Massive Open Online Courses

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1 Massive Open Online Courses—The Democratization of Education?

The Georgia Institute of Technology (Georgia Tech) is one of the world's leading universities in computer science education. Starting from 2014's winter term, Georgia Tech is providing a Master's program in Computer Science. Individual courses are offered exclusively as "massive open online courses" (MOOCs).[1] The tuition fees will cover only a fraction of the traditional Master's program in order to enhance accessibility. To realize this project, Georgia Tech is cooperating with AT&T and the private educational organization Udacity.[2] AT&T supports the program with 2 million USD. The telecommunication company uses the program for educating its own members of staff as well as for recruiting highly skilled graduates. With MOOCs for up to 300,000 participants, Udacity has gained global media attraction. Top German universities, e.g., Freiburg, Munich, and Berlin, have already started to accept some Udacity-MOOCs in their regular curricula.[3] As a consequence, MOOCs are increasingly challenging traditional teaching methods and institutions (Vardi 2012).

What are MOOCs? MOOCs are web-based online courses for an unlimited number of participants held by professors or other experts. The following constitutive characteristics can be identified (Clow 2013; McAuley et al. 2010; Vardi 2012):

- Large number of participants ("massive"): In contrast to traditional distance learning courses, MOOCs address an unlimited number of participants.
- Open accessibility ("open"): There are no, or very few, formal conditions for participation. The courses address a global target group. Specific previous knowledge is only required if the course is embedded in a degree program. Moreover, MOOCs are often free of charge or impose only low participation fees.
- Digitization ("online"): Courses are exclusively conducted via the Internet and thus are not location-dependent. Digitization comprises the learning material, the teaching process, social interaction of participants as well as their examination.
- Didactical concept ("course"): The learning content is structured according to a didactical concept. The teaching process and the development of knowledge follows pre-defined learning objectives. Elements of design may include course scheduling, a pre-structuring of the learning content, the control of social learning interaction, as well as the execution of reviews of educational objectives and tests.

From an information systems research perspective, MOOCs represent an innovative, web-based business model for financing, designing, and provisioning educational services. Due to the increasing digitization and respective structuring of these services, the laws of the Internet economy (cf. Shapiro and Varian 1999; marginal costs of additional participants tend towards zero, occurrence of network and long-tail effects) open up higher education and vocational training to the masses. Thus, MOOCs offer great potential (e.g., increased effectiveness and efficiency in education; Leimeister 2012, pp. 46–102) and challenges (e.g., new competitors) for academic institutions and other providers of educational services.

2 Previous Research on MOOCs

The current academic discussion on MOOCs focuses on the different types of MOOCs, the involved didactic concepts, as well as the technology and mechanisms that facilitate the scaling of educational services.

Clow (2013) distinguishes two fundamental types: cMOOCs and xMOOCs. The connectivist MOOCs (cMOOCs) are based on the pedagogical principles of

[1] http://www.omscs.gatech.edu/.
[2] https://www.udacity.com.
[3] http://blogs.faz.net/netzwirtschaft-blog/2013/06/07/online-akadamie-udacity-uni-abschlusse-werden-verschwinden-3495/.

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Table 1 Mechanisms and technologies for the digitization and scaling of courses

Peer support	In order to support social learning interaction, peer support mechanisms are institutionalized, thus enabling participants to help each other with questions and problems. For instance, forums may be utilized (Clow 2013) in which active participation in discussions is frequently required as an essential component of courses. There are many further possibilities for IT utilization in order to facilitate collaborative learning (Haake et al. 2012).
Peer grading	In the context of MOOCs, examinations and tests are often evaluated by fellow students (peer grading). Generally, there are only slight deviations from the assessments of professional teaching staff (Sadlar and Good 2006). Moreover, peer grading procedures are used for the calibration of diverse student assessments (Robinson 2001).
Gamification	In order to create incentives to participate in forum discussions and in peer support in general, gamification mechanisms such as badges, missions, and quests are integrated. Gamification entails the implementation of game-design elements in products, services, and information systems in order to increase their usage and effectiveness (Blohm and Leimeister 2013). Also, badges are used as an alternative to the traditional certificates in order to confirm the acquired competence within a MOOC.[a]
Learning analytics	Due to the total digitization of the teaching process, the effectiveness of the applied teaching methods can be measured. Learning content may accordingly be adapted to the individual proficiency level of participants (Cooper and Sahami 2013; Sadlar and Good 2006).
Identity control and monitoring	IT systems can support examination, e.g., in carrying out identity verification and digital monitoring.
Digital administration of user rights	Parallel to the course, participants may be granted access to electronic textbooks. To this end, information technology may support the provision of e-book licenses and the accompanying administration of user rights.

[a] http://www.forbes.com/sites/jamesmarshallcrotty/2013/02/25/new-improved-badges-give-credential-meat-to-mooc-revolution/

connectivism. They may be compared to seminars in which participants evaluate and structure new contents, create texts, and write comments that are then made available to other participants. Connectivism considers intensive interaction between participants as the essential source of the creation of knowledge (Kop and Hill 2008).

xMOOCs have evolved from the digitization of traditional lecture formats and use behavioristic teaching approaches (Clow 2013). Generally, xMOOCs consist of short video sequences for the mediation of learning contents, and direct tests (Vardi 2012). Due to the high number of participants, individual, direct interaction with teaching staff is hardly possible. Therefore, xMOOCs make use of different technologies to ensure scalability, such as an automated evaluation of multiple choice questions, validation procedures for examining the correctness of software code as known in software development (Cooper and Sahami 2013), or procedures for an automated plagiarism detection. **Table 1** summarizes essential didactic mechanisms and technologies that are applied within MOOCs.

Due to the large number of participants and the systematic application of such mechanisms and technologies, MOOCs have to be distinguished from blended learning approaches where e-learning and class-based lectures are combined. Compared to what more traditional, web-based distance learning offers, MOOCs do not attempt individual interaction with teachers. Furthermore, MOOCs differ from other web-based formats of knowledge transfer, such as webinars, which often lack comparable interactivity and didactic underpinnings.

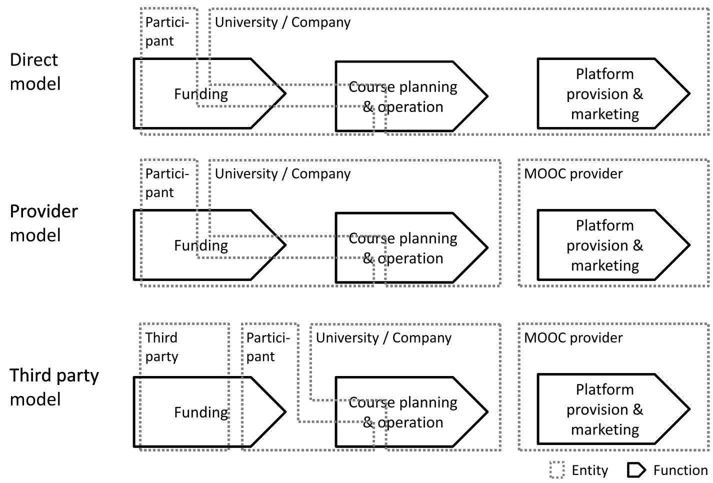

Fig. 1 MOOC business models

3 Business Models for the Conduct of MOOCs

MOOCs represent a class of business model innovations for educational services that are increasingly realized within digital value creation networks. From a general perspective, three fundamental business models for the provisioning of MOOCs can be identified (see **Fig. 1**). For categorization purposes, characteristic functions can be distinguished. Depending on the business model, these functions may be provided by different entities (e.g., universities, enterprises, IT service providers, course participants, or third-party institutions):

- Funding: Provisioning of the financial means needed for the course and the technical platform.

- Course planning and operation: Didactical course planning, preparation and provisioning of teaching material, social learning interaction as well as examination.
- Platform provision and marketing: Development and operation of the technical systems for the distribution of teaching contents, for the support of the teaching process, for user management and marketing.

In the direct model, the same entity accounts for the course and the technical platform. This model is financed by participants (e.g., certification fees) or by the educational institution that uses the MOOC for the promotion of complementary offers. This model is primarily applied by enterprises for staff or customer training purposes. To some extent, it is also used by universities to increase the reach of their educational offers and services. Examples of this model include openHPI[4] of the Hasso-Plattner Institute or SAP´s openSAP-program.[5]

In the provider model, a dedicated MOOC provider is in charge of the technical infrastructure. The provider offers MOOCs of several educational institutions and is also responsible for the marketing of courses, as well as for user management. Potential revenues through certification fees are then divided between the MOOC provider and the educational institution. Examples of this model are MOOC2degree[6] and Udemy.[7]

In the third party model, MOOCs are neither funded by the educational institution nor exclusively by course participants; rather, they are additionally funded by revenues generated by offers for third party institutions. MOOC providers can, for example, commercialize participants' information by selling it to potential employers or advertisers. A further source of funding can be exploited if real company problems are worked on by course participants in the context of a crowdsourcing initiative.[8] Beyond this, MOOC licenses may be issued to other universities in order to be included in their curriculum. The MOOC providers Udacity and Coursera,[9] for example, use such sources of income.

4 Potentials, Challenges, and Future Directions

Due to digitization and the emergence of digital value creation networks, MOOCs offer a multitude of potentials to educational institutions and companies with regard to the development of innovative educational offers as well as to their effective and efficient provisioning:

- Co-creation with learners: Through the systematic use of social interaction mechanisms, such as peer support or peer grading, value activities traditionally carried out by providers of educational services are systematically sourced to MOOC participants. From an economic perspective, course participants contribute actively to reducing education costs by taking on subtasks of the teaching process, especially in the areas of support and evaluation. From a didactical perspective, this helps participants to internalize the learning content, as interactive value creation is usually accompanied by positive learning effects (Reichwald and Piller 2009).
- Low marginal costs: Due to the total digitization of educational services, the high automation of teacher-student interaction, as well as the systematic exploiting of possibilities of interactive value creation, the marginal costs for the scaling of courses are close to zero. Significant cost reductions can thus be realized (Vardi 2012).
- Long-tail offers: The lack of location- and time-dependency of MOOCs makes it possible to address a global target group, especially in the domain of vocational training. As a consequence, also specialized courses may now be offered economically.
- Individualization of teaching services: Learning analytics facilitates the adaption of learning contents and teaching methods to the needs of individual participants (Cooper and Sahami 2013). The use of existing e-learning methods and MOOC technologies may be geared to individual learning targets and participants' performance, thus facilitating personalized courses with only little additional expenses. Approaches of systematically designing e-learning servicing (Wegener et al. 2012) may enable individualization.
- Network effects: An increased diffusion of MOOCs could result in a considerably higher concentration in the educational market. The reputation and brands of universities could become increasingly important in the competitive acquisition of participants.[10] Mechanisms of an "attention" economy could become effective and could lead to winner-takes-all markets. This is especially important in the context of third party funding models in which MOOC providers open up alternative sources of revenue. For instance, if providers of free educational services commercialize participant information, the revenue volume increases with the number of participants.

In MOOCs, learners have to take personal responsibility, as contact with teaching staff is highly restricted. In order to complete their courses successfully, learners have to effectively master digital tools, reasonably manage their time and continuously motivate themselves. Thus, the requirements for participation are high (Kop 2011) and cannot be fulfilled by all participants. Accordingly, there is a high probability that many participants will not successfully complete their courses. For instance, the dropout rate of the MOOC "artificial intelligence" at Stanford University in 2011 was around 87 %.[11] However, this problem also exists in traditional in-class lectures, in which learning satisfaction and success decrease with an increasing number of participants (Cuseo 2007). Moreover, community-based online courses

[4] https://openhpi.de/?locale=de.
[5] https://open.sap.com/.
[6] http://www.mooc2degree.com/.
[7] https://www.udemy.com/.
[8] http://trust.guidestar.org/2013/04/25/connect-with-students-to-mooc-source-your-data/.
[9] https://www.coursera.org/.
[10] Sebastian Thrun (CEO Udacity) assumes that in 50 years there will only be 10 universities worldwide. http://www.economist.com/news/international/21568738-online-courses-are-transforming-higher-education-creating-new-opportunities-best.
[11] http://www.forbes.com/sites/collegeprose/2013/01/28/moocs-a-college-education-online/.

show that aspects such as individual support by the teacher, structured tasks for small groups, and evaluation of individual and group performance are important for the success of learning (Wegener and Leimeister 2012). These didactic approaches, however, are difficult to realize within MOOCs due to the high number of participants.

In principle, an automation of examinations and peer grading mechanisms may help to deal with this lack of resources. However, there are still technological and legal challenges. For example, if certification and grading of participants are strongly based on peer grading, this would be highly questionable from a legal point of view. Automated tests, moreover, are still not applicable for all types of learning contents and learning targets. Rhetorical skills, for example, cannot be evaluated by means of multiple-choice tests.

The extent to which MOOCs can be classified as competitors to educational offers of universities, colleges or companies is debatable. Due to the high significance of social interaction with the teacher, significant substitution effects are unlikely. Rather, initial MOOC experiences show that a complementary application of MOOCs in the context of blended learning emphasizes interactivity during in-class lectures (flipped classroom; Martin 2012).

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