



# Innovation at universities: A fuzzy-set approach for MOOC-intensiveness<sup>☆</sup>



Julieth Ospina-Delgado<sup>a,\*</sup>, Ana Zorio-Grima<sup>b</sup>

<sup>a</sup> Pontificia Universidad Javeriana de Cali-Colombia, Calle 18 #118-250 Cali, Colombia

<sup>b</sup> Facultat Economia, Universitat de València, 46022 Valencia, Spain

## ARTICLE INFO

### Article history:

Received 1 February 2015

Received in revised form 1 June 2015

Accepted 1 September 2015

Available online 3 November 2015

### Keywords:

Mooc

University

Innovation

Fuzzy sets

FsQCA

## ABSTRACT

Typologies can be an adequate tool for analyzing the complex cause–effect relationships between innovation and the supply of university courses. This study presents a new theoretical perspective on causal core and periphery factors for MOOC-intensiveness in universities using fuzzy set Qualitative Comparative Analysis (fsQCA). The findings show how this new theoretical perspective allows for two different typologies. Different configurations lead to an outcome combination of different core and peripheral conditions building on internal, strategic, and external factors. However, the two configurations leading to the absence of the outcome simply refer to the absence of a strategic factor (university prestige) or of an internal factor (low number of faculty).

© 2015 Elsevier Inc. All rights reserved.

## 1. Introduction

Massive online open courses (MOOCs) are a new educational tool in higher education. Stanford University's 2011 MOOC on artificial intelligence, with more than 160,000 participating students and 23,000 completing students, is the starting point for this phenomenon that attracts students from around all around the world. (Waldrop, 2013). The importance of MOOCs lies in the MOOCs' virtuality, ubiquity, and in the fact that MOOCs are free of charge (Atenas, 2015; Liyanagunawardena et al., 2013a; 2013b; Morris & Stommel, 2015; Siemens, 2013).

In spite of MOOCs' novelty, research primarily focuses on the demand for these courses. According to Christensen et al. (2013) MOOC students come mainly from developed countries, are young, have a high level of education, and usually have a job. Students' main reasons for taking a MOOC are career development and curiosity. Yousef et al. (2015) group the MOOC community (i.e., students and teachers) into cluster sets according to their expectations and experience, blended learning, flexibility, high quality content, instructional design and learning methodologies, lifelong learning, network learning, openness, and student-centered learning.

Regarding MOOCs' supply, Hollands and Tirthali (2014a; 2014b) identify six main reasons why universities offer MOOCs: MOOCs reach

a higher number of people and are more accessible than traditional education; they offer an easy way of branding; they also offer financial improvement to universities; they promote better educational outcomes; and also promote teaching innovation, and research on teaching and learning. However, no existing research explores the issue of MOOC-intensiveness amongst MOOC suppliers. This study, therefore, presents a theoretical approach on the different configurations that explain universities' MOOC-intensive profile.

As Fiss (2011) argues, typologies are attractive because of their multidimensional nature that acknowledges the complexity and interdependencies of configurational antecedents. Typologies result in integrative theories that consider multiple causal links that relate to internal, strategic, and external factors. This study characterizes MOOC-provider leaders through fuzzy set Qualitative Comparative Analysis (fsQCA). This study's importance lies in that this study explains why universities are MOOC-intensive or not, because recipes indicating the absence of the outcome are not the opposites of recipes leading to that outcome (Ordanini et al., 2014; Woodside, 2014; 2015).

## 2. Theoretical framework

Because of the digital revolution, higher education institutions face new opportunities and challenges. MOOCs constitute an important development in open education: MOOCs are a new tool in a digital context, and they represent a step further from traditional free open education. Free open education, on the one hand, suffers from physical and geographical restrictions, has low personal interaction, and has low media variety in teaching resources. MOOCs, on the other hand, are available

<sup>☆</sup> The authors thank Domingo Ribeiro, University of Valencia, and Norat Roig, Polytechnic University of Valencia for their careful reading and suggestions.

\* Corresponding author.

E-mail addresses: yulemos@javerianacali.edu.co (J. Ospina-Delgado), ana.zorio@uv.es (A. Zorio-Grima).

to anyone with an internet connection, no matter the number of students taking the course or any physical or geographical condition of the university delivering the course. In addition, MOOCs use many media formats and resources—text, video, audio, quizzes, forum and multimedia in asynchronous or synchronous modes (Weller & Anderson, 2013). MOOCs also contribute to the universality of culture (Liyaganawardena et al., 2013b), enhance communication through IT with the use of global, pedagogical methods, and allow for better higher education. Even though MOOCs are not a phenomenon of such a magnitude to transform radically education, because they draw on teaching methods from more traditional courses, MOOCs will anyhow improve teaching and encourage universities “to develop distinctive missions” (Daniel, 2012). Therefore, MOOCs are an ideal case study for the contrast between innovation intensity and ICT resilience amongst universities (Weller & Anderson, 2013).

By applying Fiss (2011) typologies on management factors of technology firms to the MOOC phenomenon at higher education institutions, this study identifies the factors leading to MOOC-intensiveness and classifies these factors into three types: internal, strategic, and external factors. Within the internal factors, this study considers size (Allen & Seaman, 2014) in terms of the number of faculty staff and faculty-intensiveness (i.e., the percentage of faculty to students). For strategical factors, this study considers university prestige (Jordan, 2014). For external factors, this study considers population percentage with internet access and gross domestic product per capita (GDP) because these factors can affect the supply of MOOCs (Liyaganawardena et al., 2013b).

### 3. Method and empirical research design

This study employs a fuzzy set Qualitative Comparative Analysis (fsQCA), which uses Boolean algebra for the formal analysis of qualitative evidence and allows for valid results even with a small sample. This method uses a conceptual and logical language. This method aims to identify the conditions that are necessary and/or sufficient for a specific outcome, including equifinality and the complex causality that may take place in organizations (Fiss 2007; Pajunen, 2008; Ragin & Fiss, 2008; Woodside, 2015).

FsQCA measures coverage (i.e., the relative importance of different configurations for a specific outcome) and consistency (i.e., the proportion of cases consistent with the pattern). This study transforms the variables into fuzzy sets using the direct method of calibration (Ragin, 2008) with three thresholds: full membership, the cross-over point (i.e., the ambiguity point) and full non-membership – coding each of them with 1, 0.5 and 0, respectively.

**H1.** According to the equifinality tenet (Ordanini et al., 2014; Woodside, 2015), several routes can lead to the same outcome. That is, several combinations of university internal, strategic, and external factors can lead to a MOOC-intensive profile.

**H2.** In line with the causal asymmetry principle (Fiss, 2011; Woodside, 2015), the factors that imply that a university is not MOOC-intensive are not necessarily the negation of the factors that lead to MOOC-intensiveness.

This study gathered data on MOOCs supply from Coursera, edX (Waldrop, 2013), MiriadaX (Liyaganawardena & Williams, 2014), and university platforms on June 30, 2014. This study identified 153 universities from 29 countries offering a number of MOOCs ranging from 1 to 30, and gathered the data for the other variables in September 2014.

#### 3.1. Calibration of the outcome condition

The outcome variable is the number of MOOCs that a university offers, according to the data gathering process. For the calibrated fuzzy set, this

study sets the three thresholds at the 95 percentile, 50 percentile and 5 percentile (Woodside, 2013), which equal 20.4, 4, and 1 respectively.

#### 3.2. Calibration of causal conditions

The data for the internal factors' variables (i.e., number of faculty staff and students) come from university webpages. The Webometrics database (Cybermetrics Lab, 2014), which is the largest academic ranking of higher education institutions (Chen et al., 2015; Orduna-Malea et al., 2014), provides the data for the strategic factor. The OECD database provides the data for the external factors (OECD, 2014).

For calibration of causal conditions into fuzzy sets, the study considers the previous three percentile thresholds. For university prestige, the percentile points are in the opposite order because a lower number means higher position in the ranking. Therefore, the calibration points for number of students are 6979, 2330, and 354. For number of professors, the calibration points are 33.40, 10.20, and 3.91. The calibration points for the university position in the Webometrics ranking are 7, 154, and 5314. The calibration points for gross domestic product per capita are 67,442 USD; 51,206 USD, and 6796 USD. Finally, the calibration points for internet access are 93, 81, and 42.3.

The subsequent property space for this study is 32 combinations of binary states of the five antecedent factors that can lead to the outcome (Ordanini et al., 2014).

## 4. Results

Table 1 shows the descriptive statistics and correlations of the calibrated variables.

Table 2 shows the results of the fsQCA necessary analysis and sufficiency condition analysis.

A causal condition is necessary if the instances of the outcome are a subset of the instances of the causal factors. The convention is that if consistency is higher than 0.9 for one condition, that condition is necessary or “almost always” necessary (Schneider et al., 2010). The consistency of this study's antecedent conditions ranges from 0.64 to 0.88, being prestige the factor with the highest consistency. Note that all the antecedent conditions are non-trivial because the coverage scores range from 0.61 to 0.65. A coverage score of 0 means that the necessary condition is trivial because the condition always occurs no matter the presence or absence of the outcome.

Regarding the sufficiency analysis, this study reports a consistency of 0.79 and 0.76 in the model for the absence of the outcome condition. Coverage values are 0.61 and 0.80, respectively. These values are acceptable because they are similar to those of previous research (Woodside, 2013; Schneider et al., 2010).

As H1 points out, several recipes can lead to the outcome condition this study expects (4 configurations in Model 1; 2 configurations in Model 2), that is, the equifinality concept (Woodside, 2015).

The findings also support H2. The model that predicts the absence of the outcome, Model 2, does not mirror opposites of Model 1. Those findings render interestingly different explanations for the configurations leading to each of the two typologies (i.e., MOOC-intensive university, non-MOOC-intensive university). Model 1 shows that the 4 solutions leading to MOOC-intensiveness have similar high consistency (from 0.81 to 0.84) and coverage (0.46 to 0.50). Solution 1 is the only one with an absent core condition (i.e., internet), while at the same time presenting the core condition of GDP and peripheral conditions for internal factors. However, internet is a present core condition in the other 3 solutions, which confirms that the “recipe is more important than the ingredients” (Ordanini et al., 2014, p. 134). Faculty is a core condition in solutions 3 and 4, and a peripheral condition in Model 1. Prestige is a core condition in all solutions, except for solution 1. Note that in Model 1, all solutions present combinations of the five factors. However, in Model 2, the solutions present only one factor. In

Download English Version:

<https://daneshyari.com/en/article/1016864>

Download Persian Version:

<https://daneshyari.com/article/1016864>

[Daneshyari.com](https://daneshyari.com)