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OVERCOME THE CHALLENGES OF MOOC IMPLEMENTATION IN FIVE STEPS: EMMA 5D MOOC FRAMEWORK

Marcelo Maina, Lourdes Guàrdia

Abstract

This communication presents the EMMA 5D MOOC framework with the aim of informing stakeholders about the different aspects of MOOC creation and delivery. By identifying five steps for MOOC implementation (Decide; Design; Develop; Deliver; and Document), the framework proposes a set of questions and illustrative examples organized according to three complementary perspectives: institutional, pedagogical and technical.

Keywords: MOOC Design, EMMA, framework, open education.

1 INTRODUCTION

Based on the substantial evidence available, we may consider that MOOCs are becoming an accepted part of the educational offering. After the 2012 hype there followed a period of turbulence and questioning the promises that MOOCs would bridge current educational gaps and balance the differences of less favoured people. Even though this commitment has yet to be fulfilled, the movement around MOOCs continues to be strong and promising, with an estimated expected growth in the global MOOC market from 0.9 billion dollars in 2014 to 14.2 billion dollars in 2020, according to [1]. MOOCs are also subject to diversification in terms of pedagogy, accreditation processes, potential revenues and the strategic alliances behind them [2].

The role of MOOCs in raising awareness of online learning in Higher Education is noticeable [3], [4], as they shake up the conventional educational models crystallized in institutions for exceptionally long periods, and mainstream new players in educational provision from the private but also the non-profit sectors [5], [6]. MOOCs also prove the existence of a latent educational demand of extraordinary proportions and the willingness of vast audiences worldwide to continue their education. Another consequence of the arrival of MOOCs is the accelerated process of adoption and expansion, requiring teachers and education institutions to rapidly adapt to an ongoing, growing and sometimes difficult to predict scenario of more flexible, open and free or more affordable education. New scaling-up pedagogies, new technological infrastructures, new organizational and business models certainly indicate that a complex solution must be found, and one that is also experimental and involves some risk.

The diversification in MOOC deployment [7] shows significant growth in self-paced MOOCs, the offer of flexible short-programme formulas (Udacity's Nanodegrees, Coursera's Specializations, edX's Xseries) and the targeting of new audiences of high-schoolers. MOOC diversification is becoming a form of widespread adoption of online and hybrid forms of teaching and learning by a majority of HE institutions [6], [8].

Within the EMMA European project we targeted the development of an EMMA approach to MOOCs, with emphasis on the European context characterized by cultural and linguistic diversity and with the intention of supporting different pedagogies as well as specific organizational needs. The project developed an experimental platform for testing these particular traits that was implemented in more than 40 MOOCs. This experience should provide for the elaboration of a framework for MOOCs. The framework is understood in our context as a conceptual structure intended to support the decision-making process of designing and implementing a MOOC. It is worth mentioning that the resulting EMMA 5D MOOC framework is not restricted to the EMMA platform, but was built as a reference aimed at all those people and institutions interested in creating and delivering a MOOC, beyond the context of any specific platform.

We present here the process of development and the resulting framework.

2 FRAMEWORK DEVELOPMENT

The methodology for elaborating the framework applies the principles of qualitative research and the interpretivist approach [9] as follows: an in-depth literature review, coding, analysis, the integration of EMMA features, synthesis and validation. See Figure 1 illustrating the main steps of the methodology.

[Insert Fig. 1]

2.1 *Identification of existing MOOC frameworks*

The first step consisted of identifying existing MOOC frameworks or MOOC classification schemes in authoritative literature, including grey literature. This process yielded thirteen relevant documents for analysis: [10], [11], [12], [13], [14], [15], [16], [17], [18]; [19], [20], [21], [22].

2.2 *Selection of criteria for comparison*

From among these documents, we selected eight based on the completeness and scope of the presented schemes, as well as the fact that they were more detailed and shared some common features with the EMMA project.

To set a common ground for comparison we proceed by eliciting the common and unique features of the available frameworks and we developed a coding system for comparison and abstraction [23] [24]. Each code corresponds to a category that was present or that we intended to explore in the elaboration of our own framework. The coding for the analysis resulted as follows:

- Artefact: framework, model, guideline, etc.
- Dimensions: components or elements present in the artefact.
- Objective: purpose of the artefact.
- Target: intended people (teacher, faculty, student, dean, principal, etc.)
- Nature: instrumental and/or conceptual; context dependent or generic.
- Type: rubric, table, descriptive document, graphic, flowchart, etc.
- Relevance (for EMMA): the extent to which the framework could be linked to EMMA.
- Comments: additional observations.

2.3 *Analysis and synthesis*

The third step consisted of analysing the selected literature according to the identified coding system. As a result of this process, we created a table listing the relevant features of each category. Table 1 shows an example of analysis for one source.

Table 1. Analysis of published frameworks (section)

Source	Artefact	Dimensions	Objective	Target	Nature	Type	Relevance (EMMA)	Comments
Momentum	Framework (mainly for MOOC design)	• Design (of MOOC) • Media • Pedagogy • Space (platform) • Assessment (of learning) • Learner profile • Time (pace, modality) • Support (tech & facilitation) • Knowledge type (content)	Designed to guide institutions in mounting MOOCs. But in the second doc they mention a different objective: "a conceptual framework for evaluating MOOCs". For me, it's the first one.	Institutions: higher education, K –12 and in the Training/professional development arenas. It's very generic so it can be used in many contexts.	Descriptive: the framework is used for guidance, not as a tool. It describes 9 dimensions and suggests some questions to reflect (just for some dimensions).	Graphic: 9 components rooted in an underlying foundation of technology and systems support and evaluation. Each component should be assessed as existing on a continuum. Graphical representation is not accurate.	High: both the shape and the components can be used for our framework.	It's generic: it does not delve into the components. They suggest that for each component you need to reflect on some questions but they are not mentioned for each one Some topics are not dealt with: institutional issues, dissemination, recognition...

We then searched for common but also unique characteristics of each feature and proceeded to merge those referring to similar aspects (the expression used being different, the meaning being equivalent). In the 'Dimensions' category, we compared all dimensions identified within each of the eight studied frameworks and

integrated them into one (Table 2). In this process, we highlighted the dimensions that share a common concern in the same colour.

This process led us to identify 12 general topics under which to group the dimensions from the literature: Design; Pedagogy; Platform; Functionalities; Assessment; Content; Support; Learner profile; Media; Accreditation; Institution; and Others. Table 3 shows the related dimensions per topic.

Table 2. Dimensions per general topic

General topic	Related dimensions identified in the literature
Design	Design of MOOCs, general description, course structure, openness, massive
Pedagogy	Pedagogy, Time (pace, modality), Pedagogical, Instructional, Pedagogical approaches, Objectives & Competences, Activities, Course evolution, Degree of communication, Degree of collaboration, Learning pathway, Amount of reflection, Formal learning, Autonomy, Diversity
Platform	Space, Technological, Interactive Learning Environment, Technology infrastructure, Complementary Technologies, Platform, Equipment
Functionalities	Interface design, Functionalities
Assessment	Assessment of learning, Evaluation, Assessment & Feedback, Evidence-based improvement, Assessment activities
Content	Knowledge Type (content), Contents, Learning contents
Support	Support (tech & facilitation), Management, Resource support, Human (role, status, etc.), Human, Intellectual, Logistics, Participants engagement
Learner profile	Learner profile, Learner background and intention, Target learners
Media	Media, Resources, Use of multimedia
Accreditation	Accreditation, Certification
Institution	Institutional, General, Context
Others	Quality assurance, Ethical, Barriers to persistence, Models, Social components

2.4 Identification of EMMA main attributes

In parallel to the literature review process, we identified the most relevant attributes of the EMMA experience based on identified project productions (19), highlighting EMMA original contributions:

- Functionalities & platform. EMMA provides a system for the delivery of free, open, online courses. An appealing, dynamic and interactive interface fronts a platform where agile development and advanced integration combine to produce a multilingual learning environment with a range of embedded learning and assessment tools and services.
- Cultural and linguistic diversity. EMMA is a European platform for the delivery of MOOCs that aims to embrace linguistic diversity as well as cultural diversity and promote cross-cultural learning.
- Translation & Transcription. EMMA integrates ad-hoc transcription and translation services in different languages (English, Spanish, Portuguese, Catalan, Dutch, Estonian, French and Italian), allowing teachers and learners to exploit courses in languages other than their own.
- Personalisation & Aggregator. EMMA offers an innovative Personal Learning Environment with CourseBook, social classroom and individual blog allowing for the creation of personal learning paths.
- Learner experience & interaction. EMMA pays special attention to learners' experiences through the collection of meaningful data from social tools in order to enhance real-time individual and collective learning and encourage participation and collaboration.
- Monitoring & Evaluation. EMMA combines tools common to all MOOCs, such as entry and satisfaction surveys with focused learning analytics of ongoing activity and final achievements (enrolment, engagement, persistence, drop out, and completion) with the aim of improving MOOC designs and teaching practices.

2.5 Alignment of EMMA attributes in the framework synthesis

The fifth step in developing the EMMA framework consisted of revising and refining the general topics, this time by integrating dimensions from the literature and EMMA attributes as well as specific components. Table 3 shows the result of this process.

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Table 3. Integration of dimensions from the literature and EMMA attributes

GENERAL TOPIC	**DIMENSIONS**
Openness	• Openness - *Open* • Massive • ***Cultural diversity – Linguistic diversity***
Pedagogy	• Pedagogy - Pedagogical – Pedagogical • Instructional • Design (of MOOC) • General Description • Course structure – ***syllabus*** • Objectives & Competences • Approaches • Time (pace, modality) • Activities • Formal learning
Knowledge	• Knowledge type (content) – Contents • Resources • Learning contents
Social components	• Social components • ***Learner Interaction*** • Degree of communication • Degree of collaboration
Learner experience	• Learner profile • Learner background and intention • Target Learners
Support	• ***Support*** (tech & facilitation) • Management • Resource support • Human (role, status, etc.) • Human Intellectual • Logistics • Participants engagement • ***Monitoring - Learning analytics***
Assessment	• Assessment, ***Evaluation***, Assessments & feedback, Assessment Activities • Evidence-based improvement • Accreditation – certification • Amount of reflection
Personalization	• Learning pathway – ***personalisation*** • Diversity • ***Aggregator*** • Autonomy
Learning environment	• Space (platform) - Platform - Equipment Platform Technological - Technology infrastructure • Interface design • ***Functionalities*** • Interactive Learning Environment • Media • Use of multimedia • Complementary Technologies • ***Translation*** • ***Transcription***
Legal	• ***Privacy issues*** • ***Legal aspects, policy*** • ***Licenses*** • Ethical
Context	• Institutional • General Context
Quality	• Quality Assurance • Course evolution

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3 EMMA 5D: A FRAMEWORK FOR MOOCS

Based on the previous analysis, we went a step further in interpreting and regrouping the dimensions. We also made additional efforts to find an easy-to-remember acronym based on the most common and generic iterative processes. This step was decisive, leading us to propose the EMMA 5D MOOC framework.

In this section, we present the EMMA 5D MOOC framework. Its purpose is to detail the different aspects of MOOC creation and delivery as well as to support stakeholders in their decision making.

The EMMA 5D MOOC framework can be used as a tool from three complementary perspectives (Figure 2):

- **Institutional**, helping senior-level stakeholders and decision-makers support the adoption of MOOCs as a strategy, including administrative and logistic issues.
- **Pedagogical**, supporting teachers, professors and educational designers to provide guidelines for MOOC design and facilitation.
- **Technical**, guiding technologists and developers to implement and integrate the learning environment.

[Insert Fig. 2]

The EMMA 5D MOOC framework identifies a set of stages that guide the whole process of MOOC design and implementation (Figure 3): Decide; Design; Develop; Deliver; and Document.

[Insert Fig. 3]

- **Decide**: the first step consists in establishing the overall purpose and scope of the MOOC. It deals with many aspects including legal issues, logistics, technology infrastructure, and cultural and linguistic diversity.
- **Design**: this step highlights decisions regarding the planning of the MOOC, addressing topics such as expected learner profiles, course content and structure, assessment, interaction and facilitation.
- **Develop**: in this step the focus is on the production of learning materials and the integration of all media content and services into the MOOC delivery platform, e.g. videos, simulations, quizzes, social tools, translation and transcription processes, etc.
- **Deliver**: this step addresses learner facilitation and peer-to-peer support, technical assistance for teachers and learners as well as the continued monitoring of the MOOC.
- **Document**: this step covers the process of documenting and reflecting on the decisions that have been taken in relation to the MOOC from start to end, focusing on quality assurance and improvement.

Each stage deploys a set of key aspects that need to be addressed in each part of the process. As Figure 4 shows, although the three identified targets (institutional, pedagogical and technical) are involved at all stages, their responsibilities vary. While pedagogical and technical perspectives are concerned with all the stages, the institutional perspective is crucial in the first stage and plays a supporting role in the others. As stated before, the institutional perspective mainly concerns senior-level stakeholders and decision-makers, the pedagogical perspective presents issues particularly relevant to teachers, professors, or educational designers, while the technical perspective is of primary interest to information technologists and developers.

[Insert Fig. 4]

In order to support stakeholders in decision making, Table 5 presents an excerpt of the framework composed of a set of key questions aimed at supporting reflection according to each aspect and perspective. It also provides specific examples from the EMMA experience (identified with the symbol ⊕). It is worth mentioning that the framework guiding questions are not exhaustive and point to common concerns. The application of the framework in each particular situation will probably prompt specific topics to deal with.

[Insert Fig. 5]

4 CONCLUSIONS

MOOCs have attracted the attention of mainstream media, educational institutions and tens of millions of people around the world. What started as a novelty or curiosity has become a necessary object of interest, particularly in Higher Education. The disruptive impact of MOOCs is challenging education and is both a source of opportunities as well as of concern.

The evolving MOOC phenomenon is growing exponentially in terms of the number of massive courses available, cementing the basis of a global educational market that is more interconnected than ever. Researchers are studying this new reality in order to understand, explain and provide practical information to help institutions position themselves, and teachers and professors to create new learning opportunities.

A few MOOC classification schemes and frameworks have emerged. Through a literature analysis we have identified the strengths and limitations of existing MOOC frameworks. Some of them are conceptual and of use mostly for analytical purposes, thus lacking in concrete guidance for decision making or designing MOOCs. Others, of a more procedural nature, concentrate on creating MOOCs from the designer/teacher perspective. On the basis of these findings and through the experience gained during the development of the EMMA project, we have created the EMMA 5D MOOC framework.

While building this framework we also considered the policy recommendations for opening up education regarding some of the proposed dimensions: access, content, pedagogy, recognition, collaboration, technology, and strategy [26].

The EMMA 5D MOOC framework details the different aspects of MOOC creation and delivery and also supports stakeholders in their decision-making.

By identifying five stages for MOOC implementation (Decide; Design; Develop; Deliver; and Document), the framework introduces a set of questions organized according to three complementary perspectives: Institutional, Pedagogical and Technical. It also provides a series of examples, mainly from the EMMA experience.

The EMMA project contributes to the MOOC field by providing a framework that:

- Builds from both theory and practice, based on the EMMA experience and other documented frameworks.
- Provides a tool for deploying a set of critical aspects, complemented with related questions and examples.
- Addresses different, but complementary, perspectives of MOOC implementation: pedagogical, institutional and technical.

The EMMA 5D MOOC framework highlights a European vision of cultural and linguistic diversity as well as of commitment to open wide access to education and knowledge.

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FIGURES

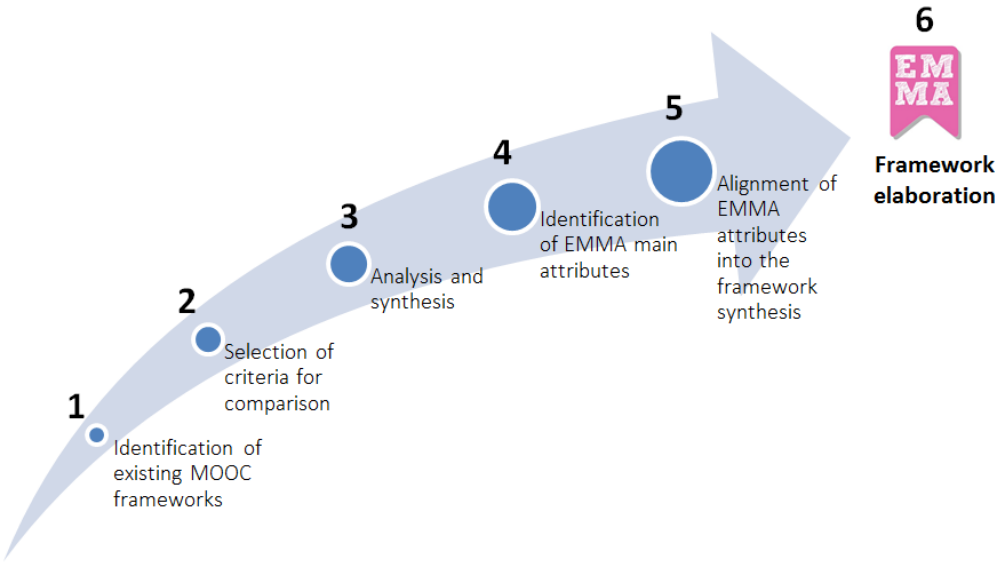

Fig. 1 Framework development steps

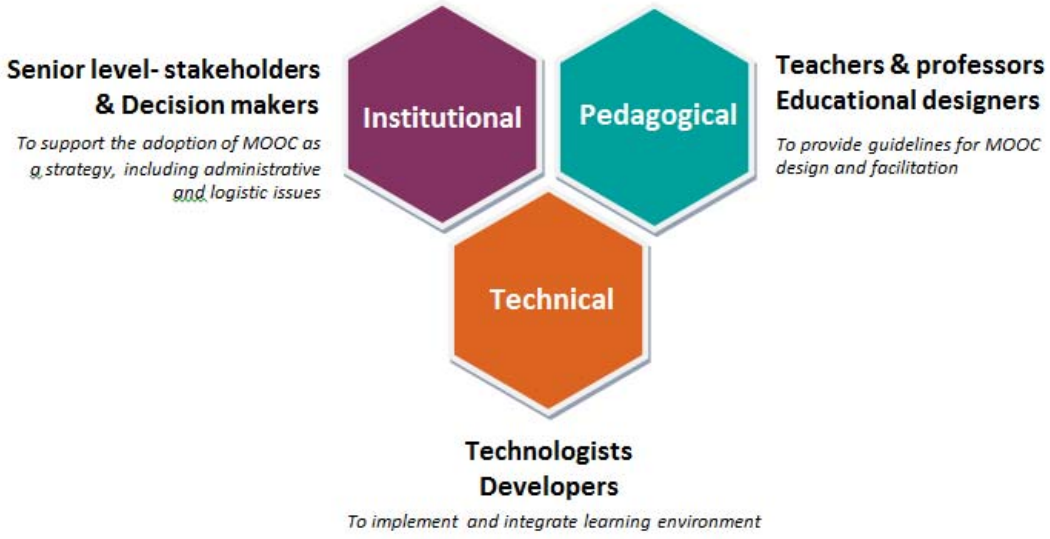

Fig. 2 Perspectives and target users of the EMMA 5D MOOC Framework

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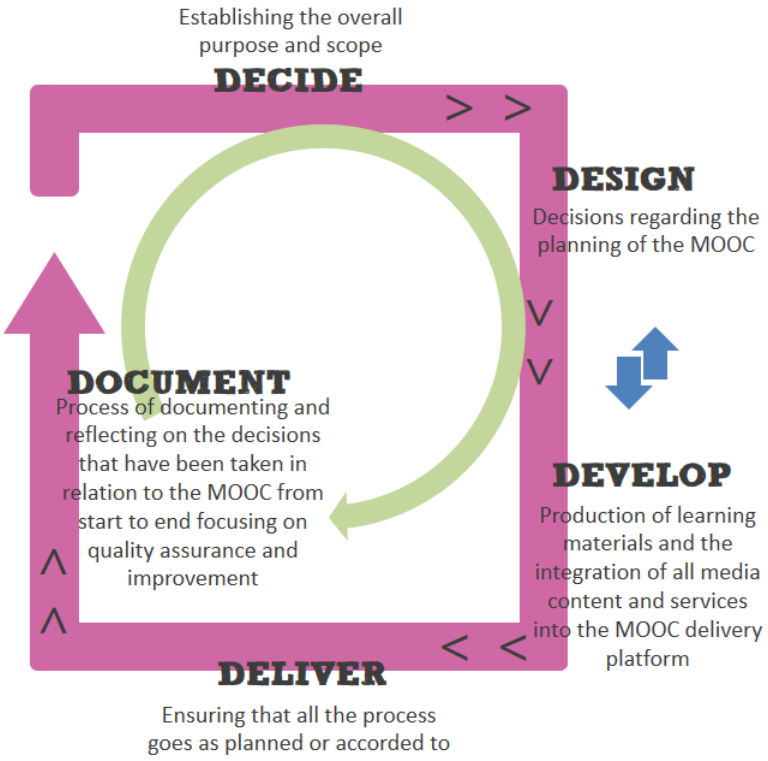

Fig. 3 The EMMA 5D MOOC framework stages

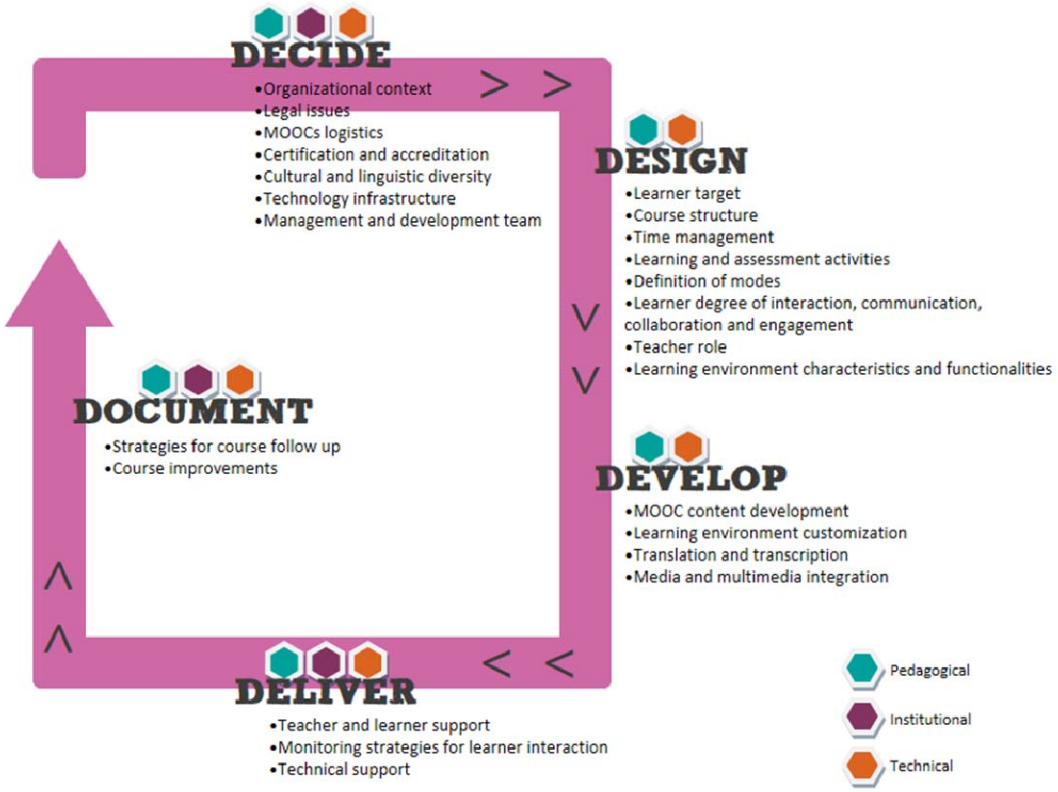

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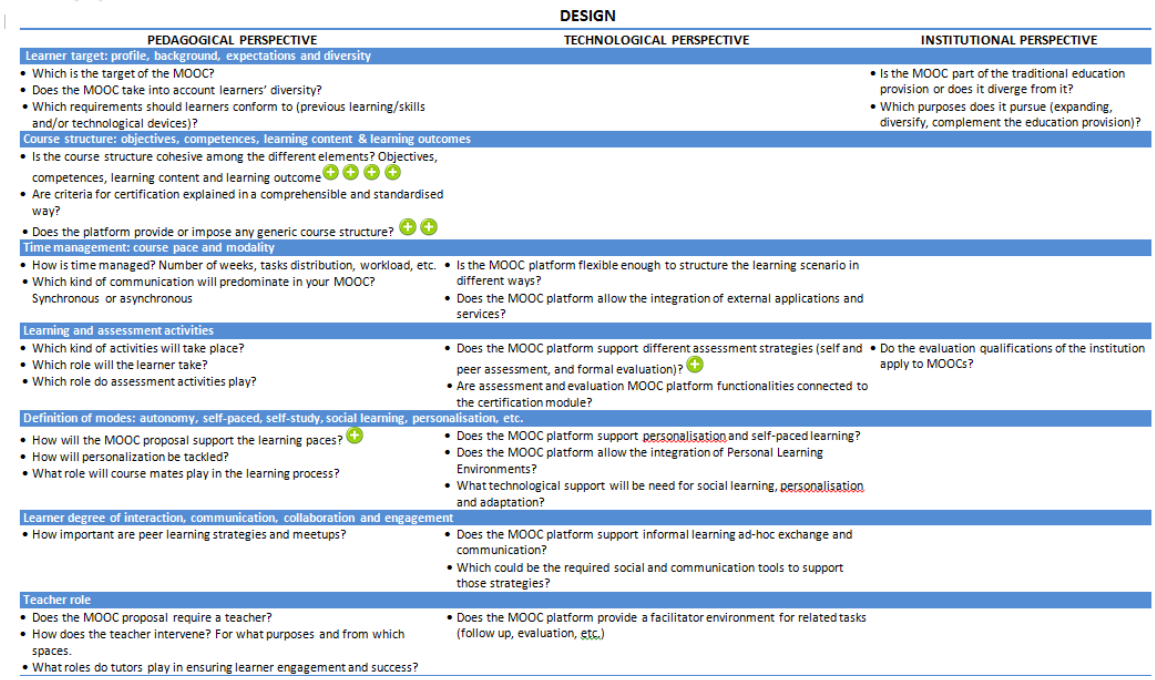
Fig. 4 Targets per stage



DESIGN

PEDAGOGICAL PERSPECTIVE	TECHNOLOGICAL PERSPECTIVE	INSTITUTIONAL PERSPECTIVE
Learner target: profile, background, expectations and diversity		
• Which is the target of the MOOC? • Does the MOOC take into account learners' diversity? • Which requirements should learners conform to (previous learning/skills and/or technological devices)?		• Is the MOOC part of the traditional education provision or does it diverge from it? • Which purposes does it pursue (expanding, diversify, complement the education provision)?
Course structure: objectives, competences, learning content & learning outcomes		
• Is the course structure cohesive among the different elements? Objectives, competences, learning content and learning outcome • Are criteria for certification explained in a comprehensible and standardised way? • Does the platform provide or impose any generic course structure?		
Time management: course pace and modality		
• How is time managed? Number of weeks, tasks distribution, workload, etc. • Which kind of communication will predominate in your MOOC? Synchronous or asynchronous	• Is the MOOC platform flexible enough to structure the learning scenario in different ways? • Does the MOOC platform allow the integration of external applications and services?	
Learning and assessment activities		
• Which kind of activities will take place? • Which role will the learner take? • Which role do assessment activities play?	• Does the MOOC platform support different assessment strategies (self and peer assessment, and formal evaluation)? • Are assessment and evaluation MOOC platform functionalities connected to the certification module?	• Do the evaluation qualifications of the institution apply to MOOCs?
Definition of modes: autonomy, self-paced, self-study, social learning, personalisation, etc.		
• How will the MOOC proposal support the learning paces? • How will personalization be tackled? • What role will course mates play in the learning process?	• Does the MOOC platform support personalisation and self-paced learning? • Does the MOOC platform allow the integration of Personal Learning Environments? • What technological support will be need for social learning, personalisation and adaptation?	
Learner degree of interaction, communication, collaboration and engagement		
• How important are peer learning strategies and meetups?	• Does the MOOC platform support informal learning ad-hoc exchange and communication? • Which could be the required social and communication tools to support those strategies?	
Teacher role		
• Does the MOOC proposal require a teacher? • How does the teacher intervene? For what purposes and from which spaces. • What roles do tutors play in ensuring learner engagement and success?	• Does the MOOC platform provide a facilitator environment for related tasks (follow up, evaluation, etc.)	

Fig. 5 Section of EMMA 5D framework