hand data from MOOCs instructors to investigate their experiences, motivations, and challenges of developing or teaching MOOCs (Blackmon, 2018; Doo et al., 2020; Evans & Myrick, 2015; Hew & Cheung, 2014; Kolowich & Newman, 2013; Lin & Cantoni, 2018; Najafi et al., 2015; Zheng et al., 2016).

Kolowich and Newman (2013) conducted an online survey with 103 professors who had MOOC teaching experience and interviewed some survey respondents to investigate MOOC professors' attitudes towards MOOCs. One of the survey questions asked about participants' motivation in deciding to teach a MOOC, and respondents could select more than one answer. The result shows 71.8% of responders selected "increase access to higher education", followed by "increase my influence as an instructor (40.8%)", and the third and fourth most popular reasons were "increase my visibility/reputation within my discipline" and "pick up tips to improve my classroom teaching", which account for 37.9% and 36.9% respectively. In addition, 47.6% of responders selected "others", but this article did not report these reasons.

Subsequently, more researchers have focused on this perspective. Hew and Cheung (2014), in their literature review, pointed out three main reasons (being motivated by a sense of intrigue, the desire to gain some personal (egoistic) rewards or a sense of altruism) for instructors offering MOOCs. In the following year, Najafi et al. (2015) surveyed eight MOOCs instructors at the University of Toronto to understand their developing MOOCs experiences. They reported three main motivations of MOOCs instructors: expanding public access to high-quality open educational resources, highlighting the university teaching practices to engage more students, and promoting academic skills.

A larger study by Evans and Myrick (2015) analyzed MOOCs instructors' teaching experience, teaching purposes, and attitudes to MOOCs. These researchers also gathered data through a survey (162 MOOCs instructors from EdX and Coursera) and interviews (five professors). The survey included one question on the "purpose" of teaching MOOCs.

Respondents were asked to use a 5-point Likert-type scale to rank five possible purposes. The authors used a paired-samples t-test to analyse the data collected from respondents: the order of the ranking was 1) To give intellectually curious adults an easy way to learn more; 2) To democratize higher education; 3) to improve professional skills; 4) To promote the university; and 5) To get more exposure for myself as a professor. Purposes 1, 2, and 3 about democratizing higher education and improving professional goals received more support than purposes 4 and 5 related to university showcase and personal benefits, although the first aim is not “increase access to education” as previously reported by Kolowich and Newman (2013).

Similar findings were reported based on data collected from universities in the US. Zheng et al. (2016) conducted interviews of 14 MOOC instructors in the north-eastern US about their MOOCs processes, motivations, and challenges. Four broad types of motivations for instructors to teach MOOCs were reported based on how often the instructors mentioned the theme. The descending order of each motivation was “global impact on students”, “professional growth”, “research opportunities”, and “enhance name recognition”. Although participants had multiple reasons for offering a MOOC, providing more study opportunities for students worldwide and professional improvement were two common motivations for instructors. The “research opportunities” purpose is a new aspect mentioned by instructors as a motivation to offer MOOCs compared with previous studies. Blackmon (2018) used a phenomenography method to examine professors’ reasons, benefits, and challenges for teaching MOOCs at a university in the US. Participants indicated three main reasons to be involved in MOOCs: altruism, research exposure, and the opportunity to experiment with new technology.

In the same year, Lin and Cantoni (2018) explored MOOC instructors’ experience for delivering MOOCs in the field of tourism and hospitality by semi-interviews and reported three personal reasons. In the beginning, the instructors decided to be involved in MOOCs due to institutional pressure. However, their motivations changed over time. The later reasons were to be exposed to new teaching methods and to share knowledge. Lowenthal et al. (2018) categorise MOOCs instructors’ potential motivations into three groups (interest and passion, publicity and marketing, benefits and incentives) in the survey. The results show the interest and passion motivation was the most selected and the benefits and incentives motivation was the least selected by the participants. These findings

suggest MOOCs lecturers are more likely to teach a MOOC out of intrinsic motivations than other motivations.

In a recent study by Doo et al. (2020) using 142 online surveys and six interviews with MOOCs instructors, the researchers found that MOOCs instructors were primarily (86.98% of responses) driven by intrinsic motivation to be involved in MOOCs. The motivation to share their knowledge and skills with others, the desire to serve their community and the public, the interest in new teaching techniques, and the demand to improve their personal development were included. Another three extrinsic reasons also drove MOOCs instructors to teach a MOOC, including institutional goals, more research opportunities, and financial incentives (Doo et al., 2020). The results concur with other literature findings (Blackmon, 2018; Evans & Myrick, 2015; Hew & Cheung, 2014; Kolowich & Newman, 2013; Lowenthal et al., 2018; Najafi et al., 2015). However, Doo and et al. (2020) classify the motivation into intrinsic and extrinsic.

To sum up, there are several motivations for MOOCs instructors. First, the lecturers might want to be personally involved in the process of promoting the accessibility of higher education (Blackmon, 2018; Hew & Cheung, 2014; Kolowich & Newman, 2013) and share their knowledge globally with students (Evans & Myrick, 2015; Lin & Cantoni, 2018; Zheng et al., 2016). Second, MOOCs might increase their reputation and provide personal achievement (Blackmon, 2018; Deng et al., 2017). Third, lecturers might want to gain more exposure to teaching in a new online format they consider will be the future direction in developing tertiary education (Blackmon, 2018; Deng et al., 2017; Lin & Cantoni, 2018). Fourth, the lecturer might be pressured by institutions to develop MOOCs (Doo et al., 2020; Lin & Cantoni, 2018). Fifth, developing MOOCs may provide lecturers with more academic resources and more research opportunities (Blackmon, 2018; Doo et al., 2020). The MOOCs lecturers were primarily motivated by intrinsic motivations (Doo et al., 2020; Lowenthal et al., 2018).

2.5 Research on MOOCs in New Zealand

My search for New Zealand literature did not reveal many studies. The research topics primarily focused on developing MOOCs, MOOCs' effect on higher education, and how technology can be used to support online teaching and learning. Although research

carried out in New Zealand has focused on various topics, no research about the relationship between MOOCs and education access was found, and research on students' and instructors' motivation to provide MOOCs was limited. The only article that studied staff experience was (Wilson et al., 2014). Research on MOOCs in New Zealand is summarized below.

Wilson et al. (2014) conducted research focused on the staff's experiences in MOOCs provided by Massey University on Open2Study. Several benefits and challenges for the MOOC staff were identified. The benefits include improving institutional and personal visibility, enhancing relationships, and transferability in the workplace. MOOC staff's challenges were tight time frames and the gap between their expectations and the reality in terms of format, pedagogy, and support from the system. These findings are consistent with other countries' findings (Evans & Myrick, 2015; Hew & Cheung, 2014; Zheng et al., 2016).

The effect of MOOCs on higher education was investigated by Jacoby (2014) through a literature review. The findings of this review suggested that, although MOOCs might have had a significant effect on several aspects of traditional universities (including evaluating teaching approaches, course delivery methods, certification, and business models), more systematic research is needed to evaluate the level, extent, and permanence of any disruption to traditional ways of teaching that may occur. Other New Zealand research by Shrivastava and Guiney (2014) from the New Zealand Tertiary Education Commission considered the effect of MOOCs' emergence on New Zealand tertiary education and the implications of MOOCs on economies of scale, MOOC providers, tertiary institutions, and individuals. Both opportunities and challenges were presented for New Zealand institutions in offering MOOCs. This research pointed out that offering MOOCs was an easy way for New Zealand tertiary institutions to reach more students globally. However, it may also raise risks for institutions to enrol more students because offering the course online through MOOCs might encourage students to complete free or low-cost courses online rather than attend courses on campus.

Similar findings were reported by Gordon et al. (2014), who studied the development of MOOCs in New Zealand from five aspects (disruptions, open learning, technology and learning, political economy, and learners and learning) by interviewing 15 MOOC

stakeholders. Their article suggests that more collaboration between New Zealand organisations would facilitate better outcomes from offering MOOCs.

Rowan and Hartnett (2019) focused on how MOOCs have been described in the New Zealand public media. This study reviewed 27 newspaper articles published in New Zealand's mainstream media between January 2012 and December 2016 to analyse how MOOCs have been described in New Zealand. This research revealed that MOOCs were considered to be experimental in New Zealand's higher education system. This study also reported that the dominant perspective published by public media was about the role of MOOC in revolutionizing higher education, which was likely to boost the public's acceptance of the changes in existing higher education structures.

Priestley et al. (2019) looked at students' experiences of being engaged in a MOOC filmed in the Antarctic based on data collected from one of the University's MOOCs: *Antarctica: From Geology to Human History*. This research revealed that learners had positive responses to the immersive Antarctic field lectures and completed the course with a new sense of interest in Antarctica's protection. Marshall (2013) analyzed strategic and leadership issues presented by the range of MOOCs and associated activities happening internationally. Marshall (2014) explored ethical issues raised from MOOCs and provided a set of suggestions to address the issues for individuals and institutions. Marshall (2018) examined how traditional higher education is changed by open education. The research focused on how technology and artificial intelligence can be used to improve teaching and learning in MOOCs was also documented (Adham et al., 2016; Khalid et al., 2020; Lundqvist et al., 2020).

To summarize, the research conducted in New Zealand primarily focused on developing MOOCs, MOOCs' effect on higher education, and how technology can be used to support online teaching and learning. None of the studies has considered the following aspects: 1) whether MOOCs increase education access to higher education; 2) lecturers' motivations to provide MOOCs; and 3) students' motivations to enrol in MOOCs.

2.6 Summary

This review has shown that MOOCs' role in improving education access has gone through three stages. In the initial stage, because of their openness, no fees and massiveness,

researchers had great hopes for MOOCs' role in broadening education access to higher education for those who were previously excluded. In the second stage, however, more and more research found that MOOCs contribution was limited since most MOOCs students were well-educated and from developed countries. In recent years, a third stage has emerged in which several MOOCs designed for specific groups were launched by educational organizations through MOOC platforms, which could make MOOCs more likely to increase accessibility to higher education for certain groups. Those MOOCs were designed or used to serve learners with low skills or from developing countries to improve their professional development and enhance their job skills. MOOCs, such as ICT In Primary Education and Computer Science 50, provided underserved learners with an opportunity to access a high-quality course from the world's elite universities.

The literature has revealed two key motivations for universities to produce MOOCs: sharing knowledge and promoting the institution to attract international students.

Multiple motivations were found for MOOCs lecturers to provide MOOCs. Their key motivations can be classified into two categories. The first is for professional reasons: obtaining new teaching skills, sharing knowledge to students globally, and increasing research opportunities, which were found in the previous articles. The second is for personal reasons: curiosity to be involved in new teaching developments and increase their reputation and personal achievement were two key considerations.

There is international literature on institutions and academic staff's motivations to provide MOOCs and research on MOOCs providing accessibility to higher education. However, no such published research was found in New Zealand. It is interesting to consider if a New Zealand university and the staff providing MOOCs have similar or different motivations to their international counterparts. My study will also investigate whether MOOCs increase access for students who are not formally enrolled in tertiary education by investigating the backgrounds of the students enrolled in the MOOCs but with the additional focus of using multiple regression analysis to consider correlations between the countries' development levels and their students' participation rate in the MOOCs.

Chapter 3 Methodology

This chapter describes how the research was accomplished. It outlines the research design and the methods used to collect and analyze the data to examine whether the MOOCs provided by the University help increase education access for those who are traditionally excluded, as well as the motivations of students, the University, and the lecturers in studying and providing the MOOCs. This research took a pragmatic worldview and, as such, used a mixed-method design. The research used quantitative student data collected from the EdX platform and interview data from four MOOC lecturers. The quantitative data were analyzed using descriptive and inferential statistics. The interview data were analysed using content analysis, in which inductive coding and sorting were used to allow themes and conclusions to emerge. This chapter describes the research questions, the research design, and the research setting of this study. Details of data collection methods, the data cleaning procedure, and data analysis are explained. This chapter also discusses the issues and strategies for validity, reliability, and trustworthiness of those research methods and includes consideration of ethical issues.

3.1 Research questions

The overarching research question for this study is:

- Do the MOOCs from the University in this study contribute to increasing education access for those who are traditionally excluded from university education?

Five sub-research questions were developed to explore the overarching research question:

- RQ1: Who were the University's MOOCs students?
- RQ2: Were students from developed countries more likely to enrol in the MOOCs than those from less developed countries?
- RQ3: What motivated students to enrol in the University MOOCs?
- RQ4: What were the MOOCs lecturers' and the University's motivations to provide MOOCs?

- RQ5: To what extent did the MOOCs lecturers cater to the students' diversity?

To address these questions, a mixed-method research design was used. Quantitative methods were used to answer RQ1, RQ2, and RQ3, and the qualitative method used to address RQ4 and RQ5.

3.2 Research design

This research used a mixed-method design to answer the research questions, underpinned by the theory of openness (Jung, 2019). The choice of methods is guided by the nature of the research questions in this pragmatic approach (Creswell et al., 2003).

The theoretical position of this study: MOOCs can be examined within theories of distance education, and one such philosophical theory is that distance education serves students who are not situated to benefit from face-to-face instruction (Holmberg, 2005). Openness is a central theory in distance education, which MOOCs have shown promise to continue. MOOCs have the potential to provide quality education for millions of people because they can provide openness at various levels. Jung (2019) has suggested that the concept of openness, with which knowledge should be shared freely across social status, demographics and geographical borders, can be applied in research on access and equity in distance education (including MOOCs). This study uses the theory of openness in distance education to examine the types of learners enrolled in the University's MOOCs and examine the MOOCs lecturers' motivations to provide the MOOCs.

This research takes a pragmatic worldview, which means that the research method is at the centre of the research rather than the philosophical approach. Morgan (2007) allows researchers to use whatever methods are appropriate to answer the research questions. According to Creswell et al. (2007), mixed methods is "research which involves both collecting and analysing quantitative and qualitative data" (p. 6). It is appropriate to use mixed methods because combining quantitative and qualitative data sources will provide a complete picture through uncovering patterns and correlations, but also providing in-depth knowledge of perspectives (Creswell et al., 2007).

About the case study As the quantitative findings were reported by multiple case studies, a description of a case study is provided. Creswell (2003) defines a case study as

when a “researcher explores in depth a program, an event, an activity, a process, or one or more individuals” (p. 15). Yin et al. (2012) also suggest that a case study can be used to gain a deep understanding of a single case or multiple cases, and the features of the case can translate into a large number of variables. The data from two MOOC courses were available for this research. To explore the University MOOCs students’ characteristics by course, the two MOOC courses’ findings from the quantitative data are presented as individual cases. Each of the two MOOC courses had distinctly different content and different instructors. For each case study, exploratory analysis and correlation analysis were undertaken. The subsequent cross-case analysis provides a summary of the similarities and the differences between the two cases.

The study was undertaken to explore the role of MOOCs from both the perspective of students and lecturers. The two independent MOOCs were examined from both perspectives. Both courses were provided by a New Zealand university on the EdX platform.

Quantitative methods were used to analyze the statistical data provided by EdX for each MOOC. These data enabled the characteristics of the students in the MOOCs to be explored. In contrast, the qualitative method was used to analyze the interviews with MOOCs lecturers. Explanations of how the quantitative research method, the qualitative research method, and the case study research were used in this research are summarized below.

3.2.1 Quantitative analysis

Quantitative research uses mathematically based methods to explain phenomena by collecting and analyzing numerical data (Gunderson & Aliaga, 2005). Creswell (2003) defines the quantitative research method as “a means for testing objective theories by examining the relationships between variables” (p. 4). The quantitative method was used to answer three sub-research questions of this study. These questions are: 1) who were the University MOOCs students? 2) were students from developed countries more likely to enrol in the MOOCs than those from less developed countries? and 3) what motivated students to enrol in the University MOOCs? First, an exploratory analysis was conducted to present an overall picture of the students, such as their academic backgrounds, age,

gender, and motivations to enrol. Research approaches, such as visualization and summary statistics, were used in this exploratory analysis.

Given that exploratory analysis is largely interpretative, multivariate regression analysis was applied to study the statistical validity of the overall intuitive picture. As the data from two MOOCs were available for this study, these quantitative investigations take the form of two case studies. For each case, exploratory analysis and regression analysis are presented separately in Chapter 4.

3.2.2 Qualitative analysis

Qualitative methods seek to answer questions about why and how people behave in the way they do. They provide in-depth information about human behaviour (Gunderson & Aliaga, 2005). Creswell (2003) defines qualitative research as “a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem” (p. 4). Another purpose of this research was to identify the motivations of the MOOC lecturers and the University to provide MOOCs. Thus, the qualitative method of using face-to-face interviews was chosen.

Figure 3-1 displays the three data sources and outlines the research methods used in this study.

Figure 3-1 Outline of the research methods used in this research

3.3 Research setting

This research is based at one university in New Zealand. Different schools within the University provided the two MOOCs. Each MOOC was six weeks in length. According to the courses' guidelines, each course required 2–5 hours of effort per week. Both courses were provided in English.

3.4 Data collection

The research data were drawn from three main sources. 1) MOOCs course data: these data were gathered by the EdX platform from students' responses and activities in the MOOCs. 2) Interview data from four structured interviews of the MOOC lecturers. 3) Country-level data to reflect the relative level of development of the country from data from the World Bank. The data collection process is summarized in the following section.

3.4.1 MOOC course data

The MOOC course data were shared with the University from EdX. Permission to access this data was first sought through an application to the Human Ethics Committee for approval. Permission was sought and given by the appropriate lecturers to access these data. The data files were then provided by the University department that supports the technical aspects of the MOOCs. The two MOOCs were named MOOC1 and MOOC2 in this study. Details of students' data collected from these two courses are described below.

The MOOC1 data were collected from 24 January 2018 to 8 July 2020. The MOOC2 data were collected between 1 April 2019 and 8 July 2020. The data collection period started at the start of each MOOC and ended at the time the researcher accessed the data. The two courses lasted for six weeks and ran once until the researcher accessed the data. However, as the MOOCs were available for students after the end date, some measures, such as the cumulative number of enrolled students, cover a longer period than the duration of the courses. For example, MOOC1 officially finished on 15 June 2018; however, the archival version was available after that.

For each course, the individual-level survey data gathered by EdX (pre-course and end-of-course survey) and the aggregated-level demographic data were used in this research. The pre-course survey asked about the motivation to participate in the course, and most of the questions were multiple-choice questions. The end-of-course survey mainly consisted of open-ended questions, which asked questions related to the course content. For example, some questions asked students to list the most enjoyable part and most challenging content in the course. There were 380 students in MOOC1 and 241 students in MOOC2 who participated in the pre-course survey, making the responding rate of 9.6% and 7%, respectively.

Information about the overall distribution of students' educational backgrounds, gender, and country of origin was aggregated. EdX collected this overall distribution data, and the sample of this data was the number of all enrolled students of that course. The sample was 3964 for MOOC1 and 3423 for MOOC2. Among those demographic files, the country of origin data was used to conduct a more comprehensive quantitative analysis. These data were provided as one aggregated file for each course, containing the number of students from each country that have enrolled in the course until 8 July 2020.¹⁸ This file is the main data input for the regression analysis.

This research analyzed enrolled students' demographic data to answer RQ1 (who were the University MOOCs students) and used the pre-course survey questions to answer RQ2 regarding students' motivations to enrol. The details of the survey questions used in this study are provided in Appendix VI.

3.4.2 Country-level data from the World Bank Development Indicator database

In addition to the data collected from the EdX platform, this study used country-level data collected from the World Bank Development Indicator database (WDI). In this study, the data from the WDI were used to further examine the relationship between MOOC students' participation rates and the level of development of their countries of origin.

¹⁸ This is the date on which I collected the data from the department that ran the MOOCs.

These data were used as independent variables in the regression analysis. Detailed information about the process of this data collection is shown in Appendix I.

Variables, including population, GDP per capita, and other control variables, were collected for 2018, which was the first year the MOOCs were offered. To this end, this analysis also fixes the independent variables as the value from 2018 to match with the enrolment data.

Both MOOCs data and WDI data have the country name column and country alpha3 column available to be used as the identifier to merge the two data sets. However, there are some inconsistencies in the country name column, which are caused by abbreviations of countries' names or the upper or lower case of the country names. To avoid this, the MOOCs data were merged with the WDI data by the International Organization for Standardization (ISO) country alpha3¹⁹, which is a reliable standardized country name classification to ensure a high quality of merge. Thus, it was possible to merge the students' data with the country-level data provided by the WDI.

3.4.3 Interview data

3.4.3.1 Selection and recruitment of the interview participants

The MOOC lecturers also provided data for the study. The University EdX website shows that there are usually two lecturers for each MOOC. There were nine lectures in total for six completed MOOCs by 1 November 2019, as some MOOCs have the same lecturers. All nine lecturers were invited to participate in this research via email. One email address provided on the University website was invalid. The lecturers from the two MOOCs replied and accepted the interview invitation, three lecturers from MOOC1 and one lecturer from MOOC2. The lecturers who were willing to be interviewed were from the same courses with the quantitative data I accessed. I conducted a face-to-face interview with each of these participants to gather the qualitative data.

¹⁹ ISO alpha-3 codes are three-letter country codes defined in the ISO.

3.4.3.2 Data collection

Each of the four interviews was audio-recorded and transcribed with the informed consent of the participants. The consent form is provided in Appendix IV. Three of the face-to-face interviews were conducted in the lecturers' offices, and each interview lasted from 35 to 60 minutes. One interview was conducted online via ZOOM at the lecturer's request. Questions were prepared before the interview, and several open-ended follow-up questions were asked in each interview based on the interviewees' responses. The interview question sheet is attached in Appendix V. The face-to-face interviews were transcribed by me from the recorded audios; the online interview transcript is from ZOOM online recording and transcription. All transcripts were checked by my supervisor and me.

This research collected the quantitative and qualitative data from three data sources: MOOC course data provided by EdX, interview data from four structured interviews, and country-level data from the World Bank's WDI database.

3.5 Data cleaning procedure

3.5.1 The EdX data cleaning

It is important to bear in mind that the MOOC data from EdX, like all other survey data, inevitably contain some data errors; thus, it requires comprehensive cleaning before interpreting the results.

The raw data do not come in an analysis-friendly format, particularly the multiple-choice questions in the course surveys, including the pre-course and post-course surveys. The final data used in the analysis were a combination of information from the CSV format data and the SPSS format data. The data provided by EdX were used in the exploratory analysis. The visualization and summary statistics were used to explore the overall demographic patterns of the students. The SPSS data format had detailed coding of the full question and each question's choices, but the CSV format was more user-friendly for analysis. Hence, I combined the analysis-friendly characteristics of CSV data with the full

coding information of SPSS data²⁰. Thus, the main content of the data was collected from the CSV format data and information about the survey questions, including the multiple-choice questions, was from the SPSS format data.

The multiple-choice questions came from the EdX system in what is known as a wide format. The respondent could choose more than one item for the multiple-choice questions, and the non-choice options were recorded as missing values. For example, if the question had five choices, it was recorded as five separate columns in the EdX raw data. These wide-format data are not suitable for visualization and summary analysis. Therefore, the wide-format data were transformed to the long-format data, which only has one column for each multiple-choice question.

Specifically, I made the EdX data more convenient for analysis in the following ways. The survey was transformed from a wide format to a long format. The choices of the questions were recorded in multiple columns, such as Q29_1, Q29_2, Q29_3. If the participant chose the first choice of Q29, the Q29_1 would be recorded as 1. Otherwise, it would be recorded as missing for Q29_1. I changed this wide-format data into long format data, which are more friendly for data analysis. I also recovered the full content of the survey from the SPSS dataset. We do not directly have the surveys' full content, as the survey was not available after the course had been archived. I managed to recover the full names of the questions and the choices that were recorded in the SPSS format data, which was made available by the variable view functionality of SPSS. In the visualization and calculation of summary statistics, the numerical style variable names were recorded as the content of the question's question and choices, which was appropriate for the analysis.

3.5.2 Country-level data cleaning

The country-level data were used as dependent variables in the regression analysis. A reasonable approach to deal with the influence of the main dependent variable's extreme values is to test the regression results' consistency using the log version and the decile version of the participation rate. Those techniques are widely used in the literature that

²⁰ This is facilitated by the variable view functionality of the SPSS. The full coding information of each question is recorded in this variable view.

uses quantitative methods in many different subjects (Adams Jr, 2004; Kyser et al., 2012; Smith & Smith, 2005; Waldron, 2013).

I followed the process used by Stock and Watson (2015) and Wooldridge (2010) to perform the data cleaning process. In the case of duplicates, I removed the repeated observations in my sample. In the case of missing values, I explained whether I had included the missing values in the analysis when I did the exploratory analysis. For the outliers, I used log transformation and decile transformation to mitigate the influence of extreme values.

3.5.3 Interview data cleaning

To make the quotes readable in the findings, I edited the interview quotes when presenting the findings (Anderson, 2010); for example, the colloquial expressions and irrelevant information in the interview transcripts were removed. In the presented extracts, [...] indicates that some text has been removed. Inappropriate tenses were converted to appropriate ones where needed. Where the tense changed, [] with explanations were provided, such as [ed], [es].

3.6 Data Analysis

3.6.1 Quantitative data analysis

Exploratory analysis is utilized first to depict the general picture of the sample. Multivariate regression is then used to assess the statistical power of the main findings (Stock & Watson, 2015).

3.6.1.1 Exploratory analysis

Summary statistics and correlation analysis were used to conduct exploratory analysis. The main function of the exploratory analysis is to visually and intuitively display the sample used in this study and show the relationship between variables of interest. One limitation of the exploratory analysis is that it is difficult to evaluate the statistical significance, and it does not control for the effect of other variables, so this analysis was supplemented by regression analysis described in the next section.

Visualization

To achieve an overall picture of the students' demographics, different visualization techniques were applied to show the general composition of students' educational background, gender, age, and other demographics.

Summary statistics

The summary statistics were used to depict the general tendency of the data, which serves as the main tool to develop the basic hypothesis of this research before more complicated statistical techniques were used. For continuous variables, the research uses the mean, standard deviation, minimum, and maximum value in the analysis. The mean is used to find the data's overall tendency, while the other three statistics measure the data's dispersion, showing the range of the sample data. The frequency of the categorical variable is reported.

Correlation table

In the correlation analysis, a Pearson correlation coefficient was used to measure the linear relationship between every pair of variables, such as the GDP per capita and the participation rate. Pearson correlation coefficients measure the linear relationship between two variables and can be used to depict the mutual tendency of two variables (Taylor, 1990). It has a value range from $[-1,1]$. For example, Pearson's correlation of 0.9 suggests a very strong and positive relationship between two variables, whereas 0.3 is a relatively weak relationship.

3.6.1.2 Regression analysis

The analysis described in the previous section was exploratory and interpretative in nature and lacked the support of statistical power. After the exploratory analysis, multivariate regression was used to test the factors that influence the two MOOCs' country-level participation rate. Regression was selected for its reliability and validity in assessing the statistical significance. Regression analysis is different and more powerful than exploratory analysis in several respects. First, multivariate regression analysis differs from exploratory analysis in that it uses statistical inferences to evaluate the reliability of the results. Second, multivariate regression identifies the effect of a variable of interest while controlling for the other variables' influence. This is hard to achieve in exploratory analysis techniques, such as visualizations (Stock & Watson, 2015;

Wooldridge, 2010). Since the exploratory analysis is limited in controlling multiple factors, the results from the exploratory analysis were complemented with regression analysis to further explore what factors could influence the participation rate at the country level and depict a more comprehensive picture of the students for the two MOOCs.

The regression analysis consisted of three parts. The first part was the data cleaning. This study used the traditional statistics method to carry out data cleaning, including cleaning outliers, missing values, and duplicates (Stock & Watson, 2015; Wooldridge, 2010). The second part was the multivariate regression analysis, which was used to measure the influence of the variables of interest, such as GDP per capita, on the participation rate in the MOOCs at the country level. The final part was a robustness check. This check used different methods and definitions of variables by changing them to decile ratings to further evaluate whether the main conclusion from the previous multivariate regressions was robust, enhancing the main conclusions.

Multivariate regressions

The regression analysis explored the country-level factors that influenced the participation rate of each country. The main regression was specified as follows:

$$Participationrate = \alpha + \beta GDPpercapita + controls$$

Participationrate is the country-level participation rate (the number of students enrolled in the MOOC divided by the population of that country). This research employs country-level independent variables to explain the participation rate in MOOCs. The main variable of interest is *GDPpercapita*, which is an overall indicator used to measure the development level of each country. This allowed the relationship between the number of students enrolled in the two MOOCs and their origin countries' development level to be tested.

As two MOOC course data were available, two separate cross-sectional regressions were run. The only difference between those two regressions was the participation rate. All the independent variables were the same. One advantage of running the two regressions separately was to examine whether similar results were shown in two courses and, therefore, to check the results' robustness.

The decile version of the participation rate in the main regression was used to mitigate the influence of the outliers. This technique is widely used in regression setting to exclude the extreme values' influence in many subjects (Adams Jr, 2004; Kyser et al., 2012; Smith & Smith, 2005; Waldron, 2013). For the countries in the top 10% of the participation rate, a value of 10 was assigned. For the countries in the bottom 10% of the participation rate, a value of 1 was assigned. Thus, the participation rate ranged from 1 to 10. In the robustness check, a log version of the participation rate was used to mitigate the influence of outliers. The results were not sensitive to the form of the dependent variable, suggesting the robustness of the main conclusions.

Given the wide range of students in the two MOOC courses and the country-level data's availability, different aspects of the country, such as overall economic development, innovation activity, and other factors, could be controlled. Overall, these control variables can be classified into three categories. (1) Participation in the MOOC course depends on the Information Technology (IT) infrastructure and the communication technology because literature has shown the importance of IT infrastructure for developing a country. Following Lee et al. (2011) and Prieger (2013) and using the conventions of other published studies, the number of fixed broadband (*Broadband number*) and mobile phone (*Mobile number*) were used to represent infrastructure development in each country. (2) Besides the infrastructure, the level of innovation in a country might also influence the MOOC participation rate, as MOOCs are regarded as a new teaching innovation (Yuan & Powell, 2013) and the patent system has been shown as an indicator of economic growth by Lerner (2002). The number of patents (*patent number*) can be taken as a proxy for innovation in each country. (3) The development of the financial market is an important input for a country's overall development. Hsu et al. (2014) show that the financial market has influenced technological innovation in many countries. MOOCs have also been regarded as an important innovation activity. Thus, the financial market should be included in the regression. Following Estrada et al. (2010), the number of ATM machines (*ATM number*) was used to measure the financial development of a country. The financial development variable was also controlled, as it is an important dimension of a country's development.

The limitation is that the regression analysis variables might not always be the best measure of some aspects of the country. However, the measures used in the regression

are widely available for many countries and comparable among countries. In the data sample, the control variables are available for more than 100 countries. Those variables have a wide coverage to measure the different aspects of the development of a country and give more statistical power for inference (Stock & Watson, 2015; Wooldridge, 2010).

Robustness check

In the robustness check, the log form of the participation rate is used to mitigate the influence of the outliers, which is a widely used practice in quantitative analysis literature (Stock & Watson, 2015; Wooldridge, 2010). The log form has many desirable statistical attributes and increases the statistical power of the regression (Russell & Dean, 2000; Von Eye et al., 2012). Essentially, in the robustness check, the decile version of the participation rate was changed to the log version in the benchmark analysis to mitigate the outliers in the data.

3.6.1.3 The individual case study analysis

Two individual case studies are used to present the quantitative findings. There are two sub-sections for each case. The first sub-section details the exploratory analysis, which answers RQ1 (who were the University MOOCs students?) and RQ3 (what motivated students to enrol in the University MOOCs?). The second sub-section is a correlation analysis aiming to answer RQ2 (were students from developed countries more likely to enrol in MOOCs?). The details of the quantitative data analysis are provided in 3.6.1 quantitative data analysis.

A cross-case analysis is provided after the individual cases to find the similarities and differences between them. This comparison analysis is used to draw the conclusion of the quantitative findings by summarizing the similarities and identifying the differences.

3.6.2 Thematic qualitative data analysis

The qualitative data were collected by interviewing the University MOOC lecturers. Thematic analysis was applied to answer RQ4: what were the MOOCs lecturers' motivations to provide the MOOCs? and RQ5: To what extent did the MOOCs lecturers consider the students' diversity?

The thematic analysis focuses on examining themes or patterns of meaning within data (Daly et al., 1997). The thematic analysis not only helps researchers to understand the shared experiences and meanings for individual data but also allows analysis of meaning across the entire data set (Braun & Clarke, 2006, 2012), including the various lecturers involved with the two MOOCs.

One of the aims of this study was to identify, from individual interviews, MOOC lecturers' motivations to provide courses. To address this aim, I explored the participants' experiences and stories through the interview data and looked for similarities and differences using thematic analysis.

According to Braun and Clarke (2006), there are six key steps (as shown in Figure 3-2) to using thematic analysis. The following analysis shows how this method was used in this research.

Figure 3-2 Six key steps to use thematic analysis (Adapted from Braun & Clarke, 2006)

The procedure starts with familiarization. In the first phase, the researcher is required to read and re-read all data materials thoroughly to become familiar with the data. This step allows the researcher to have an overall idea about the data and pay specific attention to where patterns occur. This study used two methods to become familiar with the data. First, I transcribed the audio recordings to text manually rather than using an external transcriber. This action allowed me to have a better understanding of the data. Then, I read and re-read the transcripts thoroughly to gain a general idea about the data.

The next phase was to start coding, which means assigning preliminary codes to the data to describe each interview transcript's content. I took notes and highlighted information related to research questions in each transcript. This helped me to understand how the data answered the research questions. Table 3-1 shows some samples of coding the qualitative data. The interview extract was from the edited transcripts.

Table 3-1

Sample of coding qualitative data

Coding qualitative data

Interview extract	Codes
<p>We should share with [learners] who do not have access to higher learning facilities. I am very proud that my MOOC reached 144 countries. It means that those people from Africa, India, South America are also able [to learn the course] even from their phones. That is really important.</p> <p>It [teaching a MOOC] feels more like a mission than a career. It's really personally important to us to share these ideas.</p>	<ul style="list-style-type: none"> • Share with learners • Attract global students • Increase higher education access for students who are traditionally excluded • Mission rather than a career • Personally important • Share these ideas
<p>MOOCs are a kind of tool, would hopefully attract students to want to study at the University. So, it must be around marketing and profile for the University.</p> <p>It [offering MOOCs] is a good way to put the University on a global map and draw students to NZ.</p> <p>I think they did it because they want to have a name internationally.</p> <p>I think it was entirely advertising, and maybe we get more international enrolments.</p>	<ul style="list-style-type: none"> • Attract students to study at the University • Highlight the profile of the University • Advertising of the University

The next step was generating themes from the codes by searching patterns or meanings across the data set, so this phase entailed combining codes into themes. Deductive and inductive approaches are two common ways that researchers use in this step. A deductive approach to data coding and analyzing is a method where the researcher brings up some concepts, ideas, or topics to code and interpret the data. In contrast, an inductive approach is an approach where the researcher finds what is in the data by coding and analyzing it (Braun & Clarke, 2012). For this research, both approaches were used. I had some identified themes from the literature review that I expected would be reflected in the data. New themes generated from the data were also added to the findings. Table 3-2 shows some samples of the process of turning codes into themes.

Table 3-2

Sample of turning codes into themes

Turning codes into themes

Codes	Theme
<ul style="list-style-type: none">• Attract global students• Attract students to study at the University• Draw students to NZ	Attract students
<ul style="list-style-type: none">• Highlight the profile of the University• Advertising of the University• Marketing and profile for the University	Promote the University
<ul style="list-style-type: none">• Share these ideas• Mission rather than a career• Personally important• Share with learners	Desire to share knowledge

Once the themes were generated, the next step was to review them. This is a crucial step to help me check that the data supported all themes. Duplicated themes were merged into

one and inappropriate themes were renamed or removed. This process ended when I was satisfied with all themes.

The next step was defining and naming themes. The name of each theme was important because it not only showed the meaning of the theme but also helped readers understand the data.

The last step was producing the report. The qualitative research findings are presented in Chapter 5 in this research.

3.7 Validity and Reliability

This section discusses the validity and reliability of the data analysis.

3.7.1 Validity and reliability in quantitative data

Validity and reliability are used as quality measures in quantitative data. Validity is defined as the extent to which a concept is accurately measured (Golafshani, 2003). Reliability refers to the consistency of a measure (Heale & Twycross, 2015). Consistency for quantitative research refers to the replicability or repeatability of results or observations (Golafshani, 2003).

The variables of interest in the data are measured on ratio scales and Wampold and Drew (1990) state that, in this case, the Pearson correlation can be used to infer relationships. They also suggest that Pearson's correlation is a reliable way to examine the linear relationship between variables. Field (2013) also recommends using regression analysis with the ordinary least square method as a reliable way to understand relationships in quantitative data better. This study used Pearson's correlation to measure the linear relationship between variables and regression analysis to test the factors that influence the country-level participation rate of two MOOCs. These analyses were a way to understand MOOCs' role in improving access for students who would not normally have access to higher education. Nick (2007) recommends using descriptive statistics to estimate the characteristics of the population. This research used descriptive analysis to explore the students' demographics that enable this study to identify students' groups in the University MOOCs.

3.7.2 Validity and reliability in qualitative data

Trustworthiness is used as a measure of quality in qualitative data analysis (Lincoln & Guba, 1985). Lincoln and Guba (1985) suggest four essential criteria to ensure the quality of qualitative research. These are transferability, confirmability, dependability, and credibility.

In the interpretive paradigm, trustworthiness issues tend to be addressed, or at least partially addressed, during the process of the research (Lincoln & Guba, 1985; Maxwell, 1992). The researcher needs to consider the transparency of the data. I did this by including direct participant quotes. I also provided a sample of the analysis process in Table 3-1 and Table 3-2. Participant verification was not undertaken through member checking because the participants all reported that they were very busy and had little time to spare. However, triangulation among the four participants, and to some extent with the quantitative data, was undertaken. As this was student research, there were frequent discussions with my supervisor to ensure the interpretations were credible and peer-reviewed. The findings were reviewed by my supervisor and another researcher who was familiar with this field to ensure all findings were generated based on the data rather than my personal opinions. I also discussed this research with the University's Student Learning advisers to ensure the meaning of the findings and interpretations were what I wanted to convey. This helped mitigate the issue of my personal bias.

Every effort was made to ensure the trustworthiness of the quality of the qualitative findings through the data collection, data analysis, and presentation of the findings.

3.8 Ethical considerations

The data collection methods, especially the interviews, in this research design raises several ethical issues. According to Wang and Geale (2015), ethics are defined as a "set of responsibilities in human relationships, that cover dignity, privacy and well-being of participants" (p. 197). Ethical considerations are significant when collecting and investigating the data. Before conducting the research, an application was submitted to the Human Ethics Committee of Victoria University of Wellington and approved. The ethics approval number is 28314. A formal letter of approval is attached in Appendix II.

For the MOOCs course data, permission from each MOOC's lecturer was sought and granted to use the course data from their MOOCs. Students' privacy and identifications have been protected with the use of data from the students according to the EdX platform privacy policy²¹. Aggregated data were provided by the University to the researcher. No identifiers were included that could identify any single student. Additionally, when presenting the data in the exploratory analysis, this research focuses on the aggregated data, such as the summary information of the student sample. This ensures the confidentiality and privacy of individual students.

The lecturers were volunteers, but due to the small number of them involved, it may not be possible to keep their identity totally confidential. However, every effort was made not to reveal their identities. The MOOC lecturers gave informed consent to use their MOOC course data for my research. Extra care was taken to ensure the University, the participants, and the courses were not identified. The course names and the lecturers were kept confidential to avoid their identification in the findings. This study presents the participants from MOOC1 as Lecturer A, Lecturer B, and Lecturer C, and the participant from MOOC2 as Lecturer D. However, they have been informed that they may be identified in the specific community due to the small number of candidates.

The data from WDI were used in the regression analysis; the analysis was conducted at the country level and relied on public data from the World Bank. No ethical issues were raised in using these data.

3.9 Summary

This chapter has established the appropriateness of using a mixed research method to explore the research questions. In this chapter, the research questions are presented, with their alignment with the research design. The research setting, the data collection methods, the data cleaning procedure, and data analysis approaches are described. This

²¹The source of this information is from EdX website <https://www.edx.org/edx-privacy-policy>.

chapter also discussed validity, reliability, and ethical considerations for this mixed research. The quantitative findings will be presented in the next chapter.

Chapter 4 Findings from the students' perspective

4.1 Introduction

This chapter reports findings from the quantitative analysis of the two MOOCs researched for this study. The two MOOCs are presented as separate case studies and there are two parts for each case. The first part of each case is the exploratory analysis, which identifies the students' demographics in the course. Visualization and summary statistics are used to explore the demographics of the enrolled students, including education background, age, and other important aspects. As the results show that most of the students came from developed countries, a regression analysis was done to further explore whether students from developed countries are more likely to attend the MOOCs by adding more control variables. Regression analysis can more accurately study the factors that influence the enrolment rate than exploratory analysis. For the data from the regression analysis of each course, a correlation table and multivariate regression were used to ascertain the factors that influence the participation rate in the MOOC course. The similarities and differences between the two MOOCs are provided at the end of this chapter.

4.2 Case study of MOOC1

4.2.1 Exploratory analysis

This subsection analyzes the students' demographic data and the pre-course survey question to identify MOOC1 students' characteristics, including their educational backgrounds, age, countries of origin, gender, and motivations. This subsection answers two research questions. The first question is who are the students of MOOC1 and what are students' motivations to participate in this MOOC? All figures in this subsection display the information for students enrolled between 24 January 2018 and 8 July 2020. The total number of students enrolled in MOOC1 was 3964.

4.2.1.1 Educational backgrounds

One question of primary interest in this research is whether the MOOC courses have increased education access; hence, the most relevant information is students' education

backgrounds. The following two figures report the percentage of students with different academic qualifications and the number of students in each group, respectively.

In terms of students' educational backgrounds, most students had a master's or bachelor's degree. Figure 4-1 displays the students' education composition of MOOC1 in descending order for all students with educational information. Two-thirds of the students were holders of master's and bachelor's degrees.²² Those with secondary school qualification rank third.

Figure 4-1 Pie chart of students' educational backgrounds for MOOC1, 2018–2020

Figure 4-2 shows the frequency distribution of students' education in descending order.²³ There were more than 800 students with a master's degree, 717 students with a bachelor's degree, around 250 students with a secondary school qualification, 136

²² The missing values are removed in the pie chart to best display the proportion of different educational backgrounds.

²³ The missing values were kept in Figure 4-2 (the final category in the graph).

students with a doctoral degree, and 93 with an associate degree. There were few students with junior secondary qualifications (17 responses), primary qualifications (5 responses), or who did not have any educational qualification (6 responses). More than 1500 students chose not to provide this information, shown as 'NA'.

Figure 4-2 Frequency distribution of students' academic qualification for MOOC1, 2018-2020

4.2.1.2 Age

Figure 4-3 displays the age information for MOOC1 students. For the declared age, MOOC1 attracted students from a wide range of age groups. Two points need further explanation. First, the age distribution was almost a normal distribution, suggesting MOOC1 attracted a broad audience of people of different ages. Secondly, the largest group of students was born between 1980 and 1990, making them 30 to 40 years of age.

Figure 4-3 Students' age distribution for MOOC1, 2018–2020

4.2.1.3 Country of origin

Students in MOOC1 came from a diverse range of countries. As MOOC1 students were from more than 100 countries, Figure 4-4 only lists the top 20 countries. The top 20 countries in the figure were either developed countries or countries with a large population base. For MOOC1, the US and New Zealand, the top two countries, attracted 1131 and 690 students, respectively. Canada, the UK, Australia, Brazil, and India are among the second group, with 100 to 200 students from each country. The number of students from the remaining countries is relatively less (equal to or less than 50). One

hundred eighty-three unspecified students preferred not to tell their country of origin and selected 'UNKNOWN'.

Figure 4-4 Distribution of students' country of origin of MOOC1, 2018–2020

4.2.1.4 Gender

Figure 4-5 plots the cumulative number of students in different gender groups from 2018 to 2020. First, in terms of the gender composition of the students, it appears there were more females than males enrolled in MOOC1. Of the gender responses that were given, other gender ranks third in this figure. Second, the gap between the number of female students and male students increased over time, suggesting more female students enrolled in MOOC1 starting from 2020. A group of around 1500 students did not specify gender, which shows as 'unknown' in Figure 4-5.

Figure 4-5 Gender distribution for MOOC1, 2018–2020

4.2.1.5 Cumulative total number of students enrolled in MOOC1

Figure 4-6 reports the total number of students enrolled in MOOC1 from 24 January 2018 to 8 July 2020. In total, there were 3964 enrolled students cumulatively. The slope indicates the growth in the enrolled students. The rate of increase in the enrolments was stable for most of the time since 2018. However, during the New Zealand nationwide COVID-19 lockdown in 2020, interestingly, the slope of this increase increased compared with 2019 and the first few months of 2020. As shown in Figure 4-4, New Zealand was the second largest country of origin of MOOC1.

Figure 4-6 Cumulative total number of enrolled students for MOOC1, 2018–2020

4.2.1.6 Students' motivation to enrol in MOOC1

Figure 4-7 provides data on the different motivations that students reported to enrol in MOOC1. In the pre-course survey of MOOC1, there was one multiple-choice question about why students took this course. The following figure was developed by counting how many times each reason was selected by the students.

Figure 4-7 Students' motivations for MOOC1, 2018–2020

In terms of the motivations for enrolling in MOOC1, 'Increase in knowledge and skills in a new area' was the most frequently mentioned reason (224 responses), followed by 'to better serve my community' (154 responses). The following reasons were mentioned with high frequency in their answers: 'curiosity about this topic' (137 responses), 'to engage in lifelong learning' (121 responses), 'personal challenge' (119 responses) and 'review of concepts in a field I have previous studied' (106 responses). For MOOC1, employment and job advancement were not among the top motivations to study this course. Employment and job advancement opportunities only ranked 7th with 78 responses in all 13 motivations listed in the survey. The reason 'to access learning opportunities otherwise not available to me' ranked 8th with 76 responses.

4.2.1.7 Verification purpose

Students can either study the MOOC for no charge or pay a small amount of money (49 US dollars) to get a verified certificate for the course on EdX. Students who paid for the verified certificate for MOOC1 were identified as having a verification purpose in this study. Figure 4-8 plots the cumulative percentage of students with a verification purpose in MOOC1. For MOOC1, the percentage of students with a verification purpose only

reached as high as 10% when the MOOC was fully opened in 2018. When the MOOC turned to the archival version, this naturally declined.

Figure 4-8 Ratio of verified students for MOOC1, 2018–2020

4.2.2 Regression analysis

The analysis in the previous section was exploratory and interpretative. The conclusion from the previous analysis is not adequate to reach a reliable statistical conclusion since the statistical inference is absent. This multivariate regression complements the previous exploratory analysis and provides more power in the statistical analysis. The statistical analysis in this section thus could further check the reliability of the findings in the previous section. There are four parts of the statistical analysis:

- The summary statistics show the overall characteristics of the variables used in the regression.
- The correlation table measures the linear relationship between each independent variable and the participation rate of each country.
- The main regression further controls the influence of a group of variables together.

- The robustness check explores the reliability of the results in the main regression.

4.2.2.1 Summary statistics

Table 4-1 reports the summary statistics of the main variables used in the multivariate regression analysis. The table lists the number of non-missing observations for that variable (Obs), mean, standard deviation, minimum value, and maximum value of each variable. For brevity, the numbers have been rounded into the closest integer. The 0 means the value of that variable is less than 1. Since the regression uses the same set of control variables to run the regression for MOOC1 and MOOC2, the summary statistics are only reported here. A detailed definition of those variables is provided in Appendix I.

The sample covers 112 countries for MOOC1 and 142 countries for MOOC2. As the number of students enrolled in each course is not normally distributed but highly skewed, the decile version was used to facilitate reliable regression analysis. After this transformation, the participation rate ranged from 1 to 10. Countries within the top 10% of the participation rate were assigned a value of 10, while one was assigned to countries that fall into the bottom 10% of the participation rate. For brevity, the summary information of MOOC2 is also listed here since the same control variables are used for both MOOC1 and MOOC2.

Table 4-1

Summary statistics table for both MOOC1 and MOOC2

Variable	Obs	Mean	Std. Dev.	Min	Max
MOOC 1 participation decile	112	5	3	1	10
MOOC 2 participation decile	142	5	3	1	10
GDP per capita	138	18	22	0	85
Fixed broadband	130	16	14	0	45
Mobile subscriptions	130	114	31	43	209
Patent applications	97	23645	146641	1	1393815
ATM number	120	55	41	2	169

Note. The sample covers from 2018 to 2020. The MOOC variable comes from the University MOOC. The other variables are collected from the World Bank's World Development

Indicator database (WDI). The observation (Obs) represents the number of non-missing country-level data for that variable.

The countries vary in their economic development, as evidenced by the GDP per capita and infrastructure. In terms of the overall economic development, the maximum GDP per capita value is US\$85,000, while the minimum is less than US\$1000. In terms of the fixed broadband subscriptions (per 100 people), the maximum value is 45, while the minimum value is smaller than 1. For the Automated Teller Machines (ATMs) (per 100,000 adults), the maximum and minimum values are 169 and 2, respectively. For the measure of the patent application, the difference is even more considerable. Overall, there are variations of the sample in term of economic development, infrastructure, and financial developments.

As indicated by the wide dispersion of the independent variables, the sample covers countries in different phases of development, suggesting that the two MOOCs provided by the University have reached a wide range of countries internationally. It is important to note that there is a wide availability of measures used in the regression analysis. Most independent variables are available for more than 120 countries. Even the patent application is available for 97 countries. According to statistical theory (Stock & Watson, 2015; Wooldridge, 2010), the large sample gives the regression more statistical power, which makes the sample suitable to conduct the multivariate regression in the later section.

4.2.2.2 Correlation table

This section will use correlation analysis to explore the linear relationship between participation rate and each independent variable separately. This section will report the Pearson's correlation coefficient of the variables used in the regression. The correlation coefficient ranges from $[-1,1]$. This analysis can serve as the preliminary analysis to show whether each independent variable has a linear relationship with the participation rate of each country. The limitations of the correlation coefficient are that it can only measure the linear relationship without controlling the other variables' influence. A negative correlation coefficient means the two variables are negatively correlated and the increase of one variable will cause a decrease of another. For example, a coefficient of -1 means

two variables are completely negatively related. A positive correlation coefficient means the two variables will change in the same direction.

Table 4-2

Correlation table of MOOC1

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) MOOC 1 participation decile	1.00					
(2) GDP per capita	0.63***	1.00				
(3) Fixed broadband	0.61***	0.82***	1.00			
(4) Mobile subscriptions	0.25*	0.26*	0.31**	1.00		
(5) Patent applications	-0.20	-0.02	0.13	0.02	1.00	
(6) ATM number	0.38***	0.37***	0.55***	0.28*	0.18	1.00

*Note. The number in each cell is the Pearson correlation coefficient, which ranges from [-1,1]. The significance level is indicated as follows: *** $p < .01$, ** $p < .05$, * $p < .1$.*

Table 4-2 reports the correlation matrix. Each number in this table measures the Pearson's correlation coefficient of a variable in the rows and a variable in the columns. Two points merit further explanation to interpret this table. Firstly, the variable name in the first row is represented by its number. For example, the (3) in the first row represents the variable (3) Fixed broadband. When row (3) Fixed broadband intersects with column (3), it measures the self-correlation of fixed broadband, which explains why it has a value of 1. This is also the reason all the diagonal elements are 1. Secondly, as the correlation matrix is symmetrical, the repeated correlations are omitted.

To sum up, most of the country-level development measures have a positive correlation coefficient with the dependent variable of the participation rate of MOOC1, suggesting that countries with higher overall development are likely to have increased participation in MOOC1. For MOOC1, there is a positive and strong correlation ($r=0.63$, $p<.01$) between GDP per capita and country-level participation rate, suggesting that students from countries with better overall economic development are more likely to participate in MOOC1. Besides, the correlation coefficient between fixed broadband and participation rate is almost the same ($r=0.61$, $p<.01$), suggesting the development of internet-related infrastructure will facilitate enrolment in MOOCs. The relationships between the participation rate and the mobile subscriptions and ATM number are moderate, which

are below the correlation coefficient of 0.4. The patent applications and the participation rate have a negative correlation coefficient at -0.20 and is significant at the 10% level, suggesting the patent application number might decrease the participation rate in MOOC1.

4.2.2.3 Main regression

This section uses multivariate regression to study the relationship between the country-level participation rate and country-level development measures. This multivariate analysis's main purpose is to further test whether the relationship suggested in the previous correlation analysis section is still statistically significant after controlling other variables. Particularly, the main variable of interest is the relationship between the participation rate of each country and its GDP per capita, as GDP per capita is the most commonly used indicator to measure the overall development of a country. This will shed light on the question of whether MOOC1 contributes to increasing education access.

Table 4-3 reports the results of the multivariate regression for MOOC1. The country-level Ordinary Least Square (OLS) regression of the participation rate of MOOC 1 on GDP and other control variables. The dependent variable is the decile of the participation rate. For the countries in the top 10% of the participation rate, a value of 10 was assigned and for countries in the bottom 10% of the participation rate, a value of 1 was assigned. This is a cross-sectional regression. The GDP and infrastructure development emerge as important factors that influence the participation rate for MOOC1. This also accords with the findings in the previous exploratory analysis and correlation matrix. The coefficient for the GDP is statistically significant from the univariate model (1) to the full model (5), suggesting that GDP is closely related to the participation rate in a general sense. In the full model (model 5), the coefficient for GDP is 0.032, which is significant at the 5% level, showing students from a country with higher GDP might be more likely to enrol in MOOC1. Also, fixed broadband is positively related to the participation rate, suggesting that good internet infrastructure can increase the participation rate of MOOC1. The coefficient is 0.08, which is strong, and its significance level is at 1%. Moreover, the patent application and ATM number are also positively related to the participation rate, which is significant at 1% and 10%, respectively. Overall, the participation rate of MOOC1 is related to the economic situation, infrastructure development, and financial development of a country.

Table 4-3

Regression results from MOOC1 when using decile of participation rate as the dependent variable

	(1) decile	(2) decile	(3) decile	(4) decile	(5) decile
Constant	3.996*** (.301)	3.384*** (.347)	3.244*** (.841)	3.19*** (.951)	2.995*** (.956)
GDP per capita	.079*** (.008)	.045*** (.012)	.045*** (.012)	.038** (.014)	.032** (.014)
Fixed broadband		.068*** (.023)	.067*** (.023)	.084*** (.025)	.08*** (.029)
Mobile subscriptions			.001 (.007)	-.001 (.008)	-.004 (.008)
Patent applications				0*** (0)	0*** (0)
ATM number					.012* (.006)
Observations	109	103	103	79	72
R-squared	.38	.447	.448	.515	.548

Note. $\text{Participation rate decile} = \alpha + \beta \text{GDPpercapita} + \text{controls}$. The dependent variable is based on the cumulative number of students enrolled in MOOC1 from 2018 to 2020. The control variables are fixed at the value of 2018. The robust standard errors are reported in the parentheses. The significance level is indicated as follows: *** $p < .01$, ** $p < .05$, * $p < .1$.

4.2.2.4 Robustness check

The main purpose of this robustness check is to evaluate whether the positive relationship between the high GDP and participation rate is robust to different model specification. This section still uses multivariate regression to study the relationship between the country-level participation rate and country-level development measures. This multivariate analysis is to further test whether the relationship suggested in the previous benchmark section is still statistically significant after changing the definition of the dependent variable participation rate. The form of the participation rate was changed from the decile form to the log form.

Table 4-4

Regression results for MOOC 1 when using the log of participation rate as the dependent variable

	(1) log	(2) log	(3) log	(4) log	(5) log
Constant	-15.445*** (.163)	-15.753*** (.172)	-15.98*** (.409)	-16.077*** (.47)	-16.141*** (.459)
GDP per capita	.04*** (.005)	.021*** (.008)	.021** (.008)	.016** (.007)	.013* (.007)
Fixed broadband		.037*** (.014)	.036** (.014)	.046*** (.013)	.045*** (.016)
Mobile subscriptions			.002 (.004)	.002 (.004)	0 (.004)
Patent applications				0*** (0)	0*** (0)
ATM number					.006 (.004)
Observations	108	102	102	78	71
R-squared	.321	.393	.394	.517	.555

Note. $\text{Log (Participation rate)} = \alpha + \beta \text{GDPpercapita} + \text{controls}$. The dependent variable is the log form of the participation rate. The dependent variable is the cumulative number of students that have enrolled in MOOC1 from 2018 to 2020. The control variables are fixed at the value of 2018. The robust standard errors are reported in the parenthesis. The significance level is indicated as follows: *** $p < .01$, ** $p < .05$, * $p < .1$.

The log of the participation rate is used as the dependent variable in Table 4-4. Log transformation is a valuable way to exclude the influence of an extreme value and check the reliability of the results (Russell & Dean, 2000; Von Eye et al., 2012). The positive coefficient for the GDP is significant in all the specifications of the robustness check, which reinforces the results of the regression analysis.

Table 4-4 reports the robustness check for MOOC1. The result shows that the GDP per capita, fixed broadband, and patent application are still positively related to the participation rate. However, the coefficient for the ATM number is no longer significant. The main variable of interest was GDP, which is significant in all five models.

This section presented the findings from exploratory analysis and regression analysis of MOOC1. The following section will report the findings of MOOC2 with the same structure.

4.3 Case study of the MOOC2

4.3.1 Exploratory analysis

Similar to MOOC1, this subsection analyzes the enrolled students' demographic data in MOOC2 and the pre-course survey questions to identify MOOC2 students' characteristics, including their educational backgrounds, age, origin countries, gender, and motivations. This subsection aims to answer two research questions. The first question is who are the students of MOOC2 and what are students' motivations to participate in MOOC2. All figures in this subsection display the information for students enrolled between 1 April 2019 to 8 July 2020. The total number of students enrolled in MOOC2 was 3423.

4.3.1.1 Educational backgrounds

Figure 4-9 Pie chart of students' academic qualifications for MOOC2, 2019–2020

As shown in Figure 4-9, for participants who have provided their educational information, similar to MOOC1, students with master's and bachelor's degree make up the majority of MOOC2 students. The academic qualifications of groups that account for

more than 5% are indicated in the figure. Students with a secondary qualification are the third-largest group in this course, followed by those who have a doctoral or associated degree. Students with junior secondary and primary academic qualifications count for a very small portion of this composition.

Figure 4-10 Frequency distribution of students' academic qualifications for MOOC2, 2019–2020

Figure 4-10 displays the frequency distribution of students with different levels of academic qualifications in descending order. More than 1000 students have a bachelor's or master's degree. Students with secondary qualifications are the next largest group. They may have gained access to higher education through this MOOC. There are more than 1500 students who chose not to answer this question, which marked as 'NA'.

4.3.1.2 Age

Figure 4-11 Age distribution for MOOC2, 2019–2020

Figure 4-11 shows the age distribution for MOOC2 students. For the declared age, MOOC2 has attracted an audience from different age groups. Most MOOC2 students were born between 1980 and 1990, with the age of 30 to 40 years.

4.3.1.3 Country of origin

Figure 4-12 Origin country distribution for MOOC2, 2019–2020

Figure 4-12 presents the students' origin country information by descending order for MOOC2. There were 719 students from New Zealand, which is the largest country group in this course. Four hundred twenty-eight students were from the US, making it the second-largest country of origin for students in MOOC2, followed by India with 269 students. The next largest groups were from Canada (108 students), Australia (97 students), the UK (84 students), and Indonesia (76 students). Two hundred six students chose not to report their country of origin, shown as 'UNKNOWN'.

4.3.1.4 Gender

Figure 4-13 Gender distribution for MOOC2, 2019–2020

Figure 4-13 shows the gender distribution for MOOC2 learners. Although more than 1500 students chose not to identify their genders, compared with MOOC1, the gender composition between males and females is relatively balanced for MOOC2. There were about 750 students of each gender cumulatively.

4.3.1.5 Cumulative total number of students enrolled in MOOC2

Figure 4-14 shows the cumulated total number of students enrolled in MOOC2 from April 2019 to July 2020. In total, there were 3423 enrolments in this period. As shown, from April 2020 to July 2020, the rate of students' enrolment increased compared with the last year or the past several months for MOOC2. New Zealand locked down for COVID-19 across the whole country from 24 March to 14 May 2000 (alert level 4 during this period), and other countries also had restrictions to reduce the spread of the virus during this period. During the pandemic lockdown, more people enrolled in MOOC2 compared with other months since the course had been archived.

Figure 4-14 Cumulative total number of enrolled students of MOOC2, 2019–2020

4.3.1.6 Motivations for students to study MOOC2

Figure 4-15 Students' motivations for MOOC2, 2019–2020

In terms of the students' motivations to enrol in MOOC2, similar with MOOC1, 'increase in knowledge and skills in a new area' was the most frequently reported reason with 262 responses, followed by 'personal challenge' with 190 responses. 'Curiosity about the topic' and 'to engage in lifelong learning' were selected by students 164 and 148 times, respectively, in this course, which makes them the third and the fourth motivations. Although relatively less reported than the top four motivations, 'to better serve my community', 'certificate/credential given for successful completion', 'employment/job advancement opportunity', and 'to learn from the best professors and university' were reported about 100 times for each. There were 86 responses that selected that they wanted to study this MOOC due to 'access to learning opportunity otherwise not available for me'. 'Interest in study' was reported by 50 times among the students.

4.3.1.7 Verification purpose

Students who paid for the verified certificate for MOOC2 completion selected this purpose for studying MOOC2. Figure 4-16 plots the percentage of students who wanted verification certificates in MOOC2, with the highest percentage reaching 10%.

Figure 4-16 Ratio of verified students for MOOC2, 2019–2020

4.3.2 Regression analysis

4.3.2.1 Correlation table

Table 4-5 reports the correlation table for MOOC2. For brevity, the numbers in the first row of this table match the variables' names in the first column. For example, (3) in the first row is the abbreviation for (3) Fixed broadband. This table shows that most of the country-level development measures have a positive correlation coefficient with the dependent variable MOOC participation rate, suggesting the overall development of the country will increase the participation rate in MOOC. For MOOC2, there is a positive and strong correlation ($r=0.57$, $p<.01$) between the GDP per capita and country-level participation rate, suggesting students from countries with better overall economic development are more likely to participate in MOOC2. Additionally, the correlation coefficient between fixed broadband and participation rate is 0.51 and is significant at the 1% level, suggesting the development of internet-related infrastructure will facilitate study in this MOOC. The relationship between the participation rate and the remaining three variables are moderate, which are below 0.4. The patent applications and the participate rate have a negative correlation coefficient of -0.22 and are significant at the 10% level, suggesting a negative linear association between these two variables.

Table 4-5

Correlation table of MOOC2

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) MOOC 2 participate decile	1.00					
(2) GDP per capita	0.57***	1.00				
(3) Fixed broadband	0.51***	0.81***	1.000			
(4) Mobile subscriptions	0.24*	0.29**	0.275	1.000		
(5) Patent applications	-0.22*	-0.01	0.112	0.005	1.000	
(6) ATM number	0.20	0.41***	0.559	0.272	0.144	1.000

Note. The number in each cell is the Pearson correlation coefficient, which ranges from [-1,1]. The significance level is indicated as follows: *** $p<.01$, ** $p<.05$, * $p<.1$.

4.3.2.2 Main regression

Table 4-6 reports the country-level Ordinary Least Square (OLS) regression results of regressing the participation rate of MOOC2 on GDP and other control variables. The dependent variable is the log form of the participation rate. This is a cross-sectional regression. This exercise checks whether the positive relationship between GDP and participation rate is just limited to MOOC1 or applies to MOOC2 as well.

Factors that are related to the participation rate in MOOC2 are similar to those of MOOC1. Table 4-6 reports the results when using the participation rate as the dependent variable for MOOC2. From model (1) to model (5), the number of variables in the regression increased progressively, which is an effective way to evaluate the robustness of the results step by step. In model (1), running the univariate regression between participation rate and GDP per capita is the main variable of interest. The result shows that the coefficient is 0.069, which is significant at a 1% level. This means students from countries with high GDP per capita are more likely to participate in MOOC2. Besides, the r squared is 0.273 in this univariate regression, which means that even GDP per capita alone can explain the 27.3% variation from the participation rate. This confirms the main conclusion that the MOOC courses provided by the University have made a limited contribution to education access since the students mainly come from countries with high GDP.

Model (2) further augments model (1) with the variable *Broadband number*, which is a measure of infrastructure development. This is motivated by the fact that MOOCs rely on the internet. The results show that there is a positive relationship between the availability of broadband in each country with its MOOCs participation rate, but this relationship is not statistically significant. The relationship between GDP, the main variable of interest, and the participation rate is still positive and statistically significant (0.052) after adding the infrastructure development as the control variable.

In the subsequent models, more independent variables are added to control the other aspects of development for each country. In model (3), the mobile subscription is further added as the control variable, which is another proxy for the development of communication infrastructure. The coefficient for mobile subscription (0.016) is significant at 5%. In model (4), the patent application is added as a control variable. The

coefficient is positively significant at the 1% level, suggesting students from countries with high patent numbers are more likely to participate in MOOC2. However, the magnitude of this coefficient is close to zero. When taking the full model specification in model (5) into consideration, the relationship between the GDP and participation rate is still statistically significant. However, the mobile subscription is no longer significant.

Table 4-6

Regression results from MOOC2 when using decile of participation rate as the dependent variable

	(1) decile	(2) decile	(3) decile	(4) decile	(5) decile
Constant	4.356*** (.279)	4.37*** (.346)	2.663*** (.827)	3.021*** (.922)	3.021*** (.958)
GDP per capita	.069*** (.007)	.052*** (.013)	.05*** (.012)	.052*** (.013)	.043*** (.013)
Fixed broadband		.024 (.023)	.017 (.023)	.021 (.023)	.039 (.025)
Mobile subscriptions			.016** (.007)	.01 (.008)	.011 (.008)
Patent applications				0*** (0)	0*** (0)
ATM number					-.002 (.007)
Observations	138	127	125	90	82
R-squared	.273	.261	.297	.415	.424

*Note. Participation ratio decile = $\alpha + \beta \text{GDPpercapita} + \text{controls}$. The dependent variable is the cumulative number of students that enrolled in MOOC2 from 2019 to 2020. The control variables are fixed at the value of 2018. The robust standard errors are reported in the parentheses. The significance level is indicated as follows: *** $p < .01$, ** $p < .05$, * $p < .1$.*

4.3.2.3 Robustness check

Table 4-7 reports the regression results for MOOC2 when using the log of participation rate as the dependent variable to check the robustness of the regression results. Both the GDP per capita and patent application are positively related to the participation rate, which is consistent with the results in the benchmark analysis. The main variable of interest, GDP, is significant in all five models. For example, in model 5, the GDP is significant at the 1% level with a magnitude of 0.02.

To sum up, the regression results show that the participation rate in MOOC2 is closely related to the overall development of a country. The participation rate of this course increases with higher levels of overall economic development. Those models further confirm the main conclusion that the students in developed countries are more likely to participate in MOOC2; thus, the MOOC has had a limited impact on increasing education access.

Table 4-7

Regression results for MOOC2 when using the log of participation rate as the dependent variable

	(1) log	(2) log	(3) log	(4) log	(5) log
Constant	-15.106*** (.137)	-15.136*** (.161)	-15.887*** (.428)	-15.74*** (.364)	-15.724*** (.382)
GDP per capita	.032*** (.005)	.023*** (.007)	.021*** (.007)	.022*** (.006)	.02*** (.006)
Fixed broadband		.013 (.012)	.009 (.012)	.015 (.01)	.024* (.013)
Mobile subscriptions			.007* (.004)	.004 (.003)	.004 (.003)
Patent applications				0*** (0)	0*** (0)
ATM number					-.002 (.004)
Observations	135	126	124	90	82
R-squared	.236	.211	.237	.432	.443

Note. $\text{Log (Participation rate)} = \alpha + \beta \text{GDPpercapita} + \text{control}$. The dependent variable is the log form of the participation rate. The dependent variable is the cumulative number of students that have enrolled in MOOC2 from 2019 to 2020. The control variables are fixed at the value of 2018. The robust standard errors are reported in the parentheses. The significance level is indicated as follows: *** $p < .01$, ** $p < .05$, * $p < .1$.

4.4 Similarities and differences between the two MOOCs

This subsection presents the similarities and differences in the characteristics of the students enrolled in the two MOOCs.

4.4.1 Similarities

The similarities of the students enrolled in the two MOOCs were found in the following terms. Similarity 1: The components of students' educational backgrounds of the two MOOCs are similar: most of the students had a master's or bachelor's degree. Students with a secondary school qualification ranked third for both MOOC1 and MOOC2.

Similarity 2: The students' age distributions of the two MOOCs are similar. Both MOOC1 and MOOC2 attracted students from a wide range of age groups, but the largest age group was students who were 30 to 40 years old.

Similarity 3: The percentages of students who paid for a verification certificate are similar: approximately 10% of students studying for the verification purpose.

Similarity 4: Similarities also are shown in the students' motivations for learning these two courses. For both MOOC1 and MOOC2, the top five most frequently mentioned reasons are the same. These motivations are increasing knowledge and skills, serving the community, curiosity about the topic, engaging in lifelong learning, and personal challenge.

Similarity 5: In terms of the students' countries of origin, the similarity is that both MOOC1 and MOOC2 attracted students from more than 100 countries, but most of the students came from developed countries.

4.4.2 Differences

There are some slight differences between MOOC1 and MOOC2 in terms of students' countries of origin, gender, and motivations.

Difference 1: For MOOC1, most students came from the US, followed by students from New Zealand. The situation is the opposite for MOOC2, where more students came from New Zealand than from the US.

Difference 2: In terms of gender distribution, MOOC1 attracted more female students than males. For MOOC2, the ratio of female and male students is more balanced.

Difference 3: The difference in students' motivations was that more students were learning MOOC2 for a 'personal challenge' and certificate/credential purposes compared with MOOC1.

4.5 Summary

This chapter analyzed the following research questions: RQ1) who enrolled in the University MOOCs? RQ2) what are students' motivations to enrol in these courses? And RQ3) do the University MOOCs broaden the accessibility of higher education to those who are excluded? This summary is presented to address each research question.

RQ1) who enrolled in the University MOOCs?

This chapter reported the overall composition of students who enrolled in the University MOOCs: educational background, age, country origin, gender, and the ratio of verified students.

The two MOOCs attracted a wide range of students globally. Regarding the students' countries of origin, most students came from developed countries, and students from the US and New Zealand were the largest proportion. In terms of their educational backgrounds, students with various backgrounds were enrolled, from those with primary school qualifications to doctoral degrees; however, most enrolled students had a bachelor's or master's degree. In terms of age and gender, the greatest proportion of students attracted to the MOOCs was in the 30 to the 40-year-old age group for both MOOC1 and MOOC2 and more female students than male students in total. There were 10% of students willing to pay for a verified certificate for both courses.

RQ2) what are students' motivations to enrol in these courses?

Students' motivations to enrol in MOOC1 and MOOC2 were similar. In summary, most students enrolled in the MOOCs to increase knowledge, for curiosity, or for personal challenge, rather than for improving job skills or verification purposes (only 10%). As most students had a master's or bachelor's degree and were employed, they may not have needed their MOOCs' study experience to add to their Curriculum Vitae (CV). The content of the two MOOCs is also not directly related to employment skills, which might not be as attractive as courses like computer science to some students who need job-related skills.

RQ3) do the MOOCs broaden accessibility to higher education to those who are traditionally excluded?

This chapter answered this research question from the following aspects:

1) enrolled students' characteristics.

This chapter has identified that most of the students enrolled in the MOOCs had a bachelor's or master's degree, and some students even had a PhD degree, which indicates that these two MOOCs provided by the University do not help increase tertiary education access for students who do not have a higher education degree. However, students with secondary qualifications ranked third in both courses, which constitutes the major group that benefits from the better education access provided by MOOC1 and MOOC2. Those students were considered as students who benefit from the University-level MOOCs.

2) enrolled students' motivations

Although most students enrolled for increasing knowledge, for curiosity, or personal challenge, rather than for improving educational levels, job skills, or verification purposes, there were a small number of students (76 responses for MOOC1 and 86 responses for MOOC2) who took the MOOCs because they wanted 'to access learning opportunities otherwise not available for me'. Students who selected this motivation were regarded as benefiting from the MOOCs. MOOCs have provided them with access to higher education.

3) regression analysis results

The multiple regression reveals that the GDP and infrastructure development variables of a country influence the participation rate in MOOCs. Students from developed

countries were more likely to enrol in those two MOOCs. This conclusion is robust to the inclusion of more control variables and the different forms of the participation rate. This result suggests that MOOCs do not help increase higher education access for students from less-developed countries.

In conclusion, the learners' information from the two courses depicts a similar picture of the MOOCs' role in providing education access. The overall conclusion is that students studying the MOOCs mainly came from developed countries, have a better-educated background, and enrolled for curiosity or personal challenge. The majority of the MOOCs participants already had tertiary degrees. However, the data about the educational backgrounds and the students' motivations do show that the MOOCs have provided high-quality courses to some students who would typically have little chance for traditional higher education: those students with qualifications below high school and students enrolled because of 'to access learning opportunities otherwise not available for me'.

The analysis in this chapter focused on the students' side. Therefore, the next chapter will move to the MOOC providers' side to explore why the University and the MOOCs' lecturers provide MOOCs.

Chapter 5 Findings from MOOCs Lecturers' Perspective

5.1 Introduction

Four lecturers from the two MOOCs taught by the University were interviewed. This chapter presents the following findings from the interviews: 1) the motivations of the lecturers to provide MOOCs and their perceptions of the University in providing MOOCs; 2) the groups targeted by the lecturers when designing the MOOCs; 3) the strategies the lecturers used to cater for students' diversity, and 4) the challenges and the achievements of the MOOCs for the lecturers.

5.2 MOOCs lecturers' motivations to provide the MOOC

In the initial stage, all lecturers were invited by the University to teach and develop the MOOCs. The team from MOOC1 were interested at that time and discussed further details of how to develop the course. The lecturer of MOOC2 was very interested and accepted the invitation immediately. Prior to undertaking the teaching of the MOOCs, the lecturers had no clear ideas about the workload required for design, delivery, and monitoring of the MOOCs, and few additional funds were to be provided by the University for the extra responsibility. Some lecturers also mentioned the University did not have a clear idea about how much work the MOOC courses would require. So, what exactly attracts the lecturers to teach a MOOC? This chapter analyzes the lecturers' motivations and the University's motivations from the lecturers' perspective to provide MOOCs by interviewing the MOOCs lecturers.

This research identified five broad types of motivations of the lecturers involved. These are: sharing knowledge with a global audience, developing innovative new teaching skills, creating valuable and reusable resources, enhancing global reputations, and working collaboratively with others.

5.2.1 Sharing knowledge with a global audience

Sharing knowledge, advancing the field, and reaching a global audience were vital factors in lecturers' motivation to develop the MOOC. The lecturers expressed what could be described as a moral obligation to share "with [learners] who do not have access to higher learning facilities" (Lecturer D, MOOC2), with another describing this as a "mission not a career" and that sharing the ideas was important for the team and regarded sharing knowledge as their priority. Two lecturers also thought the MOOC paradigm aligned with their goals to develop their current projects, which is to help students in understanding this academic field.

The MOOC seems like a good chance to provide a different way of presenting the course, and that would meet our goals which were to continue to develop the understanding of this field. (Lecturer A from MOOC 1)

The lecturer from MOOC2 described his/her passion for sharing knowledge in the field and felt excited about the fact that the MOOC had worldwide participation. The lecturer stated:

We should share. I am very proud that my MOOC reached 144 countries. It means that those people from Africa, India, South America are also able [to learn the course] even from their phones. That is really important. (Lecturer D, MOOC2)

5.2.2 Developing innovative teaching skills

None of the four lecturers had had any online teaching experience prior to developing the MOOC; however, they were very keen to try new teaching techniques and formats. Lecturers regarded the MOOC as a good opportunity to explore new teaching innovations. They all found teaching a MOOC was quite different from their classroom-based teaching, and they developed new professional skills by developing the MOOC. They described MOOC as 'a learning exercise'.

It was the first time that I work[ed] towards videoing quite a lot, having to develop skills around how to prepare the film, interview,

scripting, speaking naturally in front of the camera. (Lecturer B, MOOC1)

5.2.3 Creating valuable and reusable resources

Another motivation for lecturers to develop the MOOC was that they wanted to create high-quality course resources that they can re-use outside the MOOCs. Lecturers reported that they put much effort into creating the MOOC materials (including course content, assignments, questions, and other course-related information) and the videos. Those teaching materials belong to the University and the lecturers. In this way, lecturers can reuse them, with minor modifications, in other forms for other students outside the MOOCs. For example, they may use short videos (one MOOC video lasts four to six minutes) to provide some basic information about their course when needed.

It [the MOOC] is basically what I have done in the last 15 years, but now, it is all packed in the six-week course. (Lecturer D, MOOC2)

One of the lecturers described the course resource as an 'online textbook', which they could refer to others as a reference.

It's kind [...] like an online textbook. So, it's something that we continue to use quite a lot to reference or to refer to people. (Lecturer C, MOOC1)

5.2.4 Enhancing global reputations

Two lecturers said they were motivated by the opportunity the MOOC provided to enhance recognition for their projects or themselves in their fields. They believed that providing a MOOC is an effective way to highlight the University's name and their names globally and let people/peers know what they were doing. One lecturer regarded enhanced name recognition as the key reason to teach a MOOC.

One of the reasons I think [is] to make sure that people can find me here. My MOOC is a good one; it is a really good way to put the message in the world and also to draw attention to what I am doing. (Lecturer D, MOOC2)

5.2.5 Working collaboratively with others

Another personal motivation for lecturers to accept the invitation to teach a MOOC was that they considered the MOOC a good opportunity to collaborate with others in the University. Two lecturers listed this aspect as their primary motivation to teach a MOOC. One achieved this collaboration by inviting others as guest lecturers on the MOOC or to film a short video to diversify the course.

I asked if they would like to come back to have that one-minute film, so, they all came back to do a few video recordings, so, we have that diversity of videos. (Lecturer D, MOOC2)

The other valued opportunity was co-working with other teams within the University during the process of developing MOOCs, such as working with the University department in charge of academic development and innovation.

To sum up, five motivations were identified for lecturers to provide MOOCs. The lecturers accepted the University's invitation to provide MOOCs because they had the desire to share their expert knowledge with others and to reach more students globally. A further motivation was to explore new teaching innovations. Creating valuable and reusable resources also motivated them to develop and teach MOOCs. Personal reasons for them to teach MOOCs were enhancing their name recognition globally and working collaboratively with others.

5.3 The motivation of the University to provide MOOCs

This research investigated this question from the MOOCs lecturers' perspective and the related per-course survey questions.

One question asked the MOOCs lecturers about why they thought the University wanted to provide MOOCs. Although some of the lecturers said they had not previously thought of this, they did offer some ideas. The interviewees identified three main motivations for the University to offer free online courses to a worldwide audience. The analysis of two pre-course survey questions from MOOC2 was included in this section as these questions provided information about the University's motivation to provide MOOCs.

5.3.1 Promoting the University globally and increasing enrolments

All lecturers pointed out that providing MOOCs on the EdX platform was an international advertisement for the University, which would lead to greater recognition of the University and increased enrolments. EdX is an internationally renowned online learning platform and the lecturers believed that the University wanted to put its name on 'a global map' to highlight its profile by offering courses partnered with EdX. Offering MOOCs was a global promotion of the University.

It [developing a MOOC] was really about the University wanting to promote itself. (Lecturer A, MOOC1)

It's a good way to put the University on a global map and to draw students to NZ. (Lecturer D, MOOC2)

Producing MOOCs is a huge, time-consuming, and expensive undertaking for both the University and the lecturers, but they are provided free of charge for students. Despite these financial challenges, the lecturers believed the University retains a strong desire to produce MOOCs. The reason is that, apart from the goals of promotion itself, the ultimate motivation for the University is to attract more international students to enrol by providing free selected MOOCs on EdX. As one participant shared:

[MOOCs are a] kind of tool, that would hopefully attract students to want to study at the University. (Lecturer B, MOOC1)

According to the lecturers, one direct way to let more people enrol in MOOCs was advertising and re-running the courses.

The results from two pre-course survey questions from MOOC2 also support that the University aimed to boost its reputation globally. One question was about how much the students knew about the University before signing up for the course. A further question sought information on how students came to know about this course. These survey questions partially show that the MOOC provider regarded the MOOC as a platform to boost its international reputation. Question details and responses are as below.

One survey question was 'How familiar are you with the University? 1: Very familiar (tell us how). 2: Slightly familiar (tell us how) 3: Not familiar at all'.

Figure 5-1 Distribution of how familiar students are with the University

Figure 5-1 shows the students' responses to this question. In total, there were 394 responses, including 36 missing values. Among these responses, 86 students believed they were very familiar with the University. According to information provided in the survey, students who selected 'very familiar' were mainly current students, former students, or staff of the University. Seventy-seven students reported they were slightly familiar with the University. Those students were from New Zealand but did not currently study at the University. However, they may have been friends or in the families of university students or people who had worked with or been to the University for some reason. One hundred and ninety-five students were not familiar with the University at all. As shown, nearly half of the students who answered this question reported that they were not familiar with the University at all, indicating that MOOC2 attracted students unfamiliar with the University, suggesting that the MOOC is raising the profile of the University.

Another pre-course survey question relating to boosting the University's reputation was 'how do you know about the course?'.

Figure 5-2 Channels through which the MOOCs students heard of this course

Figure 5-2 reports the results of this question. There were nearly 400 responses to this question. As shown, most students found out about the MOOC from sources outside of the University community (118 responses from the EdX webpage and course catalogue, 65 responses by word of mouth, 15 responses from Google searches, 14 responses from the EdX newsletter, and 12 responses from Facebook). Only 52 responses were from university communications, which indicates students have come from outside the University community. In this sense, the University has enlarged its reach to the outside community by offering MOOCs.

5.3.2 Spreading knowledge

According to the lecturers, another motivation for the University to provide MOOCs was to spread knowledge globally. They believed the University had thought thoroughly about what kind of courses to provide before developing MOOCs. The topics selected were representative either of the University or of New Zealand, suggesting the University has

the intention to show something different from other universities to fulfil the mission to spread knowledge as a reputable university in New Zealand.

I think that they picked them [MOOCs] because they're special and unique to the University and New Zealand and they wanted the University to stand out. (Lecturer C, MOOC1)

The lecturer from MOOC2 also pointed out that all universities have the mission to spread knowledge and provide educational opportunities to students, and they thought that the University was strong with that idea.

To summarize, the lecturers thought the University's motivations to offer MOOCs were as follows. The University has the mission to spread knowledge and MOOCs provide an opportunity for the University to spread knowledge globally and reach more students than it traditionally could. Promoting the University's name globally also motivated the University to offer MOOCs. The ultimate purpose for the University to provide MOOCs was to attract more international students to enrol.

5.4 Target groups

Although MOOCs are global and open to anyone interested, there are different targeted groups for different MOOCs. The quantitative data analysis investigated whether the MOOCs offered by the University helped increase the accessibility of students to higher education.

This was further explored by asking the MOOCs lecturers if they had any intended target groups for their MOOCs.

5.4.1 Educational backgrounds

Lecturers from both MOOCs believed that professionals in their fields would be their likely target group:

We thought initially, that would appeal to teachers, social workers, and professionals of this field, who were already in full-time

employment, and so did not have the availability to study at the University to do the traditional course lecture. (Lecturer B, MOOC1)

With this in mind, the lecturers expected that most of the students would be graduates with a bachelor's degree or a professional qualification. In terms of students' employment status, the lecturers assumed that most of their audiences would be employed. Nevertheless, all lecturers had a consistent idea that there was no previous relevant knowledge required for students to enrol in the MOOCs. According to the lecturers, anyone interested could enrol and would be able to understand the course, but they were pretty surprised that people with PhDs and in academic positions enrolled in their MOOCs.

I do not think we expected that people with PhDs and academic positions would do the course, so I assume that be mainly members of the general public were interested. (Lecturer A, MOOC1)

We expected they would not know anything about this course, except for maybe the words [name of MOOC...]. I didn't expect that anyone would have any kind of background education in it. (Lecturer C, MOOC1)

5.4.2 Country of origin

Lecturers expected that MOOC students would come from a diverse range of countries as EdX is a global platform, but they were surprised by the diversity of countries the students enrolled from. However, they were not surprised that most students came from New Zealand and the US, suggesting they assumed that most students would be from those two countries. Two main reasons were mentioned by the lecturers for their expectation. The first was that EdX is a US platform, and more people from there know about it. The other is that all those highest enrolment countries (New Zealand, the US, Canada, Australia) are English-speaking countries that have some similarities with New Zealand. Compared with students from other countries, students from those English-speaking countries were more likely to enrol in the course to learn some basic information that is similar to their countries.

The majority of them are from NZ and the US; we thought that would be the case. (Lecturer B, MOOC1)

I thought a lot would be from the United States and New Zealand because it acts as an American platform. More people know it there. (Lecturer C, MOOC1)

It's quite a high proportion of people in NZ, Australia, US, Canada, English speaking countries, those countries have similar kind of experience to NZ. One of the challenges in presenting the course is because it's a part of the legal system here; it's a different system with somewhere else. (Lecturer A, MOOC1)

To summarize, this subsection presented the MOOCs' targeted groups from students' educational backgrounds and their country of origin. Although the MOOCs were open to anyone who interested, considering the content of the courses, lecturers assumed the students were mostly from western, developed, English-speaking countries and with a higher education degree.

5.5 Catering for the learners' diversity

Lecturers were aware that the audience had the potential to be diverse before running the MOOCs. Although they did not deliberately design the MOOCs to cater for the diversity of students, some of their methods of designing courses did help to meet the diverse needs of different students. This research identified three methods the lecturers used to make the course more accessible to diverse students through course materials, language, and assignments and questions. They added that they had intentions to introduce other strategies to help the MOOCs reach more students in the future, which included providing more communication opportunities among students and re-designing the course.

5.5.1 Diversifying materials

In terms of catering for student diversity, the materials played a vital role in the whole process. Different types and levels of materials were provided to cater for the various needs of different students. Diverse materials were offered by each course, including text materials for students who preferred to read, videos for students who chose to watch, and assignments for students who wanted the verification certificate. Students could then pick and choose what they needed from the different materials provided. Lecturers from MOOC1 made great efforts to diversify their presentation of the course materials. Extra links and/or recommendations were also provided for students interested in exploring a topic further.

We try to diversify our presentation of the story. (Lecturer A, MOOC1)

*We are able to offer additional resources for those who wanted more.
And so, we tried to do that in a bunch of different places by linking to
external things. (Lecturer C, MOOC1)*

For MOOC2, the lecturer had a booklet that included some basic information about the course topic. Videos and reading materials were also provided for students. The lecturer explained that the reading materials were suitable for everyone and the levels were diverse, from newspaper articles to professional articles.

*What we did is we took the book, we had a simple theory, and few
videos [...] Then we had a layer with readings, our readings that
everybody can access from a newspaper article to a professional
article. (Lecturer D, MOOC2)*

5.5.2 Language

To respond to a diverse student audience, both MOOCs applied two strategies. First, lecturers said they used plain language rather than academic language, which allowed students who had no relevant academic background to understand the materials. Secondly, both MOOCs in this study were provided in the English language, but in New Zealand, te reo Māori words and terms were also used. Where Māori language terms were used, an English translation was provided.

The language used in the course was not academic or overly complicated. It was at the level that a mature high school student should understand and follow. (Lecturer B, MOOC1)

We refer[ed] to additional language, Māori, we offer[ed] the translation. (Lecturer B, MOOC1)

5.5.3 Assignments and questions

The MOOCs also catered for learner diversity by designing self-reflective assignments and by setting up questions on the discussion board.

One lecturer mentioned that, although the stories they used in the course were from New Zealand, they designed assignments that students could reflect on and apply to their context wherever they came from.

The lecturer from MOOC2 also pointed out that another way to cater for diversity was to make sure the questions in the discussion board were open-ended and relatively basic. With this approach, every student had the experience to share, which encouraged their participation in the course.

5.5.4 Communication

Three out of the four lecturers talked about interaction among students. They all believed that only a small number of students were fully engaged in interaction through the discussion board. The MOOC2 lecturer pointed out that only 200 to 250 students engaged with the discussion board. Considering the total enrolments of that course, the percentage of students who were engaged with the discussion board was below 10%.

One participant from MOOC1 explained the reason was that the EdX platform did not allow for good communication among students during the course. Students could not reply to each other easily as there were no notifications when students replied to each other. In this case, responses were delayed, which hindered discussions.

Another participant from MOOC1 mentioned that allowing students to communicate more when they were doing MOOCs was a good way to engage more students. The participant further explained that good communication made a good learning experience.

They suggested that MOOC lecturers invite their colleagues or friends to join them and enjoy the learning together in their location.

I think the only other way would be to those who enrolled in this course. To enable them to communicate with their colleagues and to enjoy themselves with them. [...] they can sign up and do the MOOC together in their own location, [...] I think some people did do that, that would be a good thing to coordinate. (Lecturer B, MOOC1)

5.5.5 Redesigning the course

Another way to attract more students would be to redesign the content or the structure of MOOCs. One participant pointed out some specific approaches for MOOCs to reach more students in the future, including 1) presenting the materials in other forms, 2) offering a shorter MOOC, and 3) offering micro-credentials.

Use the [MOOC] materials for school courses, secondary school courses, use the core material with some minor editing. The other thing I just thought with the same idea is the University getting into micro-credential[s]. (Lecturer A, MOOC1)

The lecturer from MOOC2 shared ideas on increasing the global reach of the MOOC by using examples from different cultures to make the course more global, as the current course is based on New Zealand examples.

To sum up, the lecturers recognized the diversity of their students and used strategies to cater for this by providing different course materials, using plain language, and setting assignments and questions. The lecturers also pointed out that improving communication among students and redesigning the course would help cater for a more diverse range of students in the future.

5.6 Challenges and achievements

This section presents the challenges and achievements of MOOCs lecturers.

5.6.1 The time investment and reusable resources

All lecturers believed that the workload they invested in the MOOCs was far beyond their own and the University's expectations and considered this as their biggest challenge. The lecturers were told by the University that all they needed to do was record their lectures in a short version before they started preparing the course. Hence, they thought it would not be too much work to do this. However, they realized this assumption was completely wrong. In reality, they spent hundreds of hours preparing the six-week MOOC. One participant who mainly worked on the course content explained that he went to a great deal of effort in writing appropriate course materials and did 3000 to 4000 words of writing for each class. It is a '*big undertaking*' to do a MOOC, and it is very '*time-consuming*'.

Creating the content was definitely the hardest part that took the longest [time]. It certainly took a lot more time and work than we had imagined. (Lecturer C, MOOC1)

There are two corresponding achievements with this challenge. First, the MOOCs lecturers have reusable and valuable resources to use after spending a lot of time and effort to produce the content and videos. Creating valuable and reusable resources is one of the lecturers' key motivations to develop MOOCs. Therefore, it has been identified as one of their achievements.

Another achievement is the sense of accomplishment and valuable experience when time-consuming and work of a significant undertaking is completed, especially for lecturers who consider doing MOOCs to be '*a good experience*'.

5.6.2 Online teaching skills

Online teaching skills are identified as both a challenge and an achievement for the MOOCs' lecturers. It was a challenge because this was the first time all lecturers had done

online teaching, which means they had no online teaching experience, and everything was new for them. Additionally, teaching MOOCs is quite different from classroom-based teaching. According to one participant, the big difference is that everything must be done before teaching a MOOC. Compared with classroom-based teaching, it is challenging to prepare all the content without being interrupted by interactions with students. Therefore, online teaching skills were another challenge for them.

The skills are also an achievement in obtaining new teaching experience/skills for MOOCs lecturers once they had mastered these skills. Additionally, this may be a significant achievement for the lecturers who regarded improving personal teaching skills and exploring new teaching innovations as one of their motivations for being involved in the MOOCs.

5.6.3 Interacting with students

Interaction between lecturers and students and among students was through the discussion board. Two lecturers talked about discussion board management. One participant pointed out that it was a challenge to manage the discussion board. The participant explained that there were more than 3500 students by the end of the course, with numbers growing by several hundred in some weeks. Although there were only 200 to 250 students engaged in the discussion board, it was still a big challenge to respond to every student on the discussion board.

I think the hardest part for my MOOC was to respond to students on the discussion board [...]. I design it for self-paced learners [...]. I hope to start the journey, but I cannot be there for every person. (Lecturer D, MOOC2)

Similarly, another participant agreed that monitoring the discussion board should have been one of the challenges. However, it was not a challenge for several reasons. First, students learned by themselves and there were only a few questions posted from students. Second, the platform did not support good communication among students. In this circumstance, the interactions among students decreased and for these reasons, the participant believed that it was not a challenge to manage the discussion board.

[There were] a few questions from students, but they largely took care of themselves and I'm checking in on the discussion board. [...] the platform didn't allow for very good discussion among students. [...] I didn't have to monitor it and like moderate that for 2000 people trying to make sure this conversation [was] helpful and productive and on task and accurate. (Lecturer C, MOOC1)

To sum up, challenges and achievements for MOOCs lecturers were identified in this subsection. The greatest challenge was the time required for developing and teaching the MOOCs. The time the lecturers spent on the MOOCs was far beyond their expectations. Another two challenges were the lack of online teaching skills and management of the discussion board. The achievements of the lecturers were gaining reusable resources and developing online teaching skills.

5.7 Summary

This chapter explored the MOOCs lecturers' perspective of the relationship between the MOOCs and education access by investigating their motivations to provide MOOCs, their targeted audience groups, and the strategies they used to design their courses for diverse students. Challenges and achievements for MOOCs lecturers were included.

This study found five broad motivations for lecturers to provide MOOCs and three motivations for the University to produce MOOCs. For the lecturers, the key motivations were to share their expert knowledge in their fields globally and to create course materials. From the lecturers' perspective, the key motivations of the University were promoting itself and attracting students to enrol globally. However, providing an opportunity to access higher-level education for those excluded from traditional education was not a motivation for either the University or the lecturers.

In terms of the target groups, the lecturers assumed their audience would be people mainly from New Zealand and the US, employed, with an undergraduate qualification or professional education background. Those groups they mentioned were from developed countries with well-educated backgrounds and good employment status. However, no relevant previous knowledge was required for the MOOCs. This may have helped to increase accessibility for people interested in learning MOOCs.

In terms of the learners' diversity, although the lecturers did not design the course to attract diverse learners, they took some measures to make their course accessible for students from different backgrounds. They also suggested other methods that may broaden the accessibility of MOOCs in the future. These can help reach more diverse students to enrol in online courses.

The challenges for MOOCs' lecturers were the high demand on their time, the lack of online teaching skills, and the management of the discussion board for developing and teaching the courses. Their achievements included creating valuable resources and gaining online teaching skills.

Chapter 6 Discussion and Conclusion

This chapter draws together the findings from this research with the existing literature. It begins by explaining how the findings address the research questions and then describes the contributions made by this study. The limitations of the research are discussed, followed by some recommendations.

6.1 Research questions

The overarching research question is:

- Do the MOOCs from the University in this study contribute to increasing education access for those who are traditionally excluded from university education?

Five sub-questions with corresponding findings underpinned the main question.

- RQ1: Who were the MOOCs students?
 - This sub-question mainly focused on the countries where the students were located and their academic qualifications to ascertain whether the MOOCs provided learning opportunities to students from developing countries or for those students without tertiary degrees.
- RQ2: Were students from developed countries more likely to enrol in the MOOCs than those from less developed countries?
 - The research used the demographic data and country-level data from the World Bank Development Indicator (WDI) database to further explore the relationship between the participation rate and the development level of a country to find out whether students from the less developed country were more likely to enrol in the MOOCs.
- RQ3: What motivated the students to enrol in the MOOCs?
 - This sub-question aimed to find out students' motivations to enrol in the MOOCs. If they enrolled for accessing learning opportunities, the MOOCs might increase access to tertiary education for them.

- RQ4: What were the University and the MOOCs lecturers' motivations to provide MOOCs?
 - This sub-question aimed to find out whether the University and the lecturers aimed to provide opportunities to students who were traditionally excluded.
- RQ5: To what extent did the MOOCs lecturers cater for students' diversity?
 - This question focused on the lecturers' target student groups, including their academic backgrounds, country of origin, prior knowledge, and employment status.

6.2 Answers to the research questions

This section summarizes how the findings address the research questions.

6.2.1 Motivations for engaging in the MOOCs

- RQ3: What motivated students to enrol in the University MOOCs?
- RQ4: What were the University and the MOOCs lecturers' motivations to provide MOOCs?

Motivations that drove students, lecturers, and the University to be involved in MOOCs were identified as follows.

Various motivations were reported by students. The most common motivations for both MOOCs were for increasing knowledge and skills, being able to better serve the community, curiosity, personal challenge, and review the course content. This finding is largely consistent with Belanger et al. (2013) findings from Duke University and Hew and Cheung (2014). They similarly found students enrolled in MOOCs for extending knowledge and skills, for personal interest, and for challenges. However, the importance of gaining knowledge to better serve the community has not previously been reported and was the second most commonly selected motivation for the students in this study. This will be discussed in 6.3.1.

Lecturers were interested in online teaching and their motivations were to share knowledge with learners in their fields, to create valuable resources, to be involved in new teaching technology, to enhance both their name recognition and that of the University, and to connect with others.

Three of these motivations aligned with Zheng et al. (2016). Zheng and colleagues collected data from American universities and reported that the motivations of MOOCs' lecturers were to share knowledge with global students, to enhance the name recognition of their institutions and themselves, for personal growth, and for research opportunities. The motivation to share knowledge with global students, to gain more exposure to teaching in a new online teaching format, and to enhance name recognition was consistent with Lin and Cantoni (2018), who explored MOOCs lecturers' experience of delivering MOOCs in the field of tourism and hospitality, and with Evans and Myrick (2015), who collected data from multiple MOOC platforms. The motivation to create valuable resources and to enhance name recognition aligned with Blackmon (2018), who report that teaching MOOCs could increase the lecturers' reputation and provide them with more academic resources.

This study also identified the challenges and achievements of the MOOCs lecturers. The biggest challenge was the heavy demand of time, which also has been identified as the biggest challenge for MOOCs lecturers in Hew and Cheung (2014). Len-Urritia et al. (2018) also report that meeting deadlines challenged the lecturers due to the heavy workload. Further, the lecturers had no online teaching experience; thus, another challenge was lacking online teaching skills and having to develop these. This finding was congruent with Len-Urritia et al. (2018), who also report that adapting to new tools and processes was a challenge for the lecturers in a Spanish university and a British university. The third challenge was the lack of interaction with students during the teaching, which is also reported as one of the main challenges by Hew and Cheung (2014).

However, for the lecturers in this study, the achievements seemed to outweigh the challenges as they were enthusiastic about improving and continuing with their MOOCs.

Achievements include that they created valuable and reusable resources and obtained new teaching skills, which align with Belanger et al. (2013) and Kolowich (2013). However, the lecturers in this study also pointed out that creating MOOCs provided them

with valuable teaching resources, which could not be obtained from their small on-campus courses. Besides, those resources developed for the MOOCs could be applied to their on-campus teaching and enrich their classroom-based teaching.

From the MOOCs lecturers' view and the results of several related pre-course survey responses, the university offered the MOOCs to share knowledge with global students, to promote the University, and to engage more students. These perceptions of the University's purposes for creating and running MOOCs aligned with findings from previous international studies, such as O'Connor (2014) in Australia, Najafi et al. (2015) in Canada, Len-Urritia et al. (2018) in a Spanish and a British university, and Wilson et al. (2014) from Massey University in New Zealand. They all found that promoting the university to increase international enrolments is a crucial motivation for universities to provide MOOCs.

6.2.2 Characteristics of enrolled students

RQ1: Who were the MOOCs students?

The demographic data of the students collected by the EdX platform provided the academic background, gender, age, and country of origin of the students who enrolled in the two MOOCs. Although the two MOOCs attracted a wide range of students globally, most of the students came from developed countries and students from the US and New Zealand made up the largest proportion for both MOOCs. Students with various educational backgrounds were enrolled, ranging from those with primary school qualifications to those with doctoral degrees. However, most of the enrolled students had a tertiary degree. The two MOOCs attracted mostly students between 30 to 40 years old and there were more female students than male students in total.

The results show that most students were from developed countries and had a tertiary degree. In this sense, the MOOCs play a limited role in increasing education access, but the data did show a large number of students with a secondary school qualification, so the MOOCs did provide access to tertiary study for those students.

RQ2: Were students from developed countries more likely to enrol in the MOOCs than those from less developed countries?

The correlation analysis and multivariate regression revealed that the GDP and infrastructure development of a country influenced the participation rate in MOOCs. Students from developed countries were more likely to enrol in these two MOOCs. In this sense, the MOOCs did not help broaden education access.

6.2.3 Anticipations and teaching approaches

- RQ5: To what extent did the MOOCs lecturers cater for students' diversity?

Although the MOOCs were open to anyone interested, considering the content of the courses, the lecturers assumed that the students would be mostly from western, developed, English-speaking countries, would have a higher education degree, and would be employed. However, they did not assume the students would have any previous knowledge related to the course topics.

The lecturers recognised the diversity of their students and used different strategies to cater for this by providing different course materials, using plain language, and setting assignments and questions. They also suggested several ways to make MOOCs more attractive for diverse learners in the future. These suggestions were redesigning the courses and improving the interactions between students and lecturers and among students. All the teaching approaches they applied and the further suggestions they proposed indicated that the MOOCs lecturers believed that the MOOCs have the potential to attract more diverse students globally.

6.3 Discussion

In this section, the overarching question will be discussed concerning the main findings from the sub-questions. The discussion will draw upon literature in this field to indicate the contributions of this research. The discussion will be guided by the diagram below (Figure 6-1):

Figure 6-1 The relationship between the sub-questions and the overarching question

6.3.1 Characteristics of the MOOCs students

Overall, the students who enrolled in the MOOCs tended to be well-educated, from developed countries, and between 30 and 40 years old. This research collected data from two New Zealand MOOCs that aligns with previous literature from a variety of countries. For example, Emanuel (2013) research from the US, Pollack Ichou (2021) research in Australia, Tang and Carr-Chellman (2016) study in China, and Musthafa and Nasimudheen (2014) study in India. These two MOOCs from New Zealand did not greatly increase access to higher education for students who were traditionally excluded because

the largest proportion of the students already had a tertiary degree and were from developed countries.

However, one finding of note that does not seem to have been previously reported in the literature was those students whose highest-level qualification was from secondary school were the third-largest group in both courses. These students did not have a tertiary degree, but they were enrolled in the MOOCs. For those students, the MOOCs did provide access to tertiary education when they may not have been able to access this through other means. Although individual students' motivations to be enrolled in these MOOCs could not be identified (due to the aggregation of the data), these MOOCs did provide these students with the opportunity to access higher-level education.

The findings from the interviews with the MOOCs lecturers indicated that the intended target group for the courses were graduate students with a bachelor's degree or a professional qualification, and students from Western, English-speaking countries. The characteristics of the students enrolled largely aligned with the expectations of the staff. This raises interesting questions about MOOCs' design and teaching if the overall purpose of MOOCs is to increase education access for students who are traditionally excluded from this level of education. If MOOC lecturers do not plan to engage a wide range of diverse students, MOOCs may not attract them.

However, the MOOC lecturers were aware that a diverse range of students might enrol in the MOOCs and used various strategies, including writing in plain, rather than academic, English, providing different levels of materials, and designing self-reflective assignments and questions. The MOOCs lecturers also suggested two ways that may help their MOOCs attract more diverse learners in the future. These suggestions were improving the interaction between lecturers and students, improving interaction among the students, and redesigning the courses by 1) presenting the materials in other forms; 2) offering a shorter MOOC; and 3) offering micro-credentials. While not directly targeting a previously excluded group of tertiary learners, the use of inclusive strategies could be seen to align with Lambert's (2020) claim of the "hope-pessimistic-hope" approach to MOOCs improving education access.

These MOOCs were available in unusual times because some of the data were gathered during the period of the rise of COVID-19 globally, and countries were in various stages

of lockdown. Compared with 2019 and the first few months of 2020, the cumulative number of students in both MOOCs dramatically increased between March 2020 to July 2020. The increase happened during the national COVID-19 lockdown in New Zealand (see Figure 4-6 and Figure 4-14). Considering students from New Zealand had the second largest number of enrolments for MOOC1 and the largest number for MOOC2, these MOOCs may have provided educational opportunities when students could not access physical sites of learning or had more time to study. One of the biggest MOOC platforms, Coursera, also reported a similar phenomenon that enrolments during COVID-19 had a dramatic increase compared with enrolments at any other previous time (Coursera, 2020).

6.3.2 Motivations of stakeholders

There was consistency among the motivations of the three stakeholders of the MOOCs: the students, the lecturers, and the University. Students most commonly reported that their primary motivation was to ‘increase in knowledge and skills in a new area’. This was consistent with the motivation of the lecturers and the university to share knowledge with learners. Sharing knowledge was also the lecturers’ priority when teaching MOOCs. These expert academics’ desire to share knowledge seems to be a characteristic of academic staff who provide MOOCs internationally.

However, the motivations of the students, the lecturers, and the University were not aligned with the following perspectives. An important motivation for the University, as perceived by the lecturers, was to promote itself and enrol more students, especially international students, which aligns with previous literature concerning university intentions (Hollands & Tirthali, 2014; O’Connor, 2014; Rhoads, 2015; Wilson et al., 2014). However, the qualitative data from the lecturers did not reveal that this was one of their motivations. Considering most students in the MOOCs already held a university-level degree and enrolled in the MOOCs for interest rather than seeking educational opportunity, it seems unlikely that the University would significantly increase international enrolments through offering MOOCs.

The quantitative and qualitative findings of students’ motivations and the lecturers’ expectations were consistent in this study. Students were more likely to enrol for employment/job *advancement* opportunities rather than employment/job *seeking*

purposes. This implies that they were in employment already. This is congruent with the expectations of the lecturers, who anticipated that the students would be employed or professionals in their fields. Because the students were not seeking a credential from the University to enhance their curriculum vitae for employment, this may explain why only 10% of students were willing to pay for the verified certificate. Another reason may be that neither MOOC1 nor MOOC2 were designed to provide job skills; thus, students did not enrol for job-related purposes. Students who selected 'to better serve my community' as their motivation may be engaging in the courses because these two MOOCs were relevant for people working in public services, such as teachers, social workers, and other professionals. The lecturers anticipated that the MOOCs' content would be relevant for people in these fields, and in that sense, the MOOCs were serving the purpose intended by the lecturers who created them. While these MOOCs may not have been providing access to tertiary education for those previously excluded, they were providing access to that knowledge to groups of people who may not have had any other way to access this information.

The lecturers unanimously expressed the idea that no particular prior knowledge was required for students to enrol in those MOOCs. Anyone who was interested could enrol and be able to understand the courses. This expectation could enhance the accessibility of their courses to those without previous knowledge of the field.

6.3.3 The reality of MOOCs in improving education access

The qualitative results indicate that a lack of interaction with the students is one of the challenges for the lecturers. Lecturers cannot engage with all learners due to the massive numbers; therefore, learners have to be self-directed and self-motivated (Romero-Frías et al., 2020). Also, as the platforms do not allow good communication among learners, support from the lecturers and peers was limited (Hew & Cheung, 2014). In this sense, providing free courses through MOOCs platforms does not mean that accessibility has been improved; the MOOCs had limited impact in increasing education access for those students who had enrolled. It would be more helpful to provide them with a better learning experience, such as providing students with a better opportunity to interact with the lecturers and other students by improving technical support.

The quantitative results reveal that MOOCs students' participation rate is related to the economic situation, infrastructure development, and financial development of the country in which they live. This finding is similar to Trehan et al. (2017), who report that certain infrastructure and technical support are needed to support online education and good interaction. Therefore, access to any online education depends on several economic factors, such as electricity, efficient internet, computers, or mobile phones. Students from low-income families in developed countries or developing countries may not have access to these facilities. Thus, MOOCs are not available to them. In this sense, the MOOCs' role in increasing education access for those students is limited. Boga and McGreal (2014) and Trehan et al. (2017) report similar findings in their research, which found that infrastructure and devices were challenges regarding using MOOCs in developing countries.

Another reality is that due to a large number of enrolments, there were many students from developing countries or without tertiary degrees enrolled in the two MOOCs. Although, as a percentage, this group of students was small, the two MOOCs indeed reached those students and provided education access for them. Besides, the MOOCs lecturers were aware of the diversity of the students and took some strategies to cater for this diversity. In this sense, the two MOOCs did provide education access for more students. Although there are some challenges to using MOOCs in less developed areas, considering each MOOC attracted thousands of students from more than 100 countries and the number is growing over time, the MOOCs do provide students with an opportunity to learn topics they are interested in but might otherwise not have access to.

MOOCs may still have the potential to achieve the initial hopes that they would increase education access for learners from anywhere. The enrolments in MOOCs increased dramatically in 2020 (Coursera, 2020), which shows that MOOCs are becoming even more popular, especially when COVID-19 forced more and more learning to go online. Besides, the infrastructure in developing countries is improving with more and more people having access to the internet and devices, which provides the possibility for them to join online learning (Trehan et al., 2017). Furthermore, more MOOCs are being designed for specific groups to improve their knowledge and skills, such as the ICT project (Laurillard, 2016), the Tanzanian project (Boga & McGreal, 2014), and Computer Science 50 (EdX, 2020).

6.4 Conclusion

The overarching research question for this study is:

Do the MOOCs from the University in this study contribute to increasing education access for those who are traditionally excluded from university education?

This study explored this question from both the MOOCs students' and lecturers' perspectives. Based on the findings from Chapter 4 and Chapter 5, this section draws the following conclusions.

The learners' information from the two courses depicts a similar picture of MOOCs' role in providing education access. The overall conclusion is that the MOOCs' students mainly came from developed countries with a better-educated background and enrolled for curiosity or personal challenge. The majority of the MOOCs' learners already had tertiary degrees. Nevertheless, the data about education backgrounds and the students' motivations show that the MOOCs have provided high-quality courses to some students who would typically have little chance to access traditional higher education; that is, those students with qualifications below high school and students enrolled because they wanted 'to access learning opportunities otherwise not available for me'.

From the MOOCs lecturers' perspective, this study explored the research question from the lecturers' motivations, their target groups of learners, and how they cater for learners' diversity. In terms of motivations, providing an opportunity to access higher-level education for those excluded from traditional education was not offered as a motivation for providing MOOCs.

Regarding their targeted groups of potential students, the lecturers assumed their audience would be people mainly from New Zealand and the US, employed, and with an undergraduate qualification or professional background. Those groups they mentioned were from developed countries with well-educated backgrounds and good employment status. However, no relevant previous knowledge was required for MOOCs, which may help increase education access for people interested in learning from MOOCs.

In terms of how to cater for learners' diversity, although the lecturers did not design the course to attract diverse learners, they took some measures to make their course

accessible for students from different backgrounds. They also suggested other ways that could broaden the accessibility of MOOCs in the future, such as improving the communication between students and lecturers and among students.

Although the MOOC lecturers realized there could be a diverse range of students enrolling in their courses, they assumed a certain group(s) would be more interested than others. The students' demographics were broadly consistent with their expectations. Although there were students from developing countries and those who did not have a tertiary degree, these numbers were comparatively less than those with previous tertiary qualifications from developed countries. Thus, the conclusion of this study is consistent with most of the studies on this topic, that MOOCs play a limited role in increasing education access despite this being considered one of the early aims for providing and developing MOOCs (Daniel, 2012; Dillahunst et al., 2014; Emanuel, 2013; Tang & Carr-Chellman, 2016).

6.5 Contributions

An important original aim of MOOCs was to provide educational opportunities for anyone anywhere (Pappano, 2012). However, this claim has come under increasing scrutiny (Lambert, 2020). Whether MOOCs improve education access is an important and still relatively under-researched issue (Rasheed et al., 2019; Zhu et al., 2018). This study investigated the role of two MOOCs in New Zealand in increasing education access.

The findings from this study make several contributions to the current literature. First, this thesis adds to the growing body of research that has found that MOOCs play a limited role in broadening education access (Daniel, 2012; Musthafa M.N & Nasimudheen T, 2014; Pollack Ichou, 2021; Tang & Carr-Chellman, 2016). Apart from the findings that are similar to the current literature, this study found that students with secondary qualification rank third in the students' composition, which indicates that the MOOCs reached a small number of students who had no tertiary degree.

Secondly, the qualitative analysis results contribute to understanding the experience of lecturers (including the motivations, the challenges and achievements, the targeted students' groups, and the approaches to attract more students) who design and teach MOOCs. The findings of the key motivations of sharing knowledge in the field and creating

teaching materials added to those of Hew and Cheung (2014) and Zheng et al. (2016). The identified challenges were the high demand of time, lack of online teaching experience, and poor interaction during teaching. These challenges are consistent with Len-Urritia et al. (2018), who reported adapting to new tools and processes, meeting deadlines, attracting target audiences, and workload as the MOOCs lecturers' challenges. However, the lecturers also reported developing valuable courses materials and new teaching skills as their key achievements, which is similar to Belanger et al. (2013) and Kolowich (2013), who reported that MOOCs provide an opportunity for lecturers to create valuable teaching materials. The lecturers' consideration of students' diversity and the teaching strategies they used to cater for the students' diversity aligns with Najafi et al. (2015), who report similar findings with consideration of students' characteristics when designing MOOCs.

In addition to similar findings from previous literature, this study also found that one motivation for the lecturers to engage in MOOCs was working collaboratively with others, including other teams in their university or other individuals outside the University. This study also identified the University's motivation from the MOOCs lecturers' perspective, which helps to understand how MOOCs lecturers interpret MOOCs' role for the University.

Although the findings were broadly consistent with the previous literature, the mixed methods used in this study indicate the need for future research to investigate how to create access to higher education using MOOCs. According to Zhu et al. (2018), most of the current empirical literature used survey data to investigate research topics focused on students' perspectives and data. This research extends this by using demographic data with country-level factors, such as GDP, to answer the research question. This correlation analysis provides a new empirical perspective for researchers to link the relationship between the development level of a country with MOOC participation.

No research was found on this topic with regards to MOOCs provided in New Zealand. This study collected both quantitative and qualitative data from a New Zealand institution and provided insights from non-US and non-European courses. This research thus could test the general applicability of the main conclusions established in the literature. One contribution of this study is adding a New Zealand-based study on this

topic. This study may provide a source for researchers who are interested in doing comparison research across different countries on this topic.

6.6 Limitations

This study has some limitations. These relate to the size of both the quantitative and qualitative data set, the missing values in the quantitative data set, and the disciplinary content of the MOOCs studied.

1) Limited available courses.

An obvious limitation of this study is that both the quantitative and qualitative data sets are relatively small. This study only investigated two MOOCs in one university. Because each MOOC had a particular design and content, the findings cannot be generalized widely. However, the use of mixed methods strengthened the findings and shed light on the motivations of the stakeholders.

2) Missing values in students' demographic data set.

Another limitation that may affect the results is that there were a large number of students who chose not to report their information regarding their academic backgrounds, gender, age, and countries of origin. The conclusion of this study was drawn without considering the missing values. The results may not accurately show the students demographics due to a large number of missing values. However, standard statistical practices were followed in the treatment of missing values.

3) Courses with similar features.

MOOC1 and MOOC2 were similar. They are non-STEM courses offered around the same time, the content in both MOOCs extends professional knowledge (albeit in different fields), and both are provided through the EdX platform. Results may differ from data from other courses, from different times, or through other platforms. This study's results do not rule out the possibility that some more technical MOOCs, like computer science, might contribute to education access in a more comprehensive way. Additionally, EdX is a US platform, and most students were from NZ and the US.

4) The complexity of economic measures.

This study identifies the strong and significant positive relationship between participation rate and GDP per capita in the quantitative analysis part. The researcher acknowledges the complexity of using GDP to measure overall economic development and the considerable variation within a country. For example, some developing countries might have a large overall GDP, but its ranking might be different when we use the measure of GDP per capita and within the country; some regions might have high GDP per capita and others a lower amount. The country average might not be a good proxy for countries with massive variation within it. Other country-level measures might also suffer from the same issue. Despite the issues with using GDP per capita as a proxy for economic development in a country, this is an internationally accepted method.

6.7 Recommendations

From my research, I propose several recommendations to increase MOOCs' effectiveness in providing access to tertiary education for students who are traditionally excluded.

The first recommendation relates to the content of the MOOC courses. Suppose course providers were aware of the importance of MOOCs' role in broadening education access to students who are traditionally excluded. In that case, they could consider providing more elementary level courses for students who do not have a tertiary degree. This may enable students to understand the course more easily. From the findings of this research, there was a relatively large number of students with secondary qualifications and an elementary level course might be attractive to them.

The second recommendation is related to the improvement of the technical features of MOOCs. More technical support could be further improved to increase the accessibility of MOOCs. For example, the interaction between teachers and students and among students could be improved. Better communication may make the courses more attractive to more students. Another improvement could also be made by providing multilingual options. For example, subtitles in other languages could increase education access for non-English speakers.

Another recommendation is about the motivations of stakeholders. Although students have various motivations to enrol in the MOOCs, the provider (the lecturers and the universities) could consider providing opportunities for students who are traditionally

excluded as one of their motivations to provide the MOOCs. The motivation may affect the marketing of the courses and then attract more students who are traditionally excluded.

Personal Statement

At the end of my research, I feel the need to present more details about why I chose this topic, what experience I have regarding MOOCs, and what my expectations were before this research. I hope this statement will help readers understand how personal interest has applied to the research project I am currently doing.

Before I started this research project, I had finished and gained certification by several MOOCs on different platforms. I learned English and programming skills through MOOCs. For example, I learned English for IELTS through Coursera, I enrolled in MOOCs provided by MIT to learn computer sciences skills (Python programming), and I finished my Nano degree as a data scientist at Udacity within six months. I have experienced the whole process of learning through MOOCs: finding the motivation to learn, engaging in the courses, the decision process to pay for the certificate, and posting questions on discussion forums.

For me, personally, MOOCs are not only great sources from which to gain knowledge and skills from the world's elite universities, which was not possible several years ago, but they also give me the hope to engage in something different from my daily role as a foreigner in New Zealand. MOOCs are my first choice when I need to learn something new or to review previous learning. I did not finish all courses I enrolled in, but the MOOCs did provide me with what I wanted. When I started this project, I thought the MOOCs would have provided great opportunities for people who lack education access normally. This is the root of my research proposal, which has pushed me to explore the relationship between MOOCs and education access in this entire thesis.

Although my results were not entirely what I expected, I still believe MOOCs can benefit students who typically do not have access to high-quality courses, but gaining access may be primarily decided by the nature of the course content. Courses with a technical orientation, such as computer programming, are possibly more desirable for those needing access. I think I will continue to use MOOCs for study in the future and will probably volunteer to do some translation work to make MOOCs more accessible.

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Appendices

Appendix I: Definition of variables from WDI

The definitions of the variables from WDI are collected from the World Bank website.

Variable name	Meaning	Detailed definition	Sources
<i>Total population</i>	Total population definition	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.	WDI
<i>GDP per capita</i>	GDP per capita (thousands US dollars)	GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. Data are in current US dollars.	WDI
<i>Broadband number</i>	Fixed broadband subscriptions (per 100 people)	Fixed broadband subscriptions refer to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s. This includes cable modem, DSL, fibre-to-the-home/building, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. This total is measured irrespective of the	WDI

method of payment. It excludes subscriptions that have access to data communications (including the Internet) via mobile-cellular networks. It should include fixed WiMAX and any other fixed wireless technologies. It includes both residential subscriptions and subscriptions for organizations.

<i>Mobile number</i>	Mobile cellular subscriptions (per 100 people)	Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service that provide access to the PSTN using cellular technology. The indicator includes (and is split into) the number of postpaid subscriptions, and the number of active prepaid accounts (i.e. that have been used during the last three months). The indicator applies to all mobile cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services.	WDI
<i>patent number</i>	Patent applications, residents	Patent applications are worldwide patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office for exclusive rights for an invention – a product or process that provides a new way of doing something or offers a new technical solution to a problem. A patent protects the invention to	WDI

the owner of the patent for a limited period,
generally 20 years.

<i>ATM number</i>	Automated teller machines (ATMs) (per 100,000 adults)	Automated teller machines are computerized telecommunications devices that provide clients of a financial institution with access to financial transactions in a public place.	WDI
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Appendix II: Approved ethics

VICTORIA UNIVERSITY OF
WELLINGTON
TE HERENGA WAKA

Phone 04-463 6028
Email judith.loveridge@vuw.ac.nz

TO	Huihui Cao
FROM	Associate Professor Judith Loveridge, Convenor, Human Ethics Committee
DATE	17 March 2020
PAGES	1
SUBJECT	Ethics Approval Number: 28314 Title: MOOCs and education access -- evidence from New Zealand

Thank you for your application for ethical approval, which has now been considered by the Human Ethics Committee.

Your application has been approved from the above date and this approval is valid for three years. If your data collection is not completed by this date you should apply to the Human Ethics Committee for an extension to this approval.

Best wishes with the research.

Kind regards,

Judith Loveridge

Convenor, Victoria University of Wellington Human Ethics Committee

Appendix III: Information sheet for interview

MOOCs and Education Access: Evidence from New Zealand

INFORMATION SHEET FOR PARTICIPANTS

You are invited to take part in this research. Please read this information before deciding whether to take part. If you decide to participate, thank you. If you decide not to participate, thank you for considering this request.

Who am I?

My name is Huihui Cao, and I am a Master's student in the Master of Arts (in Education) at Victoria University of Wellington. This research project is to work towards my thesis.

What is the aim of the project?

This project *aims to 1) explore the relationship between learners' educational background and their engagement in MOOCs; and 2) investigate the motivations and intentions of VUW staff to provide MOOCs and what is the MOOCs targeted group.*

Your participation will support this research by *helping us understand whether MOOCs have contributed to making higher education more accessible and your motivations for providing the MOOC.* This research has been approved by the Victoria University of Wellington Human Ethics Committee: *reference number 0000028314.*

How can you help?

You have been invited to participate because you are the core member of developing or delivering the MOOC courses at Victoria University of Wellington. If you agree to take part, I will interview you at a convenient location for you. I will ask you questions about your experience of teaching the MOOCs, focusing on the questions related to the targeted audience of the MOOCs and your motivations to provide MOOCs. The interview will take *around 1 hour.* I will audio record the interview with your permission and write it up later. You can choose not to answer any question or stop the interview at any time, without giving a reason. You can withdraw from the study on any day before 31 July 2020. If you withdraw, the information you provided will be destroyed.

I also seek your permission to access, through the Centre for Academic Development (CAD), the Victoria EdX students' MOOC data for your course, including students' demographic data, pre-course and post-course survey data. This data will help me explore the relationship between learners' educational background and their engagement in the MOOCs they attended.

What will happen to the information you give?

This research is confidential. This means that the researchers named below will be aware of your identity, but the research data will be combined, and your identity will not be revealed in any reports, presentations, or public documentation. However, you should be aware that in small projects your identity might be obvious to others in your community.

Only my supervisors and *me* will read the notes. The interview transcripts, summaries and any recordings will be kept securely and destroyed by *31 December 2025*.

What will the project produce?

The information from my research will be used in my Master's thesis and academic publications.

If you accept this invitation, what are your rights as a research participant?

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- choose not to answer any question;
- ask for the recorder to be turned off at any time during the interview;
- withdraw from the study before the interview begins;
- ask any questions about the study at any time;
- receive a copy of your interview recording;
- be able to read any reports of this research by emailing the researcher to request a copy.

If you have any questions or problems, who can you contact?

If you have any questions, either now or in the future, please feel free to contact me or my supervisors:

Student:

Name: Huihui Cao
University email address:
huihui.cao@vuw.ac.nz

Supervisor:

Name: Dr Anne Yates
Role: Senior lecturer
School: School of Education
Phone: 04 4639744
anne.yates@vuw.ac.nz

Associate Supervisor:

Name: Dr Stephen Marshall
Role: Associate professor
School: Centre for Academic Development
Phone: 04 4635205
stephen.marshall@vuw.ac.nz

Human Ethics Committee information

If you have any concerns about the ethical conduct of the research you may contact the Victoria University HEC Convenor: Dr Judith Loveridge. Email hec@vuw.ac.nz or telephone +64-4-463 6028.

Appendix IV: Consent form for interview

MOOCs and Education Access: Evidence from New Zealand

CONSENT TO INTERVIEW AND DATA ACCESS

This consent form will be held for *five* years.

Researcher: *Huihui Cao School of Education*, Victoria University of Wellington.

- I have read the Information Sheet and the project has been explained to me. My questions have been answered to my satisfaction. I understand that I can ask further questions at any time.
- I agree to take part in an audio-recorded interview.
- I agree to provide the MOOC data, including students' demographic data, pre-course and post-course survey data.

I understand that:

- I may withdraw from this study at any point before 31 July 2020, and any information that I have provided will be returned to me or destroyed.
- The identifiable information I have provided will be destroyed on *31 December 2025*.
- Any information I provide will be kept confidential to the researcher and the supervisor.
- I understand that the findings may be used for a Master's dissertation and academic publications.
- I understand that the recordings will be kept confidential to the researcher and the supervisor.
- My name will not be used in reports and utmost care will be taken not to disclose any information that would identify me. However, you should be aware that in small projects your identity might be obvious to others in your community.

Appendices

- I would like to receive a copy of the final report and have added my email address below. Yes ☐ No ☐

Signature of participant: _____

Name of participant: _____

Date: _____

Contact details: _____

Appendix V: Interview questions

The following questions have been used as the main guideline for my interview with the lecturers.

About Intentionality/motivation to teach a MOOC/MOOCs

1. Were you invited to teach MOOC/MOOCs, or did you propose one by yourself?

If invited, did you say yes at that time?

If proposed, why did you do so at that time?

2. What motivates you to teach MOOCs?

If they mentioned several reasons, ask if there are any priorities for the reasons,

Or, what is your primary motivation to do so?

3. Why do you think the University provides MOOCs?

About the audience/students

4. Learners with what types of characteristics did you anticipate would enrol?

5. Do you assume that your learners have any previous relevant course knowledge?

If yes, what level of previous knowledge do you assume?

6. Do the learners' have the same characteristics and previous knowledge level as your expectation?

About course design to cater for students' diversity

7. Have you taken part of the students' diversity into your consideration before developing MOOCs?

If yes, go to Q8, Q9 and Q10. If no, go to Q10

8. How have you written course material to meet learners' diversity?

9. In what other ways do you cater for learners' diversity/needs?

10. What approach do you think will be helpful in terms of reaching more students/diversity students to MOOCs?

About the challenges and achievements

11. Do you think what are the challenges and achievements to engage in MOOCs?

Appendix VI: Selected EdX survey questions

This appendix contains the open-ended questions I have used in the analysis.

1. Which of the following describe why you are taking this course? (select all that apply)

- A. Personal challenge
- B. Certificate/credential given for successful completion
- C. Increase in knowledge and skills in a new area
- D. Review of concepts in a field I have previously studied
- E. Social community of the course
- F. Curiosity about the topic
- G. Interest in MOOCs and online learning
- H. Employment/job advancement opportunities
- I. To better serve my community
- J. To engage in lifelong learning
- K. To access learning opportunities otherwise not available to me
- L. To learn from the best professors and universities
- M. Other (please tell us)

2. How familiar with the University are you?

- A. Very familiar (tell us how) - Text
- B. Slightly familiar (tell us how) - Text
- C. Not familiar at all

3. How did you hear about this course?

- A. EdX webpage or course catalogue
- B. EdX newsletter
- C. Google search
- D. Twitter
- E. Facebook
- F. Other social media (tell us which one)
- G. University communications (Alumni, etc)
- H. Word of mouth
- I. Other method (tell us how)
- J. Other social media (tell us which one) - Text
- K. Other method (tell us how) - Text