10 Openness in MOOCs for Training and Professional Development – An Exploration of Entry and Participation Barriers

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10.1 Introduction

Massive Open Online Courses (MOOCs) constituted a high-profile phenomenon in educational technology within the last ten years and attracted a lot of attention from researchers and practitioners. Although MOOCs have not disrupted the higher education sector as profoundly as it had been propagated (Reich & Ruipérez-Valiente, 2019), a new global market for online education with commercial platform providers has emerged. By 2018, more than 900 universities had launched 11.4k MOOCs with different platform providers serving over 100 million learners. The estimated revenue of Coursera as the biggest global MOOC provider is $140 million, and a growth rate of more than 20% indicates a huge demand for online-based education and training (Shah, 2018a).

Historically, MOOCs have developed out of academia, closely related to the concepts and ideas of open education (Yuan & Powell, 2015). Openness has always been a central part of the MOOC narrative, the courses being offered at virtually no cost, without formal prerequisites and accessible from virtually everywhere. Extending the academic perspective, MOOCs have been identified as a promising option for work-related learning and professional development (Milligan & Littlejohn, 2017). Lately, MOOCs have been gaining more acceptance among employers (Hamori, 2017, 203ff.) and employees (Egloffstein & Ifenthaler, 2017), despite the fact that openness is rather uncommon in corporate contexts (Olsson, 2016). At the same time, MOOC providers are adjusting their business models after the initial years of euphoria, both for monetization and for accommodating the requirements of training and professional development. The idea of openness, meanwhile, seems to be fading into the background. More and more MOOCs are provided with entry and participation barriers at different course stages. Hence, the question arises whether openness remains a distinctive feature of MOOCs, especially with regard to training and professional development.

The aim of this contribution is to explore the openness of MOOCs for professional development and to add empirical evidence to the current discussion. This leads to the following research questions:

1. What are current notions of openness in online education and training, and how do they relate to MOOCs with respect to professional development?
2. Which types of barriers do exist in MOOCs for training and professional development?
3. Are there systematic patterns of barriers, pointing towards specific strategies of openness employed by MOOC providers?

We first discuss current notions of openness in online education and training and show possible links to generic MOOC models. We then review N =295 MOOCs from nine common English-speaking providers for barriers. Based on our empirical data, we set out to characterize different types of MOOCs from the perspective of openness.

10.2 Theoretical background

10.2.1 MOOCs in post-secondary education

Broadly defined, MOOCs are "free or low-cost Internet-based university courses or near equivalents" (Waks, 2016, xiii). Following the acronym, MOOCs can be classified as "courses that are designed for large numbers of participants (*massive*), free to access (*open),* delivered entirely over the web (*online*), and structured and assessed (*courses*)" (Knox, 2015, 1372). However, there is a great variation in MOOC formats, so this broad description can only be a first conceptual consensus. Apart from MOOCs being delivered *online*, all the other defining characteristics can be questioned in one way or another. Especially how *openness* is understood seems to be a key difference of several MOOC initiatives and approaches (Knox, 2015).

As a result of two separate development paths, two generic MOOC models with different underlying pedagogical approaches have emerged (Ifenthaler, Bellin-Mularski, & Mah, 2015). cMOOCs (connectivist MOOCs), on the one hand, provide collaborative and network-oriented learning environments. They focus on learning communities and promote the autonomy of educational objectives. cMOOCs enable knowledge generation through discussions, construction and sharing of contents, and social network activities. xMOOCs (extension MOOCs), on the other hand, follow a more traditional cognitive-behaviorist approach. They focus primarily on the dissemination of contents to larger audiences. Therefore, xMOOCs enable a scalable knowledge delivery with specialized video-oriented learning platforms. Typical elements of those platforms are lecture videos, integrated quizzes and short online tests for automated assessment. With respect to instructional design criteria, the two approaches can be characterized as follows (Tu & Sujo-Montes, 2015):

cMOOCs are centred around content production, and learners are expected to create, enhance and share. Content is fragmented and not bound to a course. xMOOCs, on the other hand, follow a defined formal course structure, and learners are expected to master what they are being taught. The xMOOC teaching mode is lecture oriented, mostly implemented by instructional videos, while cMOOCs rely on distributed interactions and personal sense-making. Recently, the boundaries between the two ideal-typical MOOC models have become less clear, and the „the division has been criticized as overly simplistic in assuming particular kinds of pedagogy" (Knox, 2015, 1373). However, content delivery and scalability are still predominantly linked to xMOOCs, while pedagogical innovation has been associated with the cMOOCs model (Spector, 2017). Beyond that, the current notion of the MOOC concept predominantly relies on the xMOOCs model, so that the term MOOC has become synonymous to large-scale video-based instruction.

The MOOC trajectory can be characterized as a sequence of (1) an early experimentation phase, (2) the rise of the mainstream platforms, and (3) a current phase of redesign and consolidation aiming at sustainability (Knox, 2015). While (1) brought pedagogical innovations with cMOOCs in the light of social media from 2008 onwards, phase (2) introduced the mainstream MOOC platforms like edX, Coursera, Udacity or FutureLearn as novel players in the global education market in 2012. Since then, the inflated expectations from the hype phase have made way for a more realistic perspective on MOOCs, and more and more feasible uses cases are being developed backed by research. This includes a shift from academic education towards corporate training and digital workplace learning, a focus on competence-based education with respect to professional development, and the implementation of learning analytics. These developments require new ways of credentialing as well as new service and business models (Egloffstein, 2018, 153).

With production costs of up to 55,000 € per course (Epelboin, 2017), MOOC providers needed business models to refinance course production costs as well as the costs for managing and developing their platform right from the very beginning. Structuring the wide range of MOOC monetization efforts, three generic business models have been outlined (Patru & Balaji, 2014, 71ff): (1) freemium business models, (2) business-to-business models and (3) business models for governmental involvement. Among the current "tiers of monetization" of commercial MOOC platforms (Shah, 2018b), revenues from certificates, (micro-)credentials and full online degrees can be attributed to model (1), where a basic service is free and additional fees apply. Corporate training as a source of revenue for MOOC providers clearly follows business model (2).

10.2.2 Openness as a distinct MOOC feature

10.2.2.1 Notions of openness in online education and training

Openness is "a complex socio-political term which is deeply interwoven with technology" (Deimann, 2019, 3). In educational contexts, openness is a value-laden concept with philosophical, pedagogical and political connotations (Hug, 2017), with its respective meanings being framed by social-political worldviews (e.g., self-empowerment vs. neoliberalism). Historically, the roots of openness in education date back until the late Middle Ages, where the Gutenberg press enabled public lectures, with recent technology-driven developments from open universities in the late 20th century to open courseware and MOOCs in present times (Peter & Deimann, 2013, 11). Openness has emerged as a major paradigm for research and practice in education (Bozkurt, Koseoglu, & Singh, 2019). The literature review by Bozkurt and colleagues shows publications from the last 50 years with a dramatic increase in research output from around 2008 onwards. Thereby, open educational resources (OER), open learning, MOOCs and e-learning were identified as central concepts. Despite the growing research interest, there is still no clear understanding or common definition of openness in education. However, most of the current approaches build on three core aspects: availability, affordability and accessibility (Kopp, Gröblinger, & Zimmermann, 2017). With respect to MOOCS, different implementations of openness addressing these core aspects have to be considered.

Open Distance Learning (ODL). The concept of ODL combines two distinct ideas (Gaskell, 2015), namely open learning (in relation to access, time and place of study, and flexibility) and distance learning (distance between "teacher" and learner). ODL refers to institutions providing remote access to higher education, combined with lower entry requirements concerning academic achievements, thus bridging the gap between academia and professional development. ODL also refers to online learning, where flexibility concerning time and place is implemented via internet technology.

Open Access (OA). OA describes the free access to research outputs and materials via internet. With regard to MOOCs, two different interpretations of OA come into effect (Cronin, 2017): *Open admission* refers to the access to formal education in the shape of the elimination of entry requirements like prior knowledge or certified academic achievements. *Open as free* refers to monetary costs involved for participating in a MOOC.

Open Educational Resources (OER). OER are an extension of the ideas of OA (Cronin, 2017). Here, open means not only gratis (free of cost), but also libre (enabling legal reuse). OER thus are teaching, learning and research materials in any medium that reside in the public domain or have been released

under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. (Hewlett Foundation, 2019). OER enable the "5R activities" for open content as proposed by David Wiley (2015, 6): Retain, Reuse, Revise, Remix, Redistribute.

Open Educational Practices (OEP). OEP extend OER with a shift of focus from resources to actions. In the narrow sense, OEP describe „practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning paths" (Ehlers, 2011, 4). From a wider, beyond-production perspective, OEP are "collaborative practices that include the creation, use, and reuse of OER, as well as pedagogical practices employing participatory technologies and social networks" (Cronin, 2017, 4).

10.2.2.2 Openness in MOOCs

Openness is the key criterion for defining MOOCs. How openness is implemented also seems to be the major criterion of differentiation regarding MOOC approaches. Research shows that cMOOCs and xMOOCs promote different concepts of openness (Rodriguez, 2013). Most of the described notions of openness can be found in experimental MOOCs following the cMOOCs model. These courses are often built with the intention of putting OER and OEP into practice. However, they cannot always fulfil the idea of open learning in the sense of ODL as entry barriers exist in terms of prerequisites of digital literacy and tool-related competencies. Also, flexibility and scalability might be questioned due to dependencies arising from cooperative or collaborative settings.

With respect to training and professional development, current mainstream MOOCs following the xMOOCs-model are of much greater relevance. They clearly implement openness in the sense of *ODL*, as access to learning materials is not constrained by time or place. Mainstream MOOCs also work without formal prerequisites in terms of academic qualifications. Furthermore, they implement distance learning to a very large extent: Usually the assessment is also delivered online so that no physical presence is necessary.

MOOCs only partly adhere to the idea of *OA*. On the one hand, admission to MOOCs is basically free. If not, courses are being re-labelled, for example as "SPOC" (small private online course) or as "COOC" (corporate open online course), the latter only being open within a specific corporate setting (Egloffstein, 2018). On the other hand, current MOOCs are not free of charge. Depending on the underlying business model and monetization strategy, different fees can apply.

Generally, mainstream MOOCs do not consist of *OER*. MOOC contents like videos and other learning objects usually are proprietary, and there is no option to retain, reuse, revise, remix or redistribute them. From a pure open

education perspective, MOOCs thus might even be regarded as a misstep, given the apparent contradiction between the proclaimed openness and the actual concept of content ownership (Wiley, 2015). However, some providers are working on the integration of the OER concept into their platforms, with expected benefits especially on the pedagogical side (Kopp et al., 2017).

Finally, current MOOCs do not fare too well regarding *OEP*. Although "open practices would not [per se] be blocked in MOOC formats" (Czerniewicz, Deacon, Glover, & Walji, 2017, 95), there is only little evidence for OEP in mainstream MOOCs. However, a number of MOOCs has enabled new partnerships between academic and business partners, with great benefits for training and professional development purposes.

10.2.2.3 Operationalisations of openness in MOOCs

Although the interpretations of openness greatly vary, studies on MOOCs often do not present explicit conceptual descriptions of openness (Weller, Jordan, DeVries, & Rolfe, 2018). Therefore, operationalisations of openness are scarce. Economides and Perifanou (2018) developed a 19-item questionnaire for evaluating the openness of a MOOC, analysing open capabilities regarding cost, time and place as well as open capabilities regarding educational resources on the MOOC. Although the instrument leads to clear results, the approach remains rather theoretical, as it does not provide information about the course features that actually constitute openness. Rousing (2014) operationalized openness in MOOCs along five dimensions: (1) education across geographical boundaries, (2) entry barriers, (3) flexibility, (4) open pedagogy and (5) openness of resources. In a qualitative approach, the author collected and described evidence of openness (structures and policies/principles) for different providers and connected those observations to an interpretative rating. While this approach provides rich information of practical relevance, validity and reliability of the interpretations can be questioned. Hendrikx, Kreijns, and Kalz (2018) developed a classification of barriers that influence intention achievement in MOOCs. In a factor-analytical approach, they identified four distinctive barrier components: (1) technical and online learning skills, (2) social interactions, (3) course design and (4) time, support and motivation. While barrier components (1) and (4) were classified as non-MOOC-related, component (3) is directly related to MOOC design, and component (2) at least in parts. Although this approach is not directly targeted at openness, it provides rich evidence, as the lack of certain barriers related to MOOC-design can be interpreted as a sign of openness.

10.3 Analysing the openness of MOOCs for training and professional development

10.3.1 Research objectives, sample and procedure

Given the broad discussion on MOOCs and open education and the lack of empirical evidence concerning openness, we intended to analyse openness in a bottom-up approach focusing on the 'tangible' dimensions of the concept. We followed the approach of Hendrikx et al. (2018) and operationalized openness *ex negativo* through the absence of barriers. Thereby, we looked at formal aspects pertaining to the learning environment and masked out intangible learner related variables. Thus, our analysis focused on 'hard barriers' to entry and participation.

From the professional development perspective, we focused on MOOCs from the field of business and management, which represent the second largest section in the global MOOC market (Shah, 2018a) and are clearly related to training and development. As the field is rather heterogeneous, we included courses from a wide range of topics as for instance Technology and Applications, Accounting, Finance and Taxation, Marketing, Entrepreneurship, Management Skills and Leadership, Innovation Management, Project Management, Legal aspects, Human Resources and Organization or Data Analytics.

The study took place in summer 2019 and included a sample of N=295 different MOOCs which were hosted by nine of the biggest mainly English-speaking providers in North America, Europe and Asia. We randomly included courses that lasted no longer than twelve weeks from a starting point within the period of investigation. We analysed courses from twelve topic fields which were randomly distributed in the sample. The rating was performed by a trained rater with a background in pedagogy and instructional design over a period of ten weeks and reviewed in a process of consensual validation. The courses showed a mean length of M=4.76 weeks (SD=2.66; Min=1; Max=16) and an overall workload of M=20.77 hours (SD=16.69; Min=1; Max=120). Most of the courses were hosted by academic institutions (n=197) in North America, Asia and Europe. Table 1 shows the structure of the sample.

Table 1. Sample structure

Provider	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***	***(7)***	***(8)***	***(9)***
Technology & Application	5	2	1	0	1	34	0	0	0
Accounting, Finance & Taxation	8	7	7	1	0	0	12	1	0
Mgt. Skills & Leadership	11	10	14	8	1	2	9	1	1
Innovation Mgt.	3	2	4	2	0	2	0	1	0
Marketing	4	5	2	0	4	1	7	0	0
Entrepreneurship	1	1	2	1	2	0	1	2	3
Project Mgt.	1	2	1	0	0	0	4	0	0
General & Strategic Mgt.	4	9	6	1	0	0	9	0	0
Data Analytics	8	4	8	0	8	4	3	0	0
Legal Aspects	1	1	0	0	0	1	0	1	1
Operations Mgt.	2	4	1	0	0	4	4	1	1
HR & Organisation	2	3	4	2	0	2	1	1	0
Total n	**50**	**50**	**50**	**15**	**16**	**50**	**50**	**8**	**6**

Note. (1) Coursera, (2) edX, (3) Future Learn, (4) iversity, (5) Udacity, (6) Open SAP, (7) NPTEL, (8) Polimi, (9) Open Learning

10.3.2 Rating scheme

The rating scheme contained 20 different types of barriers which are assigned to six categories (see Table 2). The first category comprises barriers pertaining to certain individual *prerequisites* of the participants. For instance, attending the course requires a certain previous knowledge or specific technical configurations. Additionally, in some cases, certain countries like Iran, Ukraine or Cuba were excluded from attendance. Pertaining to the *materials* there were either fees for the activation of the learning contents or access was limited temporarily. Barriers concerning the *assessments* implemented in the courses were either referring to *criterial* (a specific amount of tasks that has to be passed) or *temporal* barriers (tasks have to be completed in a certain period). In some cases, participants only had a limited number of attempts to pass the tasks successfully. When looking at barriers pertaining to the *feedback* provided in the course, some providers demanded payment for the accessibility of solutions or called for peer feedback while in other cases feedback was only provided for solutions that arrived on time. Concerning the availability of *certificates*, we differentiated between barriers which implied fees for the certificate itself or

the participation in the assessments. In some cases, certification was based on a certain amount of learning contents which had to be accessed during the course, or there was no online certificate available, but the participants had to pass a local exam. In the course of consensual validation, interrater reliability was calculated by means of Cohens Kappa and reached satisfactory values from .71 to .95 for the six categories.

Table 2: Categories and types of barriers

Category	Types of Barriers
Prerequisites	0= no barriers 1= language barriers 2= specific previous knowledge 3= country of origin excluded 4= attendance of associated courses 5= technical barriers 6= several barriers at the same time
Materials	0= no barriers 1= fees for the activation of materials 2= temporal limitation of access 3= both
Assessments (criterial barriers)	0= no barriers 1= all tasks must be passed 2= share of tasks must be passed
Assessments (temporal barriers)	0= no barriers 1= tasks accomplished within deadline 2= limited number of attempts
Feedback	0= no barriers 1= fees for the accessibility of solutions 2= peer feedback necessary 3= feedback only when solution on time
Certificate	0= no barriers 1= fees for certificate 2= fees for assessment participation 3= combination of 1 and 2 4= access of material 5= no certificate available

10.4 Results

10.4.1 Entry and participation barriers in MOOCs

First, we analysed the number of barriers which were implemented in each course of the sample. The number of barriers ranged from a minimum of 1 to a maximum of 6 barriers. On average, we found approx. three barriers per course (M=2.94, SD=1.23). Six courses showed the highest number of six barriers while in 38 of the courses we only identified one barrier. The latter mainly originated from Asia (n=19) or North America (n=10). When taking a look on the categories of barriers in this subsample, there was either no online certificate available (in case of the Asian courses) or a certain previous knowledge was required. In eleven courses, the providers demanded fees for certification or access to the course materials.

In the next step, we analysed the frequency of barriers in each category of the full sample. Barriers focusing on *prerequisites* were implemented in 34.6% of the courses in the sample, most of them concerned previous knowledge (18.6%) or the attendance of associated courses being part of a specialization (8.8%). While technical barriers (2.4%) or the country of origin (0.3%) were rarely used. In 4.4% of the courses in the sample, we found more than one barrier on learners' prerequisites. When analysing barriers pertaining to the course *materials*, nearly two-thirds of the sample (65.8%) did not use any barrier while nearly a fifth of the analysed courses (16.6%) demanded fees for access to the materials and 13.9% limited access temporarily. In case of the *assessments*, we differentiated between *criterial* and temporal barriers. Most of the courses demanded for a defined share of tasks/quizzes which have to be accomplished (66.4%) while nearly a third did not implement any criterial barrier (31.2%) and in 2.4% of the courses all tasks/quizzes had to be passed successfully. *Temporal* assessment barriers mostly concerned a limited number of trials (34.9%) or a certain deadline to pass the tasks/quizzes which were implemented (13.9%). In about half of the courses in the sample (51.2%), we found no temporal barrier associated with the assessments. Barriers concerning the category of *feedback* in MOOCs were rarely found. In only 10.2% of the courses peer feedback was required, while 86.1% did not implement feedback barriers. When finally looking at barriers pertaining to the *certificates*, we identified a share of 41.7% of the courses which demanded fees for certification and 9.8% demanded fees for the participation in the assessment. 18% demanded for a certain amount of access to the course materials to get the certificate. 17.3% of the courses did not implement any barrier to certification.

10.4.2 Distinctive MOOC features and number of barriers

In the next step, we analysed systematic differences concerning the number of barriers due to several distinctive features of the MOOCs in the sample. Table 3 shows the means, standard deviations and results from variance analysis. First, we compared the nine MOOC providers concerning the mean number of implemented barriers. We found significant differences: Especially Coursera, edX and openSAP implemented significantly more barriers than the other providers. When looking at the types of barriers, we typically found monetary barriers like fees for participation or certification on the one hand. On the other hand, we also observed barriers associated with promoting learning success, namely deadlines, assignments to be passed and materials to be viewed. The lowest numbers of barriers were established by NPTEL and iversity.

Further, the assumption of systematic differences also applies to the regions from which the MOOCs originate. We found a significantly higher number of barriers in MOOCs administered by European and North American institutions, while the lowest numbers of barriers were implemented in courses from Asia. Moreover, we focused on the different course topics that were represented in this study. We found significant differences and a small effect size. Post hoc tests revealed that courses in the field of Technology and Application showed a higher number of barriers compared to courses from Management Skills and Leadership or Accounting, Finance and Taxation. Finally, a comparison of academic and non-academic institutions revealed no significant differences concerning the number of barriers in business MOOCs.

Table 3: Comparison of mean numbers of barriers

	M	***SD***	**F-value/T-value; η^2 /d**
Provider			
Coursera *(n=50)*	3.74	1.175	
edX *(n=50)*	3.74	1.026	
FutureLearn *(n=50)*	2.84	.997	
iversity *(n=15)*	1.87	.743	
Udacity *(n=16)*	1.94	1.289	31.23**; 0.446
openSAP *(n=50)*	3.60	.535	
NPTEL *(n=50)*	1.70	.614	
Polimi *(n=8)*	2.00	.000	
Open Learning *(n=6)*	2.94	1.234	

Table 3: Comparison of mean numbers of barriers (cont.)

	M	*SD*	F-value/T-value; η^2 /d
Region			
North America *(n=77)*	3.38	1.396	
Europe *(n=141)*	3.05	.973	
Asia *(n=65)*	2.22	1.231	9.545**; 0.116
Australia *(n=11)*	2.73	1.348	
Africa *(n=1)*	4.00	---	
Authoring institution			
academic *(n=197)*	2.92	1.271	
non-academic *(n=98)*	2.99	1.162	*t*=-.465; *d*= -0.057
Topics			
Technology & Applications *(n=43)*	3.58	.763	
Accounting, Finance & Taxation *(n=36)*	2.81	1.142	
Management Skills & Leadership *(n=57)*	2.56	1.225	
Innovation Management *(n=14)*	2.79	.699	
Marketing *(n=23)*	2.83	1.435	
Entrepreneurship *(n=13)*	2.15	1.214	2.78; 0.097
Project Management *(n=8)*	2.88	1.356	
General & Strategic Management *(n=29)*	2.83	1.256	
Data Analytics *(n=35)*	3.40	1.265	
Legal Aspects *(n=5)*	3.20	1.304	
Operations Management *(n=17)*	3.06	1.298	
HR & Organization *(n=15)*	2.87	1.598	

10.4.3 Barrier patterns

In order to identify specific patterns of barrier combinations, we calculated a latent class analysis following an exploratory approach. As there were six different barrier categories, in a first step, we compared six latent class models to figure out the optimal number of classes. Table 4 provides several information criteria which are the basis for the model comparison. The values lead to the

assumption that the solution with two classes (highlighted in bold) probably fits the data best as it shows the lowest BIC and the highest value for entropy. The AIC, however, is somewhat ambiguous as it is even slightly lower in the three-class-solution, so the results should be interpreted with caution. The average latent class probabilities which should reach values near 1 range between 0.982 (class 2) and 0.954 (class 1) indicating a reliable model estimation.

Table 4: Model comparison

Model	AIC	BIC	adj. BIC	Entropy
1 class	1409.138	1464.442	1416.873	---
2 classes	**1248.643**	**1362.939**	**1264.629**	**0.959**
3 classes	1243.175	1416.463	1267.412	0.747
4 classes	1250.972	1483.251	1283.459	0.703
5 classes	1271.259	1562.530	1311.998	0.731
6 classes	1297.342	1647.604	1346.331	0.736

In the next step, we focused on the two-class-solution and analysed the probabilities for each category to be either assigned to class 1 or 2. We found that some categories tend to be located in both classes, while others are clearly assigned to one of the classes. Table 5 illustrates the probabilities of being part of a class for each of the categories. Probabilities beyond the value of 0.500 are highlighted in bold.

Table 5: Class assignment probabilities

Category	Class 1	Class 2
Prerequisites		
knowledge	**0.895**	0.327
country	0.000	0.016
specialization	0.105	0.344
technical	0.000	0.110
several	0.000	0.203
Materials		
activation fee	0.000	**0.521**
temporal limitation	**1.000**	0.362
both	0.000	0.117

Table 5: Class assignment probabilities (cont.)

Category	Class 1	Class 2
Assessments (criterial barriers)		
all tasks	0.026	0.037
share of tasks	**0.974**	**0.963**
Assessments (temporal barriers)		
deadline	**0.828**	0.000
limited attempts	0.172	**1.000**
Feedback		
solution fee	0.000	0.061
peer feedback	0.000	**0.909**
solution on time	**1.000**	0.030
Certificate		
certification fee	0.000	**0.737**
participation fee	0.000	0.174
combination	0.000	0.090
access material	**0.688**	0.000
no certificate	0.312	0.000

Concerning the individual *prerequisites,* the main differences between the classes is related to the previous knowledge of the participants followed by courses that are part of a specialization. When looking at the course *materials***,** the providers either demand fees for the activation or limit the access temporarily. In the *assessment* categories, the classes do mainly differ by implementing a deadline to provide the solutions or limiting the number of attempts to successfully pass the assessments. Most of the courses demand for a share of tasks that have to be solved, concerning the criterial assessment category, we did not observe any clear differences. Pertaining to *feedback*, the classes differed insofar as either peer feedback was obligatory or the participants had to submit the solutions in time to receive feedback. Considering *certification* in classes 1 and 2, they differ insofar as they demand either fees for the certificate itself or a certain amount of materials and contents that have to be viewed.

In summary, class 1 contains courses that rather require a certain amount of previous knowledge, limit the access to the contents temporarily, and offer a certificate when the participants provide their solutions for a certain share of tasks and quizzes in time or prove to have viewed a certain amount of the course materials. Class 2, on the other hand, consists of courses that typically, charge fees for the activation of the course materials or for the certificates.

Consequently, it can be assumed that providers either tend to implement monetary or pedagogical barriers, the latter rather being associated with the learning process than with monetization in terms business models. However, we found no significant differences between the groups concerning the total number of barriers.

Table 6: Distribution of providers in classes

	***n* Class 1**		***n* Class 2**		
Provider	**acad.**	**non acad.**	**acad.**	**non acad.**	**Total**
Coursera	0	1	47	2	**50**
edX	0	0	44	6	**50**
Future Learn	0	0	41	9	**50**
iversity	0	0	4	11	**15**
Udacity	0	7	0	9	**16**
openSAP	0	50	0	0	**50**
NPTEL	24	0	26	0	**50**
Polimi	0	0	8	0	**8**
Open Learning	2	1	1	2	**6**
Total	**26**	**59**	**171**	**39**	**295**

Table 6 shows the structure of the latent classes concerning the distribution of providers. Class 2 is larger and includes more than 200 courses. It becomes obvious that for a majority of the providers (e.g. Coursera, edX, FutureLearn, open SAP, iversity, Polimi), the courses fall homogeneously into either one of the classes, while other provider-specific subsamples (e.g. Udacity, NPTEL, Open Learning) rather split up.

10.5 Discussion

In this study, we explored entry and participation barriers in MOOCs in order to add empirical evidence to the broad discussion about openness in online learning. First, we outlined different concepts of openness in education and reviewed corresponding operationalisations in MOOC research. Framing openness as the absence of entry and participation barriers, we developed a rating scheme which covered barriers from six dimensions. We reviewed *N*=295 business MOOCs from nine major global MOOC providers out of twelve different topic areas. When looking at the absolute numbers of barriers, we found a wide range of barriers from all of the categories reviewed. Only in

a small share of courses just one barrier was observable. Concerning the importance of certain categories, we found a criterial assessment barrier in most of the courses where a certain share of tasks had to be accomplished successfully. Another significant category of barriers concerned the fees for course certificates, which were obligatory in nearly half of the sampled courses reviewed. These descriptive results support the assumption of different barrier concepts, which either come along with monetary, business-related constraints or rather stress pedagogical criteria in order to promote successful online learning.

Concerning differences between the observed numbers of barriers due to distinctive features of MOOCs, we identified systematic variance. Especially courses from Asia seem to correspond with the original notions of openness to a higher degree compared to European and North American courses. This might be due to the increased importance of online-based education in populous Asia and could be associated with a certain educational policy. In terms of business models, the vast absence of barriers in Asian courses could therefore be a sign of governmental involvement rather than providers following financial interests. Pertaining to the course topics, offerings in the field of Technology and Applications showed the highest overall number of barriers. Taking a closer look at the types of barriers implemented, we found a mixture which mainly concerned learners' prerequisites or a set of criteria regulating the learning outcomes, while only a small share of courses demanded fees. With regard to the confounding between the course topic Technology and Applications and the provider openSAP, we analysed whether certain topics were administered by certain providers but could not find any other significant patterns.

Finally, we intended to identify typical combinations of barriers by means of an exploratory latent class analysis. The two-class solution fitted the data best, indicating two groups of courses which mainly differ regarding the types of barriers implemented. In class 1, we identified higher probabilities for barriers which are related to pedagogical criteria for successful learning (e.g. deadlines, viewed contents), while in class 2, which represented large parts of our sample, we mainly found high probabilities for monetary barriers pointing towards revenue goals in terms of business-related strategies. Thereby, some providers could be clearly attributed to one of the classes, while others had courses in both classes. Hence, the majority of providers seems to concentrate on one of the barrier concepts, while others are inclined to implement a mixture of different approaches.

Considering these results, it becomes evident that the openness of MOOCs seems to be restricted to a basic accessibility of the courses. However, one has to differentiate between barriers that are associated with a meaningful structuring of learning processes, while others indicate business models in the market for professional development. Thus, not every barrier can be interpreted as an

impediment for learning. It would be fruitful to shed light on the question if some of the barrier concepts we found are more successful than others in terms of course retention or instructional quality.

Evidently, our study faces some limitations. The convenience sample is a snapshot and can only cover a fraction of the global MOOC market. Due to language barriers, we had to limit our analysis to the English-speaking world and could not consider the vast number of MOOCs in other languages. From the professional development perspective, an extension towards other topics seems to be desirable for future approaches. Thus, the results may be interpreted as a first exploration of the field not yet providing representative findings. Further, the interpretation of the barriers in MOOCs depends on the period of investigation, as some providers change their barrier concepts when a course is not activated anymore.

To sum up, we found evidence for a reduced concept of openness implemented in MOOCs for business-related professional development. In light of the current findings on MOOCs refuting the widely heralded claim of education for all (Reich & Ruipérez-Valiente, 2019), this is not surprising. Van de Oudeweetering and Agirdag (2018) argue that even though privileged learners benefit more from MOOCs because of certain formal barriers, MOOCs still reach a notable share of underprivileged learners that would otherwise not participate in academic education. For training and professional development, this claim might hold in a similar way. The basic accessibility of MOOCs grants access to formal training for both employees and companies which might otherwise not have had the opportunity. Since MOOC providers have to address financial aspects and sustainability, barriers aiming at monetization are a necessary precondition for granting these opportunities.

With a focus on tangible factors like barriers and constraints, this study adds a pragmatic perspective to the discussion on openness in MOOCs. It has become clear that, in addition to a basic accessibility, differentiated entry and participation barriers aiming both at the generation of revenue and learning outcomes have to be taken into account.

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