Materializing Conception and Deployment Phases of a cMOOC Scenario

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Abstract. The work presented in this paper examines part of a broader issue in the field of Technology-Enhanced Learning (TEL). It is particularly focused on Massive Open Online Courses (MOOC), and more specifically on designing pedagogical scenarios for connectivist MOOCs (cMOOC). This paper presents a conducted research work, which aims to propose models and tools to support the design, deployment and adaptation of connectivist MOOC scenarios. It presents our contributions for conception and deployment phases, namely: cOPRS model, MOOCAT authoring tool and OpenEDX deployment service. For adaptation, it focuses on finding some possible solutions to adapt cMOOC oriented pedagogical scenarios by taking into account: plurality, heterogeneity, massiveness and openness aspects of cMOOCs.

Keywords: MOOC, cMOOC, connectivism, TEL, authoring tool.

1 Motivation and Aim

The research work presented in this paper is part of a general issue of TEL. It deals, more specifically, with pedagogical scenario design of connectivist MOOCs. Regardless of being interested, directly or indirectly, on TEL and e-learning environments, the media, institutional and scientific interest in this form of learning cannot be ignored. Thus, between new trends and innovative pedagogical concepts, MOOCs have stood out and have received acclaims, as well as criticisms on several levels. This research work has explored some of the multiple facets of MOOC as a research object through pedagogical conception and assistance to teachers. The intended purpose is to conceive models and implement tools to assist teachers in the cMOOC design process by taking into account complementary and plural aspects of e-learning, through individual, collaborative, social and massive dimensions.

The origin of MOOCs has inspired by the connectivist approach, which led to the launching of the first MOOC in 2008 by Downes and Siemens, whose objectives are to foster the emergence of knowledge through a connected network of learners (Downes, 2012). The learner is no longer a knowledge consumer, but a creator of knowledge and resources shared with the community. With the advent of MOOCs in higher education, the stakeholders intended to transcribe the aspects of transmissive pedagogy into

MOOCs: xMOOCs then appeared. Although this categorization is considered minimalist, we have relied on the distinction between xMOOC and cMOOC in our proposal. By comparing these two types of MOOCs, a number of differences were observed, particularly in regards to: the roles played by the teacher and the learner, the pedagogical aspects targeted and the openness and freedom granted to learners (Bakki *et al.*, 2018).

Despite the potential benefits of cMOOCs, the literature review has shown that the most widely deployed MOOCs are xMOOCs. Based on an analysis of a panorama of 76 MOOCs, Toven-Lindsey *et al.* (2015) reveal that only 10% of these courses can be categorized as cMOOCs. This observation was addressed by (Morrison, 2013) who explained this by pointing out that the majority of teachers do not feel confident and are lacking the technical skills to deal with connectivist environments that are mainly focused on the use of technology. We share this point view, and believe that a limitation for the emergence of cMOOCs is the lack of methodologies, models and tools to support pedagogical scenario development (Alario-hoyos *et al.*, 2014; Peter & Villasclaras-Fernández, 2013) as the current literature provides a description of pedagogical practices in cMOOCs in a purely descriptive manner. In addition, there is very limited research on cMOOCs that focuses on teachers' practices (Liyanagunawardena *et al.*, 2013). As a result, there is a real need for a well-defined conceptual and technical framework to describe connectivist oriented pedagogical activities.

Based on these findings, we have hypothesized that modeling a cMOOC scenario and reifying it in an information system that is easy to use by teachers with no computer expertise will help them to move towards this type of MOOC. These reflections, which were both intuitive and verified in the literature, led us to orient work around teacher practices. Given the page limit of the paper, the aim is to purpose a global overview on the conducted research work, by specifying the different phases that a cMOOC project goes through, namely: cMOOC scenario building process, operationalization of pedagogical scenarios on an online learning platform and Adaptation of pedagogical scenario. The next section will present the issues of the conception phase as well as our proposed model and tool responding to cMOOCs specifications. The section 3 will highlight our proposal for the deployment phase. Section 4 focuses on the adaptation phase and provides an overview of how the adaptation is conducted in cMOOCs context. It also presents the future directions of our research work. Finally, the paper ends with a short conclusion and an outlook on obtained results.

2 An Authoring Tool for cMOOC Context

Conception phase is certainly the most challenging phase of cMOOC courses development process. One of the major difficulties confronting teacher-designers concerns the definition of pedagogical activities in this connectivist context. Creating such scenario is not a simple task, as it requires collaboration between different actors involved in the learning process. In this context, for the teacher, the purpose is not to establish a traced course scenario; it is more about suggesting resources and activities that aim to guide learners towards the initial objectives of cMOOC and then encourage

them to create, produce and collaborate according to their needs. The above-mentioned aspects have an impact on both the types of activities proposed and on the evaluation methods..

A review of the literature has shown that current methodologies and tools do not fully meet all the requirements for designing connectivist course. Thus, we conducted a literature review on pedagogical scenario building practices, particularly related to open scenarios, collaborative scenario, that considering the social dimension. We have also conducted a study on potential teachers' requirements for the conception and deployment of such courses and have analyzed a number of existing courses. This exploratory work has resulted in the proposal of the cMOOC Oriented Pedagogical Scenario Model, named cORPS (Bakki *et al*., 2017).

cORPS Model describes all the conceptual elements of a connectivist oriented scenarios including: actors and their roles, pedagogical resources, tools needed to carry out the activities over connected environment, interaction and activities. For those later, a categorization is defined based on the theoretical anchoring; Indeed, according to the co-founders of the first connectivist course, the structure of the course is based on four practices (Kop *et al.*, 2011; Downes, 2008): aggregation, remixing, repurposing and feed forwarding, to which we had added a category for evaluating activities.

To make our proposals operational, we provide teachers with a simple and ergonomic tool to assist them in modeling and structuring their cMOOC scenarios. Thus, our second contribution is an authoring tool, named MOOCAT (Bakki *et al.*, 2018). Actually, when a tool does not meet the teacher's expectations, when it is not simple to use or when its comprehension is complex, then few alternatives are offered to the teacher. It is one of the arguments justifying the approach taken in this work. Thus, to meet teachers' expectations, we explored the possibility of using an existing design method, based on business workflows modeling: BPMN.

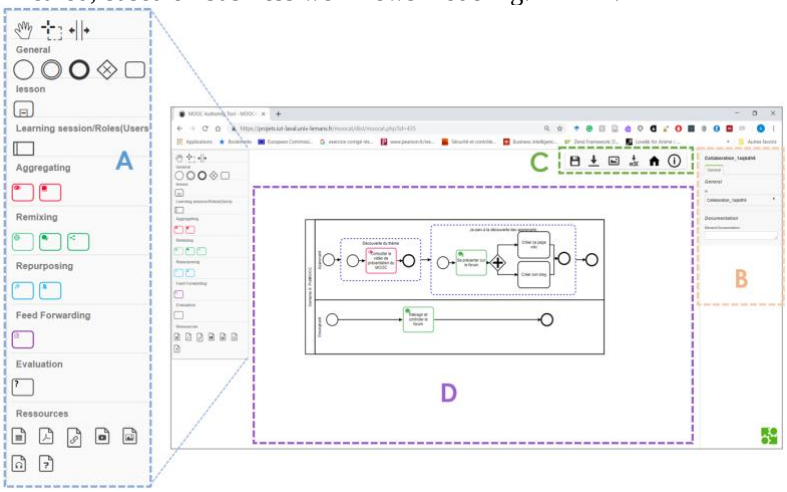

Fig. 1. MOOCAT Conception Interface (Bakki *et al.*, 2018)

Hence, to achieve our goal, we first proposed an extension of the meta-model and BPMN notation independently of any tool, in order to allow an explicit representation of the different concepts defined in the cORPS model. We then embedded the extended

BPMN in the proposed authoring tool. The main objective was not to rebuild a new platform, but to develop and enhance an existing tool. Thus, we used the open source web application BPMN.io and proposed a graphical modeling tool that complies with the extended BPMN notation, the cORPS model as well as the business rules.

Figure 1 shows the interface of MOOCAT authoring Tool. (D) Represent the conception area where the teacher conceives his scenario by dragging and dropping the elements from the toolbox (A). The toolbox contains the elements of the proposed new BPMN notation, which represents the entities of the cORPS model. We emphasize the categorization of the activities in blocks, thus allowing the teacher to clearly identify each group of activities. As the design progresses, the teacher can specify the properties related to each element of his scenario through the property tab (B). For example, for a consultation activity, the teacher can specify the type of resource to be consulted. Once the scenario has been completed, the teacher can save his scenario in different formats, or deploy it to a training platform (C). This point will be discussed in the next section.

3 From the Scenario to the Learning Platform: OpenEDX Case

In order to support the teacher, a service allowing the deployment of pedagogical scenarios carried out by MOOCAT has emerged. We have implemented an operationalization service that allows teachers to automatically deploy their pedagogical scenarios on a specific target platform. In line with our work, we have provided a solution that allows to transform the pedagogical workflow into a deployable scenario.

In order to demonstrate the technical feasibility of our proposal, we have chosen to develop importation modules for OpenEDX platform. We thus proposed the approach illustrated in figure 2 that goes through two phases:

Transformation - Pretreatment. The aim is to propose a confrontation between the two models, in order to resolve all ambiguities and to match each concept in the MOOCAT scenario with a concept in the OpenEDX platform. It is a surjective transformation, i.e. each MOOCAT element has at least one correspondence on OpenEDX. The general idea of the transformation algorithm is to: (1) Generate the BPMN pedagogical workflow. (2) Create the tree structure of files from the information specified in the BPMN file. (3) transform the scenario into the format required by OpenEDX.

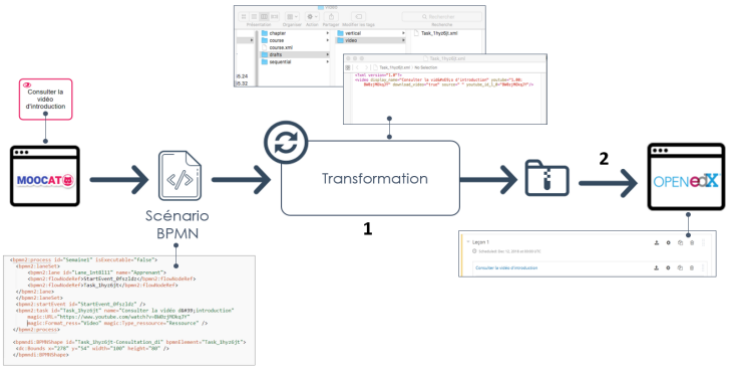

Fig. 2. Proposed Deployment Process

Deployment. The operationalization module acts as a communication gateway from our tool to a learning platform. In this phase, the service automatically connects to this platform and then retrieves the list of available courses. The teacher can choose a course from existing ones or create a new course. Finally, the deployment process is automatically executed, using the OpenEDX import function.

An extension of the transformation and deployment module to other platforms remains possible, as long as the target-learning platform provides import/export functionality. Therefore, for a given platform, it is first necessary to go through the confrontation phase; the purpose is to find a correspondence between the elements of a MOOCAT scenario and the scenario model of the target platform.

4 Towards a Personalized Learning Experience

Once the MOOC is launched, the learning process begins; the learner is in the center of the learning experience, with a certain degree of autonomy. However, during this phase, adjustments and adaptations may occur. In the literature, several terms are used to refer to the concept of adaptation: personalization, individualization, etc. Nevertheless, these terms do not refer to the same concept. In the cMOOCs context, it is a matter of personalization of learning. It is the process of adjusting the rhythm, objectives and methods according to individual preferences or the specific interests of learners, and where learners can progress through the learning material at different speeds depending on their learning needs (Battou, 2012).

However, in cMOOC environments we distinguish two approaches: (1) The personalization carried out by the teacher, which aims to make the necessary adjustments to ensure the successful completion of the learning process. Such adaptation occurs following a formative evaluation carries out by teacher. This provides an important research direction towards the study of the learner behavior, through analyzing their interactions with the learning platform or their social interaction via various social networks. The idea here is to use the Machine Learning mechanisms to build a recommendation system, which will suggest to the teacher, based on the

analyzed traces, a range of connectivist pedagogical strategies in order to adapt his initial scenario.

(2) The personalization provided by the learners, which is initiated following the emergence of new learning needs. In cMOOC, a high level of autonomy is given to the learner. This openness allows them to adapt and control their learning according to their needs and the meaning they give to it. The learner constructs his pedagogical learning path from an open pedagogical scenario through socialization and collaborative work tools that are outsourced or integrated into the learning platform. Thus, in this phase, the participants propose new learning activities or enhance those already programed in the cMOOC. This implies implementing an adaptation process by involving learners in a collective and collaborative design process. Conceptually and methodologically, the adaptation issue cannot be approached separately from the granularity of pedagogical entities and objects; and without emphasizing the complexity generated by the openness and massiveness aspects of these environments. In this sense, the proposal of an instrumented methodology to co-design a scenario, in progress, would be a solution to this problematic. Nevertheless, several scientific issues emerge regarding the formulation of adaptation needs, capitalization, negotiation and validation of planned changes, especially in a massive environment.

5 Discussion and Conclusion

In this paper, we had described the overall process to design, implement and adapt a cMOOC-type course. For the conception and deployment phase, we have proposed solutions to support pedagogical scenario building of cMOOCs by providing a tool and model for this purpose: MOOCAT, a visual authoring tool that produces pedagogical scenarios that are internally represented using a cMOOC scenario model entitled cORPS. The tool allows also to deploy the produced scenario to OpenEDX platform.
These proposals were evaluated from utility and usability point of view. A total of 39 individuals have participated in an experimentation. The findings confirm that MOOCAT can be used to design connectivist pedagogical scenarios and can provide all the necessary elements for the design of such courses. For adaptation phase, we have provided a first overview and clarified an outline of future work to be carried out in this direction. Thus, the analysis of traces generated by learners through the learning platform or on social networks provides an interesting research line, which aims to provide the teacher with a recommendation system for pedagogical strategies.

6 References

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