



European MOOC Consortium Labour Market

*Massive Open
Online Courses for
Employability,
Innovation and
Entrepreneurship:
a Rapid Assessment
of Evidence*

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Other authors	
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Executive Summary

This report summarises the evidence base regarding the use of open online learning for supporting employability, innovation and entrepreneurship within the European area. It was written as part of the European MOOC Consortium – Labour Markets project (EMC-LM). MOOC platforms in the European MOOC Consortium (EMC) look for solutions to reach better the labour market. This streamlined review of literature draws on scientific literature, project reports, policy documents, case studies and other resources to describe the potential for MOOCs to stimulate and empower organisations to use open education as part of their programs of continuous education (CE) and continuous professional development (CPD) or continuous vocational training (CVT). Resources were chosen for their presentation of evidence rather than discussing the MOOC potential.

Jobs are becoming more flexible and complex: by 2025 it is projected that half of all jobs will require high-level qualifications. Non-traditional access routes into higher education opportunities are still seldom used, but MOOCs offer a route to reconceive traditional roles within knowledge communities. For effective lifelong learning, MOOC learners need to develop digital skills, communication skills, heutagogical skills, peer learning skills, skills for engaging with online resources and time management skills. MOOC learners are diverse physically, culturally, economically, geographically, linguistically and in terms of their motivations, skills and prior learning.

The rapid expansion of MOOCs left little time for organisations to adapt to the MOOC offer resulting in much unexplored potential. Current best practice in MOOC provision is characterized by an innovation mindset which recognizes their disruptive potential while being realistic about what can be achieved. Sound pedagogy, effective learning design and evaluation are essential elements of teaching and learning with MOOCs, and MOOC design and facilitation is emerging as an area of expertise. Evaluation data and web analytics can be used to iteratively refine a MOOC offer; alternative, authentic performance indicators may be used in assessment to validate work-related learning.

Approaches which emphasize the flexible delivery of learning are especially suited to workplace upskilling. For greatest impact and relevance, collaboration should cross disciplinary and professional boundaries, involving a wide range of stakeholders. Employability can be supported through improved management of work transitions; more flexible training options; new routes between education and work; building credibility in CPD; enhancing soft and transversal skills; and developing new mechanisms for authenticating non-formal learning. Innovation can be encouraged by working with greater transparency and sharing; improved dialogue between stakeholders; adopting a reflective attitude towards technology; and through policies which support and motivate new approaches. Entrepreneurship can be moving beyond the knowledge transfer model of entrepreneurial education; drawing stronger connections between theory and practice; promoting collaboration between

researchers and practitioners in education and entrepreneurship; and encouraging entrepreneurial culture.

In summary, this report identifies several interstices where the worlds of higher education, vocational educational, training and open online learning come are converging. Evidence is provided for the contention that, through enhancing opportunities for flexible delivery of education, MOOC can innovate the way that we approach degree programmes, lifelong learning, CE and CPD. The information gathered in this report aims to provide a comprehensive overview of relevant material but does not claim to be exhaustive. This report was written as part of the EMC-LM project as a way to establish a shared understanding of the possibilities for collaboration and innovation. The references provided are nonetheless a great starting point for any investigation of the potential of MOOCs for workplace and lifelong learning.

EMC-LM is funded under the Erasmus + Programme as an example of a Knowledge Alliance activity (KA2: Cooperation for innovation and the exchange of good practices - Knowledge Alliances (Call: EAC/A05/2017)).

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Introduction

About the European MOOCs Consortium (EMC)

MOOCs combined with digital continuous education/training are a flexible and scalable solution for a transnational, truly European response to the needs of the economy across Europe. They can keep innovative knowledge and skills of the workforce up to date and anticipate on careers of tomorrow. MOOC platforms in the European MOOCs Consortium (EMC) look for solutions to reach more systematically the labour market.

In 2017, the main European MOOC platforms (Futurelearn, FUN, Miriadax and EduOpen) and the OpenupEd partnership established the European MOOCs Consortium (EMC). The EMC represents most of the MOOC development work in Europe by offering together more than 1,000 MOOCs with 15 million+ learners. They represent large networks of 280 universities in a variety of European countries and languages areas. EMC is open to newly emerging platforms in Europe. One of its missions is to stimulate and empower universities and other organisations to use digital education and MOOCs as open education and as part of their programs of continuous education (CE) and continuous professional development (CPD) or continuous vocational training (CVT).

EMC for Labour Markets (EMC-LM)

The EMC-LM project is a successful outcome of the European MOOC Consortium, combining the world of education and training (universities, platforms) and the world of work (Public Employment Services, companies, sectoral organisations).

MOOC platforms in the European MOOC Consortium (EMC) look for solutions to reach better the labour market. In this knowledge alliance, they opt for a structural collaboration with Public Employment Services (PES) active on the national labour markets, with companies and with a sectoral industrial organisation. The alliance is anchored both in the world of work (PES, companies, sectoral organisation) and in the world of education and training (universities, platforms). It shows which role MOOC platforms, universities, PES and companies jointly play on the labour market. PES and companies are not only mediators between MOOC platforms and individual learners, but also as allies in the (co-)development and (co-)delivery of MOOCs and digital continuous education and training (CE, CT).

The main purpose of the project:

- To strengthen the partners in the knowledge alliance by sharing experience and expertise on MOOCs and digital education and training
- To create a framework for structural collaboration on the development, delivery and use of MOOCs, meeting the needs of the EU labour market

- To provide a more complete offer of high quality MOOCs for digital education and training targeting the European labour market
- To implement a more structured outreach for continuous education and training and career development for the EU labour market
- By doing this, to enhance the quality and strength of the European workforce in terms of employability, innovation and entrepreneurship
- To raise the competitiveness of regions and member states
- To bring the Modernisation and Skills agendas of the European Commission into practice

The partners in EMC-LM are:

- Vereniging van European Distance Teaching Universities (EADTU) (Netherlands)
- FutureLearn (UK)
- France Université Numérique (FUN) (France)
- Telefónica Educación Digital (Spain) (managers of MiridiaX)
- University of Foggia (Italy) (managers of EduOpen)
- The Open University (UK)
- Vlaamse Dienst voor Arbeidsbemiddeling en Beroepsopleiding (Belgium)
- Agenzia Nazionale per le Politiche Attive del Lavoro (Italy)
- OPCALIM (France)

This report was authored by The Open University (UK) as leaders of the work package WP1 “Building a knowledge alliance responding to the needs of the EU labour market”. It serves as a foundation for other elements in the work package and for other elements of the knowledge alliance as a whole.

Knowledge Alliance

The alliance is anchored both in the world of work (PES, companies, sectoral organisation) and in the world of education and training (universities, platforms). The main purpose of the alliance is to strengthen the partners in the knowledge alliance by sharing experience and expertise on MOOCs and digital CE and CT; to create a framework for structural collaboration on the development, delivery and use of MOOCs, meeting the needs of the EU labour market; and to implement a responsive and large-scale outreach to the EU labour market. Last, but not least, EMC-LM will contribute to regional, national and European policies for education and training, employment and growth proposing strategies for change and action plans.

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Although this report was authored by The Open University (UK) several partners contributed reviews of evidence. The author warmly thanks the reviewers for their efforts. The reviewers were:

EADTU

- Piet Henderikx
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- Irène Azar

Method

Rapid Evidence Assessment

A “Rapid Evidence Assessment” (REA) is a streamlined literature review which makes compromises on breadth, depth and comprehensiveness for the sake of a fast and agile approach to summarizing and synthesizing evidence. This is often done to provide evidence that could not be provided on a typical research cycle because it would take too long to conduct relative to the project timeframe, or to identify areas for future research or collaboration. REAs are often employed by policymakers to get a quick overview of a particular field that can guide future activity.¹

This report was produced by an international team between April and June 2019. The goal was to summarise the existing evidence with respect to the potential use of Massive Open Online Courses (MOOC) in supporting learning and development in European businesses (see “Research Questions”). The goal of REA is to quickly extract relevant data rather than provide an exhaustive overview of a subject.

The CEBMa REA guide proposes 12 steps to follow in conducting REAs. In the case of EMC-LM some steps are handled differently, such as the initial evidence base being partially drawn from consortium expertise. There is less emphasis on “academic” knowledge and more on elements that can be practically applied in a policy, business or education context.

The following table describes the stages and sets out these differences.

¹ There is a useful guide to REA by the Center for Evidence Based Management at <https://www.cebma.org/faq/what-is-an-rea/>.

Table 1. Rapid Evidence Assessment in the EMC-LM Project

Stage	Name	CEBMa Description	EMC-LM Variant
1	Background	Determines the context for the study	These are determined in the grant application. See "Research Question".
2	Question	Specifies the objectives for the study	
3	Inclusion Criteria	Imposes a filter for choosing which evidence to include (e.g. date, type, focus area, etc.)	We took an inclusive approach here to be better able to draw on consortium expertise and make fewer assumptions. Exclusion was primarily determined by irrelevance, brevity or lack of quality.
4	Search Strategy	Identifying database searches, keywords, publications	In addition to drawing on consortium expertise, a keyword combination search was also used to identify additional research papers.
5	Study Selection	Abstract review; read full studies for those that meet inclusion criteria	Readings were assigned to partners once the list of evidence was agreed; the aim was to make best use of institutional expertise in the knowledge alliance for assessing evidence.
6	Data Extraction	Extraction of all relevant data and results from the evidence base	We developed a tool for data extraction and collated reviews include critical elements. Further validation comes from future project activity (collaboration framework; recommendations).
7	Critical Appraisal	Imposition of quality metric(s); critical interpretations	
8	Results	Outcomes of evidence assessment. Picks up on tensions in evidence base through Definitions (glossary); Causal Mechanisms (theories of action); Main Findings (validity, trustworthiness); Moderators and Mediators (caveats)	We use a simplified approach to describing the relation between phenomena (e.g. claims & criticisms).
9	Synthesis	Coherent summary of the evidence and constructs; describes nature of evidence base (research designs, foci of studies; context; sector; population, etc.) and main conclusions to research questions. In the EMC-LM context this refers primarily to the data extracted for each research question element.	
10	Conclusions	Concise statements which convey main findings	
11	Limitations	Fair description of the limits of the REA method for this study.	'Rapid' review; risk of bias; indicative evidence; some studies excluded; etc.
12	Implications for Practice	Recommendations for action	Framework for collaboration and roadmap for subsequent EMC-LM project activity

Research Questions

The scope of the review was determined by the description in the grant application:

- Screening previous projects with the rapid evidence method regarding needs; the development, delivery and use of MOOCs for the labour market
- Analysis of data generated by employment services
- Screening of needs and opportunities on the labour market for continuous education and training, Continuous Professional Development (CPD)/Continuing Vocational Training (CVT), related to competence development, employability, innovation, entrepreneurship and career development.
- State of the art analysis on the role of MOOCs in continuous education/business training related to needs and opportunities in Europe
- Good practices in MOOCs delivery by platforms, universities (organisational aspects, platform technology and tools, business models)
- Good practices in the use/uptake of MOOCs by companies or workforce, employees
- Experience on pedagogies, technologies, support services, business models on MOOCs for the labour market
- Comparing institutional models (platforms and universities) on MOOCs for the labour market

For an effective RAE, more precise research questions are required. Through consultation with the project consortium, the remit of the study was rephrased and simplified in the following way:

RQ1. How can MOOC best support employability, innovation and entrepreneurship in the European area?

- A. What are the most effective forms of learning with MOOC?
- B. What is needed to support employability, innovation and entrepreneurship in European labour markets?
- C. How can MOOC systematically support CE/CPD and career development in Europe?

Each of these sub-questions were systematically expanded into a more granular description of relevant fields and data points that could inform the reporting tool (see appendix A). This ensured that the full scope of the review could be covered while ensuring that there was sufficient focus and breadth in the study. Results for the three sub-questions can be found in the 'Synthesis' section.

Search Strategy

The initial base for relevant evidence was a range of EU-funded project results and recommendations. The projects that were reviewed were BizMOOC; ECO; LangMOOC; LocoMotion; MOOC for webskills; MOOCAP; MOOCMaker; moocs4all; MOOCs4Inclusion; MOONLITE; MOOQ; OpenUpEd; SCORE2020; TraMOOC. In some cases, the full results of projects were not yet available during evidence collection.

Many of these EU-funded projects referred to a consistent body of literature; these were often added to the potential evidence base. Further suggestions were made by project partners in order to include relevant evidence from policy papers; technical reports; infographics; briefings; PhD studies and grey literature. Google Scholar was the primary database for bibliographic search. Keyword combinations were used to find relevant material. Some other specialist repositories – such as the CORDIS archive of EU projects – were also searched. This initial list was refined through consultation with the EMC-LM consortium.

In some cases, a paper was identified as relevant but because no-one in the consortium was at an institution able to access the paywall it was not included in the review.

Inclusion Criteria

In general, only evidence published since 2015 was included (although some exceptions are made for evidence of particular relevance). This was to ensure that the report provided a state-of-the-art account rather than a re-description of the extensive amounts of MOOC literature published between 2010 and 2015, which often focuses largely on the theoretical potential of MOOCs. This REA was conducted primarily to meet the requirements of the EMC-LM project as a dynamic and contemporary initiative and the evidence selected reflects this. Sometimes an older reference is included because it is cited in another piece of research or is of particular interest.

It was necessary to ensure a spread of evidence across the different aspects of the research question. It would have been quite possible to assess hundreds more pieces of evidence for each sub-question but project constraints did not allow for this. In any case, since the goal was to provide an overview of the evidence base it is unlikely that additional resources would have resulted in a radically different assessment.

Data Extraction

The research questions were expanded into sub-questions and data points. This granular description informed the design of the reporting tool. Partners were assigned a list of evidence to review and used an online form to enter the data. This ensured consistency of approach across the consortium. The reporting tool was piloted and evaluated by project partners in March 2019. A copy of the proforma can be found in the Appendix.

The fields of the tool were broad since much of the available evidence might only relate to a couple of discrete aspects of interest.

The PICOC method (Santos *et al.*, 2007; Schardt *et al.*, 2007) was also used to ensure that research relevant fields would be included. This meant that information about the nature and outcomes of research studies would be consistently extracted from the evidence base.

Table 2. Use of PICOC Method to inform Reporting Tool

PICOC Method	Description	EMC Context
Population	Type of employee, subgroup, people who may be affected by the outcome	A range of European stakeholders; SMEs; educators; HEIs; trainers; companies
Intervention	Approach taken or employed (independent variable)	This is the use of MOOC to provide education or training in innovative ways – the focus could be on flexibility, delivery, assessment, qualification, etc.
Comparison	Alternative intervention, factor, variable	Existing or traditional forms of delivery
Outcome	Purpose or objective (dependent variable)	A summary of the outcome or impact that resulted from the intervention; conclusions drawn
Context	Type of organization, sector, relevant contextual factors	Capturing relevant elements of the context (e.g. organisations, sectors, countries, etc.)

In addition, fields were created for assessing the quality and relevance of a particular resource, as well as fields for capturing other relevant metadata. Quality metrics included the personal reflections of the reviewer as well as whether a study's design was theoretical or data-led; peer-reviewed; or included controlled studies or meta-analysis.

Reporting Process

The initial evidence base was identified through a combination of structured bibliographic searches; suggestions based on partner expertise and systematic reviews of the outputs of relevant EU projects. 172 pieces of evidence were identified for further review.

These reviews were distributed across the consortium according to partner expertise and interest; length and complexity; and relevance. Project partners were given six weeks to extract evidence. The reporting tool (See Appendix) was used to collect data around specific fields of relevance to the research question. A Google Form was used to collate the information extracted. The resulting database was used to summarise the evidence around key aspects of interest to produce the first draft of the report.

Results

Description of the Evidence Base

Format

Table 3. Evidence Formats

Format	Frequency	Percentage
Book	5	2.91%
Book Chapter	9	5.23%
Conference Paper	39	22.67%
Journal Paper	38	22.09%
Policy Paper	17	9.88%
Report	49	28.49%
Website	15	8.72%
Total	172	100%

Sector

Table 4. Evidence Sector Relevance/Focus

Sector	Frequency	Percentage
Primary (Agriculture, Natural Resource Management)	8	4.65%
Secondary (Manufacturing, Engineering & Construction)	5	2.91%
Tertiary (Service Industries)	10	5.81%
Quaternary (Education & Research)	120	69.77%
Quinary (Government, Policy, Senior Leadership)	29	16.86%
	172	100%

The preponderance of evidence around the quaternary sector is not surprising since MOOCs have an educational focus. There are also a number of high-level policy and strategy documents and reports in the evidence base. Evidence pertaining to agriculture, resource management, manufacturing, engineering and construction is less well-represented because there is less of it.

Scale

For each evidence entry reviewers recorded whether the evidence, arguments and positions discussed in the paper mainly applied at a micro, meso or macro level.

Table 5. Evidence Scale

Scale	Frequency	Percentage
Micro (Institutional / Regional)	23	13.37%
Meso (Federal / National)	41	22.67%
Macro (International / Continental)	108	62.79%

Most of the evidence gathered was focused on macro change and implementation. This reflects (i) the fact that many MOOC and other online education providers work across national borders; and (ii) the proportion of evidence aimed at a European level.

Evidence

In this exercise we included both peer reviewed and non-peer reviewed material. Both can be considered as forms of evidence, but there is arguably more normative weight to data that has undergone scientific review. In this section the methods, samples and main conclusions of the scientific papers included are described.

Research Design

Research evidence (papers, reports) was catalogued according to an index of empirical grounding. Non-research evidence was not catalogued in this way.

Table 6. Types of Research Study Included

Research Design	Frequency	Percentage
Theoretical Paper	25	19.38%
Literature Review	19	14.73%
Survey	37	28.68%
Case Study	20	15.50%
Randomized Controlled Study	1	0.78%
Meta-analysis of Randomized Controlled Studies	4	3.10%
Other	23	17.83%
	129	100%

Under 'other' were included some interview series, factsheets, corporate briefings and expert commentary.

Evidence Value

Reviewers were asked to score each item of evidence according to its relevance and usefulness for the EMC-LM project on a scale of 1 (not useful) – 10 (essential).

Table 7. Subjective Evidence Ratings

Score	Frequency	Percentage
1	9	5.23%
2	11	6.40%
3	11	6.40%
4	9	5.23%
5	11	6.40%
6	21	12.21%
7	30	17.44%
8	27	15.70%
9	29	16.86%
10	14	8.14%
	172	100%

The median rating for evidence was 6.44/10. This was a subjective evaluation but indicates that quite a few resources identified as potentially useful but were actually lacking much relevant evidence. In some cases, 'cutting-edge' papers from recent years had been quickly superceded, or were rather general in their claims.

MOOC Innovations, Best Practice & Challenges

What makes MOOCs different?

There has been a significant debate about what constitutes a MOOC. The history of this debate will not be rehearsed here. Reliable and interesting accounts of these debates can be found in the references section (e.g. Moe, 2015; Deimann, 2015; Pappano, 2014; Van Dijck & Poell, 2015; Yousef *et al.*, 2014; Patru & Balaji, 2016; Rapp, 2014).

This report concentrates on what is distinctive about MOOC offerings and highlights their potential for innovation. Our motivation is pragmatic, and so our approach is to remain open-minded on these debates. There are four main dimensions of interest with MOOCs (BizMOOC, 2019; Hood & Littlejohn, 2016; EADTU, 2017a; Henderikx & Jansen, 2018):

- MASSIVE: MOOCs are designed for implementation of eLearning at scale
- OPEN: MOOCs are typically free to access without prior entry requirements; content may be made available on an “open” licence; registration may be porous
- ONLINE: Typically, all MOOC elements in a MOOC are delivered online
- COURSES: MOOCs are bundles of structured learning content (which may be experienced supported or unsupported)

From this basic differentiation a diverse ecosystem of MOOC offerings has developed (Bayne & Ross, 2014:21-22) characterised by different pedagogies, business models and audiences (Farrow *et al.*, 2015) and using a range of technologies to innovate elements of educational delivery (Schwerer & Egloffstein, 2016). A report on the maturing of the MOOC by the UK Department for Business, Innovation and Skills (2013:70) noted the following trends:

- The emergence of cost-reducing financial models for production and presentation of MOOCs
- The need to identify viable sources of revenue for MOOCs
- Growing recognition of MOOC learning as valid
- Extension of MOOC format beyond elite institutions
 - Open access by other institutions to MOOC hosted content
 - Recruitment of second-tier HEIs

Historically there has been some criticism of the quality of open resources for learning though this is much less apparent in recent years. In a rigorous review of 16 studies of OER implementation (covering 14,000 students) found that utilizing OER does not appear to decrease the quality student learning (Hilton, 2016). In no instance did a majority of students or teachers report a perception that the OER were less likely to help students learn.

“One of the most remarkable innovations for students lay in how their teachers developed their professional knowledge. The share of students taught by teachers

who took part in peer learning increased considerably in the past decade.” (OECD, 2019)

“While MOOCs have emerged as a new form of open online education around the world, research is still lagging behind to come up with a sound theoretical basis that can cover the impact of socio-economic background variables, ICT competences, prior experiences and lifelong learning profile, variance in intentions, environmental influences, outcome expectations, learning experience, and economic return on taking and completing Massive Open Online Courses (MOOCs).” Kalz *et al.* (2015)

Vacanti *et al.* (2015:50) note that the affordance of MOOCs – supporting interaction, collaboration, evaluation, and self-reflection – mean they should be approached differently than traditional education.

MOOCs and Innovation

MOOCs have long been associated with innovation. OCED (2014) provides a range of indicators for innovation in classrooms and schools: (i) comparing innovation in education to innovation in other sectors; (ii) identifying meaningful innovations across educational systems; and (iii) constructing metrics in order to examine the relationship between educational innovation and changes in educational outcomes.² They cast light on several dimensions of innovation in education and other sectors of the economy (or society), finding that “Within the education sector, higher education shows the greatest innovation intensity, while secondary and primary education have approximately similar levels... Education is at or below the average in terms of the speed of adoption of innovation [but] The education sector has significantly higher levels of innovation than the public administration on all our indicators” and

² The Organisational and Economic Development Council (OED, 2014) cast light on several socio-economic dimensions of innovation in education and other sectors:

- There is a fair level of innovation in the education sector, both relative to other sectors of society and in absolute terms. 70% of graduates employed in the education sector consider their establishments as highly innovative, on par with the economy average (69%).
- Within the education sector, higher education shows the greatest innovation intensity, while secondary and primary education have approximately similar levels.
- Compared to other sectors, knowledge and method innovation is above average in education, product and service innovation is below average, and technology and process innovation is at the average sectorial level.
- Education is at or below the average in terms of the speed of adoption of innovation: 38% of graduates reported that their educational establishment was mostly at the forefront in adopting innovations, new knowledge or methods (against 41% on average in the economy).
- Higher education stands out in terms of speed of adopting innovation, above the economy average, and well above primary and secondary education.
- The education sector has significantly higher levels of innovation than the public administration on all our indicators and is at least as innovative as the health sector on each measure.

“higher education stands out in terms of speed of adopting innovation, above the economy average, and well above primary and secondary education”.

Open education alternatives have been growing more quickly than formal provision. Miyazoe and Anderson (2013) argue that: “the availability of ever-growing amounts of OER and the consequent non-formal learning opportunities fuel this ‘opening’ of the traditional education systems. These free and open opportunities for both interpersonal and student-content interaction create an interaction surplus that can be used to augment and enhance formal educational curricula and systems”. The high impact of MOOC and OER has led to the belief that MOOCs can lead to the next generation of learning experiences through innovative partnerships (Stracke & Tan, 2018).

Overall innovation can best be achieved by focusing on smart partnerships including young and agile organizations, well established HEIs as well as committed experts and strong exchange platforms (Rampelt & Suter, 2017).

Berger & Frey (2016:37) associate MOOC closely with new routes to innovation in higher education. “Importantly, MOOCs also provide avenues for autonomous innovation in teaching. Dynamic instruction systems that allow the learning load to match a student’s progress, for example, may augment traditional modes of teaching. Furthermore, lectures can be attended several times, at no additional cost, and tests can be retaken until the desired level of proficiency is achieved.”

It has been suggested that MOOC represent an example of ‘disruptive innovation’ (Flynn & Min, 2013; Yuan & Powell, 2013; Mazoue, 2014). Al-Inmarah & Shields (2018) argue that MOOCs do not match all the characteristics of disruptive innovation as they are commonly identified in the literature, suggesting that MOOCs may be a sustaining innovation that establishes new markets for learners who are not served by universities. Christiansen (cited in Ubachs & Konings, 2018:632) argues that MOOCs have not really disrupted educational or industrial business models as the hype once suggested they would.

Belleflamme & Jacqmin (2015:165) suggest that “the transformative potential of MOOCs seems more disruptive for the internal functioning of incumbent institutions than for the higher education market as such”; they argue that the role of MOOC platforms in the higher education sector is to catalyze the evolution of teaching practices rather than supercede incumbent institutions.

MOOCs can have unanticipated impacts. Stokes *et al.* (2015) describe a MOOC designed for prospective students of dentistry and the dental professions. Most of the people who took the MOOC were not dental students but practitioners looking for specific information; people browsing the subject; non-native speakers trying to improve their English; and patients anxious about dental treatment. Learners from 79 different countries accessed their MOOC.

A study of the impact of MOOC on workplace competencies (Karnouskos, 2017:7-8) suggested that MOOCs may directly affect a downstream increase in corporate innovation as a result of developing skills and increased motivation. It is noted that staff who work in innovation (or are 'innovative') are often keen on acquiring new competences, and MOOCs provide an avenue which fits around work commitments.

One consequence of the commercialization of the Internet is that it becomes possible to provide multimedia content to a large audience at much lower cost than before (Whitaker *et al.*, 2016:349). Stracke (2017b:1044-5) aligns the promise of open education with that of "smart", learner-centered education which will better address social challenges through STEM, informatics and educational innovation.

Ossiannilsson, Altinay & Altinay (2016) in a content analysis of literature found that MOOC implementation facilitates transitions to opportunities for lifelong learning and CPD. As such, MOOCs can be considered "change agents" that directly promote innovation and support a wider transition to open online learning. Silveira (2016:219) consequently suggests that the interconnected world requires providers to rethink their delivery models.

Rothe, Täusche. & Basole (2018) present four propositions regarding the interdependence of business model innovation, market evolution, and performance of platforms in emerging markets:

1. Superior ecosystem size, i.e. the number of ecosystem partners and their frequency of value co-creating activities, provides platforms with an initial competitive advantage
2. Platforms with an initial ecosystem advantage can compete sustainably by imitating business models that have been successfully implemented by other platforms
3. Platforms with a small network size can overcome ecosystem disadvantages through business model innovation, if they are able to align ecosystem partners around a unique value proposition or a unique market segment
4. Innovating a platform's business model influences the position and characteristics of the platform's ecosystem.

An extensive review of MOOC literature found that, despite the rhetoric around MOOCs emphasizing them as disruptive, distributed, and democratic, in fact "most MOOC implementations so far still follow a top-down, controlled, teacher-centered, and centralized learning model" (Yousef *et al.*, 2014:16-17). Brown & Costello (2016:75) also identify a tension in the MOOC movement between a neo-liberal push towards bigger markets and "provide a real opportunity to reduce costs, enhance quality and address increasing demand for higher education".

Jansen, Rosewell & Kear (2017:1) argue that MOOCs have become part of a larger modernization agenda in higher education, becoming subject to greater external scrutiny as part of a globalizing market.

Gilliot & Bruillard (2018) find that the ongoing vocational training market presents far greater opportunity for MOOCs than initial vocational training. This change of focus allows for greater flexibility in the pace and supervision of MOOCs.

Pedagogical Considerations

A review of 159 items of MOOC-related research literature from 2010-2013 (López *et al.*, 2015:79) concluded that at the research level MOOC is conceptually and thematically linked to the educational experience of learning, environment, design, and evaluation rather than monetization or technological advance.

Prolific online activity is being transferred to the educational and scientific world in the form of posts in blogs, social networks and web pages, as well as scientific papers and books that attempt to analyze the movement from different methodological approaches (Aguaded Gómez, Vázquez-Cano & López-Meneses, 2016). Any form of electronically mediated pedagogy brings challenges in terms of delivery mechanism, learner cohort size and approach to content (Niederman *et al.*, 2016). There are arguably three main pedagogies that have historically been used to inform design and activity of MOOCs: cognitive-behaviourist; social constructivist; and connectivist (Department for Business, Innovation and Skills, 2013).

Martins Ferreira (2016) notes that MOOCs might be thought at first to promote an instructivist pedagogy, and the onus is on faculty to explore student-centred models. Canals & Mor (2014:5-6) also contend that neither traditional pedagogy nor the prevalent format of short video-quiz-forum are optimal for MOOC, which should be organized around interaction and collaboration.

Thus, one central challenge for MOOC pedagogy is how best to support learners at scale. It is not possible to offer personalized support to learners who are joining a MOOC from around the world (CRUI, 2017). Furthermore, building up the kind of data points (level of study, validation of acquired knowledge, experience, etc.) that would allow for differentiation of delivery and assessment (Costa & Labord, 2016) is similarly challenging for the same reason. Silveira (2016) suggests that allowing faculty some degree of customization to fulfil the learning requirements of specific groups is one possibility.

What might a high level of support for MOOC learners look like? Jones (2015) describes the "Supported Open Learning" (SOL) approach that was developed by The Open University (UK) for supporting distance learners at scale.

1. Distance or Open Learning
 - a. Learning 'in your own time'
 - b. Reading, undertaking set activities and assignments
 - c. Possibly working with others
2. Resources

- a. Printed course materials, set books, audio and video cassettes, CD/DVD materials, home experiments, course and program web sites (previously broadcast TV programs)
3. Systematic support
 - a. A course tutor, a regional network of 13 centres, central library and technical support
 - b. Tutorial held within regions, day schools and online (e.g. languages, summer schools)

Low levels of pedagogical skills among academic teaching staff can act as an obstacle for the development of learning and teaching (Bunescu & Gaebel, 2018:20). Content creation requires expertise in the field of online pedagogy (Traeger, 2015). Low salaries in the higher education system impact the attractiveness of the career for young academics (Bunescu & Gaebel, 2018:20). It has been suggested that teachers must adapt to the online environment, and may need to be incentivized (EADTU, 2017c:6-7). Key areas include:

- Assessment (Vacanti *et al.*, 2015)
- Challenge of adapting to MOOC pedagogies like “flipped learning” (Hanlon, 2015).
- Engaging learners (Petronzi & Hadi, 2016:113)
- It can be hard to make a MOOC fun or interesting (Stokes *et al.*, 2015)
- MOOC can attract an unanticipated audience, causing issues with facilitation (Liyaganawardena *et al.*, 2015:558)
- The need to develop competences rather than knowledge can be challenging (Stracke, 2017a).

In a study which comprised of one MOOC, seven language groups, 16 facilitators, and 1691 participants, Colas *et al.* (2016) identified four critical factors that influence participation: facilitation, language of participation, group size, and a pre-existing sense of community. BizMOOC (2019:Ch.8) highlight the importance of encouraging active participation and proper procedures for recognition, accreditation and certification.

Okada, Rabello, & Ferreira (2014:122) find in open educational approaches the possibility of transforming the roles of “teachers and students from dispensers and receptacles of knowledge to both co-learners – collaborative partners on the process of sensemaking, understanding and creating knowledge together”. Collaborative open learning features OER production, feedback loops, co-ordinating and network building. The COLEARN open research network represents an example of such an approach, which is contended to support “critical-creative thinking, communication and collaboration as well as scientific literacy through collaborative inquiry-based learning” (*Ibid.*:128)

The LangMOOC project proposed the Massive Open Online and Interactive Language Learning Environment (MOOILLE) framework. Perifanou (2015) suggests that MOOC pedagogy should:

- Enhance active communication between all the participants (peer-peer, student-teacher, open class community);
- Facilitate collaboration [and] collective intelligence through group projects, forums etc.;
- Support autonomy (Autonomous/Self-paced/Self-regulated Learning/Reflection);
- Keep participants engaged and motivated via interesting, playful interactive and updated activities (Playful/Game based learning);
- Provide sufficient tutors in support of the learning process

Slavova (2017:61) recommends the use of international teams to write course content, and cautions against 'excessive' use of video, which can be harder to follow without a transcript for second language learners.

In a study of computer science teachers (N=900) Sentence & Humphreys (2015) found that "technology-enabled communities of practice can make effective online learning communities in the domain of education" but "there is also value in face-to-face interaction, not least where people are reticent to join discussions and as such do not fully participate in the online community".

Students will vary in the degree to which they want to participate in co-creating knowledge, in which they are willing to engage in discussion (in a traditional model) or create their own "bundling" of educational components (Niederman *et al.*, 2016)

Belleflamme & Jacqmin (2015:153) believe that MOOC provide opportunity for evidence-based assessment but that this introduces a difficulty in distinguishing correlation and causation with respect to educational practice. MOOC production requires interdisciplinary collaboration which should be adequately incentivised and recognised by HEIs (Traeger, 2015).

Challenges for Learners

Learner perspectives are under-represented in research despite the large amounts of data collected (Kalz *et al.*, 2015:63). One key challenges for learners is adapting to the MOOC learning environment and building their capacity for learning and developing new skills related to heutagogy and lifelong learning (BizMOOC, 2019:Ch.19). Berger & Frey (2016:37) suggest that online students may perform in group work assignments and that this "highlights the limits of online learning, namely the lack of social interaction that comes from classroom debates, discussion, and presentations".

It is often interest and personal discovery that motivates MOOC learning, not a desire to improve employment prospects. Vrillon (2017, N=5,079) found that more

than half of MOOC learners (54%) are like this with just around 11-15% mainly motivated by training or professional development.

The theory is that new digital technologies “allow students to more easily take up positions as prosumers (both consumer and producer) of learning” (Hanlon, 2015:10). In reality, university courses are often designed for campus students and then made available as MOOCs, but online learners do not have the same access to facilities and support (Parkinson, 2014:16).

“Self-regulation, therefore, emerges as a key lens for understanding nature of who is able to benefit from the learning opportunities offered in a MOOC. The wider context of a learner (rather than the often-superficial dimensions of prior educational attainment, geographic region, job) influences what they will get out of their learning journey.” (Littlejohn & Hood, 2018:47-48)

To successfully engage with MOOC, learners also need to develop:

- Digital skills (EADTU, 2017c; Gruber, 2015; Slavova, 2017)
- Heutagogical skills (EADTU, 2017c)
- Peer learning skills (European Commission, n.d.)
- Skills for engaging with online resources (MOOCS4Inclusion, n.d.).
- Time management skills – especially for those who work in SMEs (Esfer & Cagiltay, 2018)

The ‘one size fits all’ approach typical of MOOC can present challenges for learners. Accessibility continues to present issues for many (MOOCAP, n.d.).³ Colas *et al.* (2016) similarly highlight the importance of understanding cultural context for learning; even where MOOCs are available in an understood language, learners can struggle with other elements that can be important for learning. Some groups (e.g. refugees) might be overwhelmed by teaching that is too theoretical or abstract (Traeger, 2015).⁴

Adapting to flexible learning opportunities and combining learning with work and family life can be difficult (European Commission, 2019a:15). Learners are

³ MOOCap (n.d.) developed a suite of online courses tackling different aspects of accessibility for online learning. The courses include: Digital Accessibility: Enabling Participation in the Information Society (joint MOOC on FutureLearn); Inclusive Learning and Teaching Environments (MOOC on FutureLearn by UoS); Design Innovation - Inclusive Approaches (MOOC on Open eClass by the UAEGEAN); Accessible Mobile Apps (public online course on Moodle by JKU & UP8); Accessible Web (public online course on Moodle by TUD & JKU); User-Centered Design for Accessibility (MOOC on Canvas by HiOA); User Interface Personalisation (MOOC on edX by HDM); Assistive Technologies (public online course on Moodle by UP8 & JKU); Intellectual Disability and Inclusion (MOOC by CourseSites/BlackBoard by DIT); Accessible Documents (public online course on Moodle by TUD); Accessible Gamification (MOOC on edX by HDM).

⁴ The e-VALUATE (n.d). project is developing academic recognition for MOOCs and SPOCS with refugees in mind.

sometimes required to build or participate in online communities, and this is not always found easy (Perifanou, 2015). Many do not have Internet access (Slavova, 2017). Some learners cannot access adequate bandwidth to download learning content (King *et al.*, 2018).

Technology is not yet available that would address all of this. For instance, even translation services for online content are not well suited to specialized discipline-specific languages (TRAMOOC, n.d.). Formal education systems do not provide learners with the networking, reputational and learning skills that MOOC environments require for successful learning – possibly because things like online autonomy, group formation and feelings of inclusion/exclusion are not sufficiently understood (Department for Business, Innovation and Skills, 2013).

Consequently, there is a need for learners to keep developing, adapting, revising and learning new skills to stay relevant and active in lifelong learning (Pitt *et al.*, 2017:369; Calonge & Shah, 2016:71; Okada, Rabello & Ferreira, 2014).

Institutional Perspectives

EADTU (2017c:13) estimate that close to 40% of HEIs make some form of open provision. Open education is a new area of provision that sits alongside degree education, CE and CPD – universities need to develop visions and strategies for each of these areas, acting flexibly and rapidly (Henderikx & Jansen, 2018:54; van Valkenburg, 2016). Although institutional uptake of MOOC is steadily increasing, openness can be seen to present a number of challenges to traditional practice in HEIs (Castaño Muñoz *et al.*, 2016; Orr *et al.*, 2018; Ossiannilsson, Altinay & Altinay, 2016). The MOOC offer continues to be not well understood by many human resource developers (BizMOOC, 2019:Ch.3).

Lester (2016:23) identifies several challenges for HEIs which MOOC can address:

- Reforming inflexible methods of delivering formal qualifications
- Addressing major skills gaps by working with employers and professional bodies
- Increasing the number of places available in higher education
- Tackling pressing health or social issues (e.g. viral outbreak) by offering a route to rapid training

Calise & Reda (2016:32) argue that HEIs currently have little incentive to offer MOOCs since they must absorb the additional costs themselves (especially in Europe where education is sometimes expected to be free). The great advantage of MOOC provision from an institutional perspective are two-fold (Berger & Frey, 2016:38). Firstly, there is the potential to tap into a global market of potential students. Second, the marginal cost of adding additional students is next to zero.

Even though the vast majority of costs are up-front, there is a considerable degree of scepticism about the financial viability and sustainability of open educational approaches (Dos Santos *et al.*, 2016:88) and MOOC (Padilla Rodriguez *et al.*, 2018:17-18; Silveira, 2016:219). (See "Business Models".)

Smith *et al.* (2018) suggest that reaching a large audience outside your institute is more difficult with your own bespoke platform. The start-up costs of MOOC (course, platform, bandwidth, personnel, training etc.) are higher than traditional courses, and incurred entirely before a course starts; however, once a course is up and running there is a considerable advantage in economy of scale (Belleflamme & Jacqmin, 2015:153).

Running a MOOC carries financial risks relating to: "running and supporting the platform, verifying and screening applicants, making sure participants have correctly completed the requirements, updating content (particularly for information systems topics that are subject to continual change), supporting students' queries and problems, and general administrative costs" (Niederman, *et al.*, 2016).

One general challenge for educational institutions is dealing with the reorganisation of clusters of academic work. As a wider range of stakeholders (including private providers) become involved new ways of working together and across institutional boundaries become necessary (Costa & Laboard, 2016).

Jones (2015) argues that although technological innovation is reducing the cost of education to society, in some countries (e.g. the UK) the cost to the learner is increasing. MOOCs can be seen to represent "the consolidation of networked and digital technologies at an institutional and infrastructural level".

Whitaker *et al.* (2016:353-6; 359) argue that HEIs have simultaneously been undergoing an increase in enrolment and a decrease in state funding. This has led many to shift their faculty to part-time and non-tenured positions. Faculty members are increasingly required to understand the impact of markets upon their role. The internationalization of higher education offers transnational opportunities (Henderikx & Jansen, 2018) but requires HEIs to design MOOC to support learners from a variety of backgrounds (Petronzi & Hadi, 2016).

Perifanou (2015) suggests the following criteria for an effective MOOC LMS:

- Ease of creating a course
- Open source software
- Ease of customizing the platform
- Technical functionality and support for cMOOC pedagogy
- Possibility of publishing or repurposing OER
- Multiple/alternative assessment tools (e.g. automated/human; analytics; peer-to-peer)
- Accreditation tools (e.g. ECTS; c.f. Jansen & Konings, 2017) (e.g. Micromasters, c.f. moocs4all, n.d.; Mol, 2016:25)

- Mobility/Ubiquity across devices
- High security
- Good usability
- Low operating cost

HEIs and MOOC providers need to ensure accessibility of resources and technical support for learners (Osuna Acedo & Camarero Cano, 2016; Schwerer & Egloffstein, 2016) which can be addressed through learning design (MOOCAP, n.d.; Brasher *et al.*, 2016; Canals & Mor, 2014:16-7; Esfer & Cagiltay, 2018).

Jansen & Teixeira (2015:4) highlight the importance of the European Credit Transfer System (ECTS). The public funding; networked universities; and relatively advanced state of certification is considered to be an advantage of Europe compared to other regions, but it remains unclear whether implementation is adequate. The European Commission (2017b) supports ECTS through the integration of work placements into higher education programmes. (Poorer socio-economic and/or migrant backgrounds continue to have weak education outcomes (European Commission, 2018d).)

EADTU (2017c:21) found that “the majority of HEIs do not have mechanisms for recognising MOOC certificates in ECTS”. 30% of HEIs might recognize a MOOC certificate obtained under on-site exam (dropping to 18% for an online proctored exam) (*Ibid.*). moocs4all (n.d.) provide more examples in “MIT Micromasters” which allows admittance to a campus programme with course credit; and “The Alternative Credit Project” which sees a selection of universities associated with the American Council of Education recognize MOOC learning for degree credit. Hyvönen (2016) describes how HEIs in Finland charge €15 per ECTS credit.

Delgado Kloos & Méndez (2016) observe a lack of incentives to create high-quality MOOCs. Schumann (2016:31) similarly argues that the problem is that the current micro-structure of the system does not incentivise HEI to offer ECTS-MOOCs and neither allows students to take ECTS-MOOCs for free. Henderikx & Jansen (2018:63) suggest that the key issue for providing ECTS credits for MOOC learning is the reliability and validity of the assessments. As a result, quality assurance processes have been adopted to a significant extent but without consensus on international standards (*Ibid.*, 90).

Burd *et al.* (2015) suggest that institutions explore the use of MOOC as pre-admission tools to prepare future students (“bridgeMOOC”); and for communicating brand identity (“brandMOOC”). The latter is thought to offer a route to establishing the perception that an institution is a leader in public education.

MOOC providers often have strong connections to HEIs but there is typically a low level of collaboration (Pitt *et al.*, 2017:372). There is a general lack of institutional strategy regarding MOOCs and other forms of innovation (EADTU, 2015a:7). Bunescu & Gaebel (2018:5) report that the lower prestige and recognition associated

with teaching excellence (compared with research) results in an institutional lack of interest in teaching enhancement.

Traeger (2015) reports that teachers and students were most satisfied with a blended-learning setting which provides flexibility while maintaining face-to-face support.

Niederman, *et al.* (2016) warn that schools, colleges and HEIs risk being left behind the curve if they have “already given up on creative bundle construction and mass customization and focused on mass production and economies of scale as its core business model”. Smaller institutions who don’t have connections with MOOC platforms may get “left behind” if they cannot secure alternative financing or joint strategic partnerships (EADTU 2017c:12).

Infrastructure investment represents an ongoing challenge (Milovanovitch, 2018, Lehto, 2016:66 Niederman, *et al.*, 2016) especially at the platform level (Lehdonvirta, Margaryan, & Dabies, 2017).

MOOC Production: Best Practice

Much of the available evidence emphasizes the importance of adequate quality review at the planning stage (Limone, 2017). Building an online environment for learning takes a lot of time, effort and money to ensure that there is adequate scale; analytics; learner experience; and other desired features (Perifanou, 2015). Charging for examination or accreditation needs to be thought through in advance. It is important to understand your primary objectives for getting involved in MOOC provision (Teixeira & Jensen, 2016). CRUI (2017) suggest that more attention is being paid to designing MOOC to support self-regulated learning. They appeal to Laudrillard’s (2012) notion of “effective design”.

One survey (N=169) of MOOC professionals (EADTU, 2017b) found that support for the design and development of MOOCs was the most important service they used, while a quality assurance framework and authentication, assessment, proctoring and certification services were perceived as most important to their institution. However, there is a lack of universal quality frameworks (Jansen & Konings, 2017).

A prototype quality framework for MOOC is proposed in Stracke *et al.* (2018b). The QRF is based on the Reference Process Model that was developed in 2005 and revised in 2017. The outcome of this expert review is the following model which distinguishes phases of work, necessary perspectives and clusters of roles (Figure 1).

Dimension 1: Phases	Analysis, Design, Implementation, Realization, Evaluation
Dimension 2: Perspectives	Pedagogical, Technological, and Strategic
Dimension 3: Roles	Designer, Facilitator, and Provider

Figure 1. Dimensions of the Quality Reference Framework (QRF)

Stracke (2017b:1045) similarly suggests the generic quality dimensions of potential, processes and results (which can be applied at the micro, meso and macro levels).

The main benefits of the Quality Reference Framework⁵ (Stracke & Tan, 2018) are:

- Providing a generic framework that can be adapted to each specific context;
- Identifying key quality criteria for better orientation on the MOOC design;
- Presenting a checklist for the quality development and evaluation of MOOCs
- Enabling a continuous improvement cycle for MOOC design and provision.

Limone (2017) alternatively suggests using the Dublin descriptors (generic descriptions of achievements of awards associated with the end of a Bologna cycle) to plan and describe modules within a course. Such descriptions comprise: knowledge and understanding; applying knowledge and understanding; making judgements; communication; lifelong learning skills.

Many such criteria for best practice have been proposed:

- Account for diversity (EADTU, 2017c:18) and design for accessibility (Osuna Acedo, & Camarero Cano, 2016)
- Run a pilot (Traeger, 2015)
- Openly licence resources to promote reuse (van Valkenburg, 2016:43)
- Reuse and remix of course materials (including OER) minimizes costs and promotes sustainability (Padilla Rodriguez *et al.*, 2018; Schuwer & de Vries, 2016:46)
- Involve academics in course design (Petronzi & Hadi, 2016:119)

Two key criteria for content creation proposed by Kapanen *et al.* (2016) are (i) the appropriateness of the content for the audience; and (ii) the technical feasibility of content implementation. Slavova (2017) argues that shortcomings in the design strategy of MOOC platforms lead to inequalities in access and problems in learner retention. Hood & Littlejohn (2016) note that learners' prior education experience also has been found to influence their retention in a MOOC. Esfer & Cagiltay (2018) suggest that a certificate of attendance be offered to those reaching 70% attendance (as in the Bilgeiç MOOC portal).

⁵ See [http://mooc-quality.eu/wp-content/uploads/2018/10/Quality Reference Framework for MOOCs v10.pdf](http://mooc-quality.eu/wp-content/uploads/2018/10/Quality%20Reference%20Framework%20for%20MOOCs%20v10.pdf) for the QRF

Brasher *et al.* (2016:183-4) argue that the problems associated with poor retention in MOOCs can be addressed to an extent by improved course design. Five learning design phases (investigate, conceptualise, prototype, implement and evaluate) and three core concepts (guidance, representation and sharing) are highlighted.

EADTU (2015b) similarly provide a design framework (micro/meso/macro) for designing a MOOC (objectives and competences, human and other resources, methods, tasks and activities, spatiality and temporality, administration, marketing, and evaluation).

Delivering MOOC, Facilitating Learning

Flexible delivery of educational content is a key feature of the MOOC offer. Much has been written on how best to take advantage of these affordances.

Based on a study (N=128,711) of students enrolled in MOOC in Italian universities, CRUI (2015) recommend that each MOOC offered should include:

- Free access (c.f. Henderikx & Jansen, 2018)
- Online availability of all course content and teaching materials (in all formats)
- The possibility of delivery at scale
- The possibility of interaction between a teacher and learner
- Activities that support interaction between teacher and learner
- A certification of learning at the end of the course

One recommendation from *BizMOOC* (2019:Ch.17) project was that “MOOCs centred around creativity and innovation live and die with social interaction and activities”. Accordingly they offer some ‘top tips’ for building a MOOC (*Ibid.*, Ch.7).⁶

- Research the choice of topic(s) and your target group(s)
- Carefully select the platform which fits to your type of MOOC as well as to your audience (c.f. Traeger, 2015)
- Design your MOOC to engage appropriately with as many learners in your target audience(s) as possible
- Use educational design tools and well-approved didactical approaches
- Get early feedback by running pre-tests with your target audience
- Focus on community and “ice-breaking activities” in the first week
- Strike a good balance between different forms of activities and resources
- Make impactful multimedia content
- Pilot and test multiple-choice assessments
- Seek to reuse existing content

Some have suggested the importance of “teacher presence” for effective facilitation (e.g., Kapanen *et al.*, 2016). Whitaker *et al.* (2016:352) suggests this can be

⁶ Detail can be found at <https://mooobook.pressbooks.com/chapter/designing-your-mooc/>

achieved through discussion, encouragement, and an understanding of individual student needs.

On the choice of moderation and interaction technologies: one study (Rodriguez, 2012; cited in Whitaker *et al.*, 2016:357) suggests that three tools alone (daily e-mail newsletter, course management system, and Wiki collaboration document) were sufficient to understand course intent. Petronzi & Hadi (2016:113/128) emphasize the importance of academic involvement in discussion and moderation since many learners are discouraged by silent or short responses. By contrast, the involvement of academics has a positive impact on perceived course quality (Petronzi & Hadi, 2016:119)

Other good practice suggestions:

- Facilitating a MOOC should expand the participant's knowledge and appreciation for accessibility issues (MOOCAP, n.d.)
- Talmo *et al.* (2016) provide detailed cases of the practical running of language and cultural education focused MOOCs.
- Rather than restrict delivery based on the technological limitations of a MOOC platform, use external services for additional or specialized activities (Canals & Mor, 2014)
- Truyen (2016:51) suggests using real-time monitoring and fine-tuning based on analytics.

Evaluating MOOC

The ultimate goal of MOOC evaluation can be understood as the attempt to enhance quality through student-centred and personalised research (Henderikx & Jansen, 2018). Evaluation of MOOC learning is another area that has seen much debate, though lack of a shared quality framework (Stracke, 2017b) and alternative accounts of how to understand or improve the MOOC offer mean that this debate rarely progresses.

The main difference with between MOOC and traditional evaluation is an alternative measure of quality: interpreting quality outcomes based on individualized rather than standardized variables (Littlejohn & Hood, 2018:91). BizMOOC (2019:Ch.11) provide an overview of different quality frameworks and evaluation practices used in MOOCs.

Stracke (2016a:217) acknowledges long-standing debates about educational quality, noting that quality is dynamic and perspectival. The three generic quality perspectives proposed in the context of open education are:

- learning objectives (precisely defined; contextual; appropriate, etc.)
- learning realization (strategy; delivery/implementation; assessment, evaluation, etc.)
- learning achievements (the results of realized learning opportunities)

CRUI (2017) similarly suggest that quality must be understood in terms of assurance, auditing and enhancement. They propose that effective evaluation will identify the good practices that will support a truly self-regulated learning environment. Six vectors of quality are proposed:

- Structure/syllabus of the MOOC
- Teaching materials
- Online educational activities
- Evaluation of learning
- Tutoring, monitoring & communication
- Learning Management System (LMS)

Costa & Labord (2016) suggest that qualitative peer review is promoted through a scoring grid that comprised five aspects: clarity of purpose; quality of argumentation; structure of the text; command of the language; instructions and writing.

Dos Santos *et al.* (2016:89-90) note that there is a cost implication to validating and certifying MOOC learning. Assessment is central to recognizing learning, and institutions have tended to either pass this cost on to learners or restrict eligibility in order to control costs. Robustness is typically achieved through on-site assessments that mirror those of traditional learners.

“...research suggests that on-site exams with identity validation and real-time supervision are perceived as being the most robust form of assessment. Finally, ECTS (European Credit Transfer and Accumulation System) credits are not yet a widely accepted currency for recognition of open learning.” (*Ibid*:89-90)

Witthaus *et al.* (2015) also make the point that “formal recognition requires tutors to review performance and students to have their identities validated. This all requires financing. To the extent that these costs have to be passed on to the learners [...] MOOCs become that much less open and less inclusive. The challenge for institutions is to overcome this low cost and high value incompatibility in the most cost-effective way.”

Several strategies towards this end have been proposed:

- Perifanou (2015) suggests that active learning can be promoted by ongoing, personalized assessment; specific metric tools (primarily data mining); feedback from peers and digital badging
- Stokes *et al.* (2015) associate effective use of learning analytics and evaluation
- Colas *et al.* (2016) suggest a robust evaluation model which combined user surveys and digital data about different learners within a MOOC to determine comparison groups
- Use of protocols (EADTU, 2017c:9)
- Iterative improvement (Kapanen *et al.*, 2016; Jansen, Rosewell & Kear, 2017)

- Pre- and post- questionnaires (Kalz *et al.*, 2015)
- Feedback into learning design (Brasher *et al.*, 2016)
- Stakeholder involvement (Traeger, 2015)
- Offer alternative certification models based on regular assessment in order to move towards more authentic performance indicators (Schwerer & Egloffstein, 2016:256; Stracke, 2016b:1044)
- MOOC quality assurance processes should be tailored to eLearning and embedded in institutional frameworks (Jansen, Rosewell & Kear, 2017)

Part of the difficulty with evaluation is that people learn with MOOC for diverse reasons. One survey (Stracke, 2017b; N=45) found that MOOC learners often do not share the goals that have been prescribed for them by designers.

Hood & Littlejohn (2016) note that engaging with MOOC quality also means engaging with “the complexities and diversity in designs, pedagogies, purposes, teacher experiences and roles, and participant motivations, expectations and behaviours present”. They propose using the following model to divide the MOOC ecosystem into presage, process and product variables that can be used to measure quality in a MOOC.

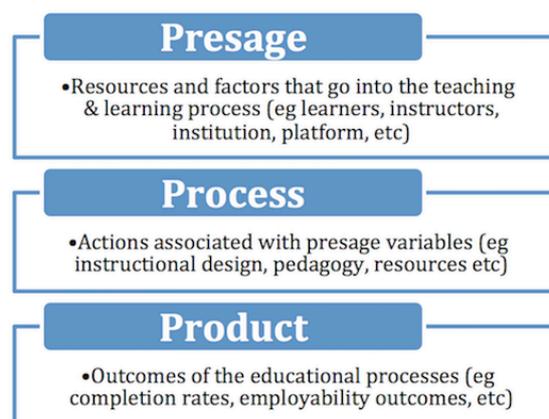


Figure 2. Biggs 3P Model (Hood & Littlejohn, 2016)

Measures that have been proposed include measuring participation, learner satisfaction, learning outcomes (and related process variables). They suggest that the fundamental tension is between the interests of learners and MOOC platforms, which means there cannot be a universal approach. Balance is important here: as CRUI (2017) note, a consistent list of quality metrics would be helpful to those who design and evaluate MOOC to ensure that they have complied with best practice.

“Quality is not objective. It is a measure for a specific purpose. In education, purpose is not a neutral or constant construct. The meaning and purpose ascribed to education shifts depending on the context and the actor, with governments, institutions, instructors, and learners approaching education from different viewpoints and consequently viewing quality through different lenses.” Hood & Littlejohn (2016)

Employability, innovation and entrepreneurship in European labour markets

The EMC-LM project is focused on European labour market innovation. One recent large scale project of particular relevance is the European-wide Knowledge Alliance BizMOOC which ran for three years and ended in December 2018. BizMOOC was directed towards enabling businesses, labour force and universities to increase their activities and exploitation (economies of scale) of the MOOC potential. Key areas of work included research into barriers to uptake; identifying key topics to act as focal points for stakeholders; and producing and evaluating MOOC. A survey (N=1,193) and a series of interviews (N=106) with representatives of business were used to generate guidelines for best practice. They are summarized here (some text reused under CC-BY licence).

MOOCs have been thought particularly relevant and useful for human resource development, customer training, marketing and recruitment (Pitt *et al.*, 2017:376-8). *BizMOOC* focused on work force & HEI-training and the acquisition of labour market key competences through applying new methodologies for online teaching & learning. This will be achieved by creating common standards & frameworks on MOOCs by integrating the experiences from Higher Education and the business world.

MOOCs have had a remarkable ability to attract large numbers of learners to a vigorous online learning community. The constant availability makes MOOCs an excellent resource not only for students, but also for all life-long learners and modern professionals striving for on-going career development and personal improvement. (BizMOOC, 2019:Ch.17)

BizMOOC (2019:Ch.11) suggest the following quality dimensions to drive effective entrepreneurship and 'intrapreneurship' through MOOC learning:

1. Quality from the learner point of view
 - a. Brand perception
 - b. Ratings of peers
 - c. Diverse expectations
 - d. Diverse motivations
2. Quality connected to pedagogical framework
 - a. Designing for scale
 - b. Qualitative indicators
 - c. Autonomy, diversity, openness and interactivity (Downes, 2013)
3. Quality relating to input elements; conventional measures of course quality (design, instruction, assessment, etc.)
4. Quality based on outcome measures
 - a. Completion
 - b. Certification
 - c. Meeting learning objectives

Ossiannilsson *et al.* (2015) also found that most quality models take a holistic view which recognizes the need to address diverse elements. In this sense, one key affordance of MOOC is the ability to exist within a network of external resources (Kapanen, 2016) and connect successfully with markets.

Drivers of Employability

European Union (2018a) recognizes that online learning tools are an integral part of training and reskilling for employability. People with education and training have a greater chance of finding employment (European Union, 2016). The European Pillar of Social Rights acknowledges the universal right to lifelong learning as a route to managing work transitions more successfully and participating more fully in society (European Commission, 2019a). Those with a tertiary education are four times more likely to engage in lifelong learning than low-qualified adults (European Union, 2016).

Kaiser *et al.* (2018:5-9) link employability to higher education relevance, suggesting that policies should focus on personal development, sustainable employment and active citizenship. They recommend greater use of existing indicators with respect to "active citizenship" (trust, happiness, self-confidence, political participation, social representation, etc.).

The European Commission (2017a) recommends regular revision of the Key Competences Framework to promote and guide required skills with a special focus on innovation and entrepreneurship. They suggest (2017a:15) that increased opportunities for validation of non-formal and informal learning (especially in the workplace) can support skills development and the presentation of qualifications.

Canals & Mor (2014:4) describe such opportunities as arriving through agile and dynamic partnerships that result in systems for formal/informal credit and portfolio recognition. Koch & Lanestedt (2016) recommend the use of specialist support in the workplace through cloud-based platforms for collaboration, video-conferencing.

In the context of employability, MOOC provision can act as a driver by enabling learners "to potentially connect with many working professionals around the world and produced by quality providers like Higher Education Institutions" (BizMOOC, 2019:Ch.9). It is believed that this process is already well underway:

"MOOCs are "not the first occurrences of either a potential disruptive technology or distance learning", and they "do not seem to be the last of either one" (Treadway, Ayala & Dick, 2013). In fact, MOOCs could be employed for designing a strategic opportunity/solution to meet local requirements through enhancing related skills and capabilities (Patru & Balaji, 2016). It is therefore anticipated that MOOCs, by building new learning/training routes towards tertiary education and by

providing lifelong learning opportunities, are well placed to provide skills training that aligns to labour market requirements. In fact, MOOCs for the world of business are already among two out of six trends for MOOCs (Shah, 2018): The share of professional learners in MOOCs is significantly growing and we see a stronger uptake of corporate training by companies.” (Ibid., Ch.4)

The OpenUpEd benchmarking system compares institutional performances and improve processes. It is grounded in open education principles (Jansen, Rosewell & Kear, 2017). It has 8 dimensions for quality assurance that are intended to be applied as an improvement tool (Rosewell & Jansen, 2014; Jansen, Rosewell & Kear, 2017):

- Openness to learners
- Digital openness
- Learner-centred approach
- Independent learning
- Media-supported interaction
- Recognition options
- Quality focus
- Spectrum of diversity

Other quality frameworks that have been expanded to address MOOC include the QM Quality Matters guide and iNAQOL; incorporating new technology-enabled measures (such as Precise Effectiveness Strategy) could innovate quality metrics (Hood & Littlejohn, 2016).

‘Academic drift’ and ‘vocational drift’ have been proposed as concepts for explaining change processes in higher education and VET (CEDEFOP, 2019; Tight, 2015).

- a) ‘Academic drift’ refers to the tendency of HEIs to aspire to higher status; or for non-HEIs to aspire to an academic status (e.g. recognition, rights, institutional profile). In a VET context, CEDEFOP (2019:17) refer to an academic drift model for higher VET.
 - a) increasing the share of (general, abstract, theoretical) knowledge and strengthening theory-based reflection in VET programmes/qualifications offered at higher levels, to facilitate permeability and progression (such as providing access to higher education studies);
 - b) strengthening institutional links between higher VET providers and HEIs
- b) ‘Vocational drift’ is generally understood as “strengthening VET principles in higher education” (CEDEFOP, 2019:17-19). This can lead to new forms of labour market co-operation; new markets and providers; new learning programmes. The vocational aspects of such programmes can be strengthened by:
 - a) strengthening the focus on professional experience as entrance requirement for learners and/or for obtaining the qualification (such as

- by introducing or strengthening possibilities for obtaining the qualification based on validation of professional experience);
- b) increasing the share of practical or work-based learning;
- c) establishing stronger links to labour market stakeholders, encouraging employer engagement and strengthening the role of social partners (such as by involving employers and industry representatives in designing and delivering qualifications, as well as in certification processes).

The most recent Joint Employment Report (2019) suggests that “there is a strong positive relationship between the share of adults (aged 25-64) receiving guidance [services for learning] and the share of those eventually participating in learning”. Employers are the ones who typically provide or finance the learning of their staff, though there is evidence that subsidies (e.g. grants) made directly to enterprises can be an effective form of financial incentivization.

With respect to sustainable employment Vossensteyn *et al.* (2018:7) suggest that the largest number of policies relate to “taught content, recognition of prior learning, personal capital effects, teaching methods, higher education’s focus on the labour market and the role of employers in higher education and in setting the conditions of entry into the labour market.”

Based on a study in Germany, Kapanen *et al.* (2016) suggest that the focus for graduate employability be job application skills, generic career and workplace competencies, self-development skills, and (inter-) cultural knowledge. They acknowledge the importance of learner motivation and cite Dacre, Pool & Sewell (2007:281) to emphasize the importance of “psychological concepts – self-efficacy, self-confidence and self-esteem – as important factors of individual employability.” Costa & Labord (2016) suggest that increased accountability often results better pay or recognition.

Dussarps (2018) asks whether having MOOC experience really makes a difference on job applications. A survey (N=79) of employers suggests that 73% see them positively. With regard to the candidate’s personality, the MOOCs reflect the candidate’s curiosity (81%), autonomy (60%), ability to work from a distance (59%) and self-discipline (55%). Motivation (50%), determination (34%), rigour (22%), organizational skills (22%) and concentration (16%) are less frequently reported. Only 31% considered a MOOC with a certificate of follow-up equivalent to university training and 5% for a MOOC without a certificate. Follow-up interviews supported the view that MOOCs tend to be seen in terms of useful soft skills, self-discipline and intellectual curiosity.

Other drivers identified in the literature (organised by theme):

Improved data flow:

- Kalz *et al.* (2015:70) highlight the importance of intrinsic vs. extrinsic motivation for MOOC learners and suggest collecting learner data as a route to understanding this
- Canals & Mor (2014) identify a need for mechanisms that employers can use to validate the efficacy and relevance of MOOCs
- Connecting job offers and employees more efficiently (Reskill, 2017a). Sharing labour market data (ESCO, 2017d)

Targeting learners:

- Jansen & Konings (2017:15) report that 23% of HEIs believe the main target for lifelong learning and CPD should be further education students.
- Make skills and qualifications more transparent and visible (European Commission, 2017a)
- MOOC as a career management tool which encourages individuals to reflection on their goals and progress (Dussarps, 2018)

Networks and communication:

- The European Commission (n.d.) recommends the creation of inter-regional networks to support the uptake of workplace innovation
- The importance of language skills for both international collaboration and accessing learning and training opportunities means that companies are increasingly requiring a higher standard of English from new recruits (Anthony, 2015:2-5).
- Supported networking (ESCO, 2017d)

Agility in the workplace:

- International mobility of staff and learners (European Commission, 2017b; European Union, 2018a) and a need to improve use of existing framework accordingly and look for technology-driven solutions (European Union, 2016).
- Developing job application skills (Kapanen *et al.*, 2016)
- Many see MOOCs as a route to offering easy access to the acquisition of basic literacy and numeracy skills (Brandt, 2015)
- Apprenticeships are considered a particularly effective form of work-based learning in vocational education because they develop mutual trust; provide relevant skills; and smooth the transition between work and study (European Commission, 2017c:2).

Supply and demand:

- There is high demand for graduates with skills in numeracy and IT, particularly as companies seek to merge roles through automation (Reskill, 2017a).
- Anticipated wages are an important factor both for driving employability and determining the attractiveness of educational pathways (Joint Employment Report, 2018).

- Accreditation of informal qualifications can improve student employability (even with a smaller offer of credits) (Martins Ferreira, 2016)

In this context, MOOCs have specifically been proposed to address lifelong learning and address competency shortages (EADTU, 2017c: 10); and also as a way to boost productivity and market competitiveness (Karnouskos, 2017). Furthermore, MOOCs are considered a tool for designing strategic opportunities for developing required skills and competencies (EADTU, 2017a; Patru & Balaji, 2016:11)

Barriers to Employability

A number of barriers to efficiency in the European job market have been identified. The European Commission (2017a:2-3; 2017b) describes the situation in Europe with respect to readiness for employment and future development at length.

- 70 million Europeans lack adequate reading and writing skills, and even more have poor numeracy and digital skills, putting them at risk of unemployment, poverty and social exclusion
- 12 million are long-term unemployed; half of these are considered 'low-skilled'
- 40% of employers have difficulties hiring employees with skills that can enable them to grow and innovate
- Skills mismatches hinder productivity and growth
- The economy is undergoing a digital transformation which requires technical training as well as new ways of working that emphasize innovation and entrepreneurship
- The EU workforce is ageing and shrinking, making it necessary to increase labour market participation; facilitate mobility of EU citizens; make better use of migrant labour; and reduce 'brain drain' (c.f. Kapanen *et al.*, 2016).
- The quality and relevance of training opportunities varies widely
- Perceptions of the value of training/education can act as a barrier to the involvement of younger people
- Increasingly learning takes place outside formal education (online, workplace, professional development; social activities; volunteering) though these experiences often go under-recognised
- An innovation gap: higher education institutions are often not contributing as much as they should to innovation in the wider economy, particularly in their regions
- The different components of higher education systems do not always work together seamlessly
- Persistent and growing social divisions regarding people from disadvantaged socio-economic or migrant backgrounds
- Lack of transversal, problem-solving, communication, digital and entrepreneurship skills

While almost three quarters of the European population has an upper secondary education, basic literacy and numeracy skills cannot be assumed – with undesirous effects on employment, wage growth and wellbeing (European Commission, 2019a; Brandt, 2015). Only 20% of the world’s population is able to benefit from content provided only in English (Beaven *et al.*, 2014).

Berger & Frey (2016:43) report that Europe is facing a shortage of digital specialists, summarized by the European Commission’s forecast that there will be a shortfall of 756,000 digital professionals by 2020. At the same time, in 2015, only 6% of Europeans participated in an online course. Furthermore, these 6% are more likely to be digital specialists who know how to take advantage of these opportunities and take many courses.

Resistance to digital technologies within businesses can act as a barrier to employability (Labord & Costa, 2016).

Garrido *et al.* (2016) identify a lack of national strategies to promote MOOCs as a means to mitigate unemployment or for professional development. Rutkauskiene & Gudoniene (2016) call for a national strategy in Lithuania. Bunescu & Gaebel (2018) reports expert opinions from countries with no dedicated national strategy for learning and teaching were quite divided over the question on whether a national strategy would be beneficial – with a slight majority in favour.

Many Europeans work in jobs that do not match their talents while concomitantly 40% of European employers have difficulty sourcing employees with the skills they need to grow and innovate. In addition, HEIs and employers often have differing perceptions of the readiness of graduates for the workplace (European Commission, 2017a). Eurostat (n.d.)⁷ describes how those without basic skills are increasingly disadvantaged by precarious employment and technological development. It is becoming increasingly unlikely that individuals can rely on skills learned in formal education till the end of their working lives.

CEDEFOP (2019:8) report that uptake of vocationally-oriented qualifications is typically low, and there is no evidence to suggest this is changing over time despite digital innovations. There is a difficulty in certifying skills for learners in different states, especially if they are mobile (European Commission, 2017d). Educational outcomes are strongly influenced by students’ socio-economic status and migrant background (Joint Employment Report, 2019:37). Not everyone gets an equal chance to acquire the skills and qualifications that are valuable in the labour market (Joint Employment Report, 2019:39). Language skills represent a barrier to employment for many (Perifanou, 2015). The Adult Education Survey (European Commission, 2019a) showed that a lack of motivation and/or understanding of the

⁷ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Adult_learning_statistics_-_characteristics_of_education_and_training

need for learning is an important barrier to participation: ""The accelerating changes on the labour market, the demand for higher skills and the penetration of digital technologies in all aspects of daily life, give added urgency to the need to upskill people who have not mastered basic skills and have not gained a qualification to ensure their employability" (*Ibid.*).

Poor quality apprenticeships can have a harmful effect on their reputation (European Commission, 2017c:2).⁸ Training is often not very innovative and digital transformation rates are slow in some parts of Europe (Reskill, 2017a:20).

In all countries, the majority of adult learning is of a non-formal nature, usually work-related and provided as well as financed by employers or individuals themselves. Such learning often targets those employees who already have the highest levels of skills and are performing the most complex jobs, while for the rest of employees, opportunities to access training are often much more limited. The fact that most learning is of a non-formal nature also implies that it is often of only short duration and aims to develop company-specific skills. This results in a situation where most adult learning is not able to help adults develop skills that are more transferable across companies including the basic skills – literacy, numeracy or ICT (Joint Employment Report, 2018:49).

On the lack of literacy, numeracy and digital skills; "people furthest from the labour market have the greatest upskilling needs but are hardest to reach" (European Union, 2016:3). Insufficient generic, knowledge, language, and team working skills are also found among foreign graduates (Kapanen *et al.*, 2016).

Employers tend to view employees using MOOCs positively but because it is indicative of a type of personality rather than because of what has been learned and how it might relate to their role (Pitt *et al.*, 2017:376). Dussarps (2018) found that many MOOC learners may prefer the novelty of the experience to the actual learning that is the purported focus. Some MOOCs lack certification (Canals & Mor, 2014) which can act as a barrier to employability though this is evolving all the time.

One significant challenge to the rhetoric surrounding MOOCs and employability is that European MOOC learners are still predominantly highly educated, more likely to be male, digitally literate (Pitt *et al.*, 2017:373; Condé & Cisel, 2019; Truyen, 2016:49; Niederman *et al.*, 2016). There is relatively little research on addressing unequal access to education within Europe through MOOC. MOOC completion rates

⁸ The following criteria are proposed for learning and working conditions: (1) Written contract; (2) Learning outcomes; (3) Pedagogical support; (4) Workplace component; (5) Pay and/or compensation; (6) Social protection; (7) Work, health and safety conditions. Elements that support this: (8) Regulatory framework; (9) Involvement of social partners; (10) Support for companies; (11) Flexible pathways and mobility; (12) Career guidance and awareness raising; (13) Transparency; (14) Quality assurance and graduate tracking. (European Commission, 2017c:9)

remain low (Burd *et al.*, 2015). (Outside Europe the picture is likely to be more pronounced.)

Reaching out to disadvantaged communities remains a challenge. One review of literature (N=96) which looked at the potential for open online learning to help disadvantaged learners within the Global South (King *et al.*, 2018). Five key themes were proposed:

- access to the Internet;
- participant literacies;
- online pedagogies;
- the context of content;
- the flow of knowledge between North and South.

Drivers of Innovation

Transversal programmes are becoming increasingly important (CEDEFOP, 2019:9). This can be understood to as a response to the need to incorporate a broader range of academic and vocational components in search of an ideal balance. Integration of higher-level VET through apprenticeship or dual workplace/HE training is increasing, and professional experience is increasingly an expectation for higher level teachers working in a vocational context.

The emphasis on digital skills is increasing in many European countries (European Commission, 2019a:17). There is a general trend towards independent knowledge acquisition, active learning and the use of computers among learners (OECD, 2019).

Labord & Costa (2016) argue that digital automation technology alone is often ineffective: it must remain coupled with analytics to generate value, beyond the costs and savings associated with its use. Silveira (2016) similarly highlights the potential of educational data mining, learning analytics, and open standards for quality assurance. There is a growing demand for new forms of learning that are adaptive, personalized and focused on specific learning needs (Littlejohn & Hood, 2018; Les Observatoires de Secteur Alimentaire, n.d.).

BizMOOC (2019:Ch.4) suggest the following drivers of innovation:

- Competition
- Quality of business networks
- Presence of high quality scientific institutions
- Large scale collaboration
- Protection of intellectual property

One tension here is that alongside competition, greater co-operation has also been suggested. This could include co-operation between countries (European Commission, 2019a) or co-operation between a wide range of stakeholders (Limone, 2017; Schwerer & Egloffstein, 2016; Pitt *et al.*, 2017:378; EADTU, 2017a:8).

The Internet can act as facilitator of education experiments (Belleflamme & Jacqmin (2015:152; Ossiannilsson, Altinay & Altinay, 2016) although Jansen & Teixeira (2015:7) argue that MOOC research needs to transcend a basic tension between simple testing and feedback of very large numbers of learners at scale and more meaningful research which is difficult to perform at scale.

Measures which act to make digital tools communicate more effectively with one another can drive innovation. For instance, ESCO is the multilingual classification of European Skills, Competences, Qualifications and Occupations. ESCO (2017b) provides a common language and Linked Open Data for improved guidance services

Karnouskos (2017:3) claims that MOOC can be used to develop “an adaptive and qualified labor force; and creating an environment for innovation in a world dominated by global competition”. From the perspective of MOOC innovation, Slavova (2017:409) suggests that “the balance between pedagogical designs, platforms and the adaptation of interactive tools in Web environments. Only this equation could answer a true educational innovation.”

OECD (2014) recommends the following drivers for innovation in education:

- Educational research and evaluation
- Educational development (tools, organisations, processes)
- Regulation and system organization
- Learning organisations who absorb & generate knowledge
- Human resources (who have skills and are open to innovation)
- Technology (especially digital)

Other relevant drivers of innovation:

- Lanvin & Evans (2018:41) argue that diversity and inclusion is now an important driver for talent competitiveness and innovation
- Henderikx & Jansen (2018) suggest that national policies and funding have a strong influence on the proportion of HEIs offering MOOCs
- Public procurement can be an important “first mover”, setting standards for the procurement of new technology (Gruber, 2015)
- Make resources available (Gruber, 2015)
- Improve digital skills (Gruber, 2015)
- Provide flexible opportunities for learning (Gruber, 2015; EADTU, 2017a; Henderikx & Jansen, 2018)
- For students in rural areas the ability to access MOOCs via mobile phones is crucial (Littlejohn & Hood, 2018:31)
- In general, countries with greater levels of innovation have also seen increases in some educational outcomes, such as equitable learning and teacher satisfaction (OECD, 2014)

Barriers to Innovation

Many potential barriers to innovation have been proposed. Milvanovitch (2018) identifies the following barriers to innovation in the European area: a disconnect between goals and the reform actions that are supposed to serve them; failure to provide evidence of the need for improvement; reform implementation plans that depend on too many independent factors (too many 'moving parts'); and disregard for existing conditions and arrangements in the VET system, combined with limited buy-in for reforms. In addition, the VET systems of European countries are partly characterized by inertia and tradition.

The upgrading of former VET programmes to higher education has strengthened the professional status of graduates. Transition from professional HE to academic HE is sometimes still difficult due to structural barriers. Depending on the type of qualification and programme, higher VET primarily prepares for access to the labour market or provides access to further learning and the labour market. (CEDEFOP:2019:8)

The European Commission (2017a) reports that "more than 65 million people in the EU have not achieved a qualification corresponding to upper secondary level. This rate varies significantly across EU countries, reaching 50% or more in some". Reforms in higher education structures and accreditation aim to address widely recognised efficiency and quality concerns, but still face stakeholder resistance (European Commission, 2018d). Small scale, disparate initiatives exist without evidence of mechanisms for co-ordination or partnership; lack of emphasis on outreach and guidance (European Commission, 2019a).

Many companies don't yet trust the MOOC concept (BizMOOC, 2019:Ch.9). In addition, privacy concerns and lack of flexible policy around eLearning and training can be possible barriers to collaboration between HEIs and business in MOOC production and use. MOOC can be hard to fit into traditional university programmes, especially where the native language is not English (Anthony, 2015:12) though this may be ameliorated through video lectures that can be paused, transcripts, etc.

Whitaker *et al.* (2016:350) note that universities are by their nature enduring, stable and resistant to change. It can be difficult to ensure participation of (especially senior) staff in new approaches to staff development or learning (Bunescu & Gaebel, 2018). Fulfilment of their core functions of teaching, administration and research remain the responsibility of faculty despite pressures to innovate, disrupt or think the function of their institutions.⁹ Lack of funding often constitutes a significant barrier to innovation (Reskill, 2017a). Latecomers in the delivery of tasks do not benefit

⁹ The MOOC4ALL (n.d.) project provides a complete introductory course for would-be MOOC providers

from the automation of technology (Labord & Costa, 2016) which implies that slow access to markets can be impede innovation.

Lack of collaboration between HEIs (EADTU, 2017b; Jansen & Konings 2017:34) – cross-border collaboration in MOOC is even less frequent than other areas of collaborative activity, which tends to be national (Castaño Muñoz *et al.*, 2016:5).

In the specific case of MOOC:

- MOOC creation requires resources, fit with existing training structures and a willingness to examine organizational potential (Pitt *et al.*, 2017:378)
- MOOC selection can be challenging for businesses and eLearning can carry a stigma. (Pitt *et al.*, 2017:376)
- MOOC providers who monetize their learner data are under pressure to restrict access but this limits the ability of MOOC creators to better understand the reception of their content (Smith *et al.*, 2018)
- Pedagogical innovation in large scale MOOCs can be limited by the nature and practice of the platform (Smith *et al.*, 2018)
- Some MOOC providers restrict their collaboration or corporate partnerships to specific countries or institutional profiles
- Lack of longitudinal studies of MOOC learners (Calonge & Shah, 2016)
- Lack of transparency regarding the data collected by MOOC platforms inhibits co-ordination (Slavova, 2017)

In summary, barriers to innovation are unevenly distributed and all stakeholders would benefit from greater co-ordination, transparency and sharing. This need not be a matter of additional funding. As Henderikx & Jansen (2018:81) note, “[educational innovation] doesn’t necessarily require a high additional cost ... it is more a matter of a visionary policy making and developing strategies in a dialogue with universities and stakeholders”.

Drivers of Entrepreneurship

CEDEFOP (2019:8-9) list the following factors as drivers for the processes of academic drift and vocational drift: securing supply of highly skilled labour; innovation; economic growth; individual and social progression. European states often “continue supporting labour market demand through employment and entrepreneurship incentives, mainly in the form of targeted wage and recruitment subsidies” (Joint Employment Report, 2019:55)

BizMOOC (2019:Ch.18) distinguish educating learners about the aspects of entrepreneurial practice and the kind of change in thinking and behaviour that is characteristic of entrepreneurial mindset, noting that the former does not necessarily lead to the latter. Wilson *et al.* (2009) argue that entrepreneurship education should

provide a mix of experiential learning, skills building and mindset shift, ideally starting from the primary level up.

Karnouskos (2017:3) suggests that learners who have benefitted from MOOCs act as ambassadors to support others in becoming self-directed learners. This can be seen to develop a further set of mentoring and ambassadorial skills, and “entrepreneurial thinking may also benefit as s/he strives towards keeping up with trends and ongoing developments”. It is recommended that best practice in entrepreneurial education is to promote collaboration between researchers and practitioners in both education and entrepreneurship. This example may be particularly relevant for those “not in education, employment or training” (NEETs).

Canals & Mor (2014) suggest that practice-based learning which offers hands-on, specific, on-the-job training meets the demand for entrepreneurial and learning skills. A study of 9994 enterprise MOOC learners on the openSAP platform (Schwerer & Egloffstein, 2016) endorses the potential of this approach for professional learning, especially in technology-oriented and agile domains. While corporate MOOC are typically informed by xMOOC pedagogies, Enterprise MOOC are characterized by a focus on wider stakeholder engagement, openness, and inclusion of cMOOC elements.

Barriers to Entrepreneurship

The field of entrepreneurial education is in a quite early stage of development (Reskill, 2017a:11). Employees typically have a low motivation to engage with entrepreneurial approaches whether inside or outside their organisations (Reskill, 2017a). BizMOOC (2019:Ch.18) suggest that although there has been an increase in both the volume and scope of entrepreneurship teaching programmes over the last twenty years, education about entrepreneurship remains based around knowledge transfer.

Entrepreneurship is encouraged at the European level, though its impacts can be hard to predict and uptake is typically low. The unmet demand for labour, as expressed by the job vacancy rate (JVR) has been rising since the end of 2014 in the EU and the Euro area (European Commission, 2017a). The European Commission (2017a:3) concludes that “too few people have the entrepreneurial mindsets and skills needed to set up their own business”.

Some schemes encourage migrants to set up businesses, and though some have been successful in this, Traeger (2015) questions whether entrepreneurship is a realistic expectation from disadvantaged communities like refugees.

MOOCs supporting continuous education and CPD in Europe

The European Union (2018b) notes that more effort is needed to modernize and improve education systems within the European Union – which is actually moving away from its objectives with regards to basic skills. EADTU (2017a:13) point out that, although MOOC uptake in Central and Eastern Europe is increasing, they remain in a vulnerable incubation phase: “Most Central and Eastern European universities are not accepted by the big MOOC platforms in the US by lacking the reputation (in ranking) and finances to become a partner (c.f. Lehto, 2016). HEIs are therefore looking for alternatives by developing their own MOOC platform mainly based on OpenedX and Moodle (e.g., UNED, Fachhochschule Lübeck), using a cloud solution like Canvas (e.g, Derby), starting a regional collaboration (EduOpen in Italy, CADUV in Czech Republic), etc. Consequently, many HEIs in Central and Eastern Europe that want to be involved in MOOCs cannot connect to big MOOC players and are potentially left behind or need to invest in platform, tools and services themselves”. “Enormous differences” arise between countries because of this unequal participation (EADTU, 2015a:7).

Aguaded Gómez, Vázquez-Cano & López-Meneses, (2016) undertook a review of MOOC activity in Spain and found that Spain is in a world leading position in the offer of MOOC courses. In August 2014 the European portal *Open Education Europe* accounted for 253 MOOC courses in Spain; which represents 34.09% of all MOOC courses offered by European institutions. “If we observe the demand, that is, the volume of participation in the global MOOC offer, we find Spain within the five countries with the most students enrolled in this type of training, together with countries such as the USA, UK, Canada or Brazil.” Fano Méndez *et al.* (2016) make a similar assessment.

Of the 5.6 million enrolments on the MiriadaX platform, 46% of those surveyed were in Europe (largely Spain and Portugal); 25-44 is the most popular age range for MOOCs; and approximately 50% split male and female. 63% of users have university level studies and/or work at a university. Of those users completing the survey, 26% believe their course has helped them improve their skills for their job with 16% claiming that it has improved their career possibilities. 70% of surveyed users express interest in obtaining academic and/or official credits on completing a MOOC on MiriadaX (MiriadaX, 2018).

In a systematic review of the literature, Calonge & Shah (2016) found evidence that corporations, universities and MOOC platforms are making progress in bridging the skills gap:

- MOOC platforms provide the complex technical know-how
- Universities disclose student databases which aid MOOC platforms statistical, research, and marketing objects

- Ed Tech companies collaborate directly with employers to improve fluidity, alignment, and design of MOOCs that are better tailored to the specific needs of their businesses.
- This, in turn, improves their credibility and acceptability in the competitive field of online skills courses.

In order to become more relevant to (corporate) business, HEIs need to offer MOOCs that address core business competencies (Pitt *et al.*, 2017:376). For instance, MOOC certification is a good way of providing evidence of CPD (Canals & Mor, 2014).

Gruber (2018) argues that there is a public interest in supporting SMEs – the main employers in some countries – in adopting MOOCs since they are slower to adopt digital technologies and related business models. Opcalim (2018) found that, in the case of France, only 38% of companies had begun their digital transformation.

Accreditation (Formal)

Having a labour market relevant qualification (academic or vocational) has been identified as increasingly relevant to dealing with the increasing demand for high skills (Joint Employment Report, 2019:39). ESCO (2017a) emphasizes the importance of regularly updated terminology for skills and competences and improved feedback loops between education providers and the labour market. Many MOOC providers have recognized business potential in charging fees for examination and certification (Burd *et al.*, 2015).

Formally accrediting MOOC learning has benefits for HEIs. For instance, a system of mutual recognition removes the need to reassess prior learning (Labord & Costa, 2016). Upskilling pathways can be linked more closely with authentic workplace activities to enable further learning opportunities (European Commission, 2019a). Mapping and documenting skills in this way facilitates validation of industry standards while identifying future demand.

CRUI (2015) outline a process for formally recognising MOOC learning that is being employed in Italian universities. After completing a MOOC, learners can pay a fee to have their learning verified through an exam. The exam is the responsibility of the University that provided the course (rather than the MOOC platform). Part of the examination fee goes to the platform; it is also suggested that the course authors receive remuneration. A network of higher education institutions then mutually recognize this MOOC learning which is accredited at any of the universities. One important consideration here is to identify a common interest and a system of governance.

Dos Santos *et al.* (2016:89) found that “recognition is only partial; there are no whole degrees yet that can be showcased”. They suggest that MOOCs will always need to charge for recognition and argue there is a European-wide need for a co-ordinated framework that will help HEIs to produce open educational resources of appeal to a greater number of end users.

Castaño Muñoz *et al.* (2016) surveyed 178 HEIs across five EU countries (France, Germany, Poland, Spain and the United Kingdom). Recognition of MOOC learning is rare: “In all 5 countries studied, HEIs usually lack recognition mechanisms; even in cases where MOOC certificates are based on reliable ways of assessment and linked to a specific number of ECTS. This indicates there is little awareness and/or trust in providing recognition of learning through MOOCs” (*Ibid.*, 5). The recognition of MOOCs within formal settings remains challenging, and is associated with issues such as quality assurance, examination and user identification (Rampelt & Suter, 2017).

The European Commission (2019a:15) suggests that learning can be tailored to individual needs through flexible and modular delivery, but that this necessitates that the programme and its parts are designed to be delivered in this way. They also identify the need for a clear and consistent regulatory framework based on a transparent and equitable approach that could include accreditation procedures for companies and workplaces that offer apprenticeships (European Commission, 2017c).

EADTU (2017c:22) suggest that “if institutions are to give credit for the MOOCs offered, they also need to find efficient and effective modes of examination and reliable ways to identify students”. The Accreditation Organisation of the Netherlands and Flanders (NVAO) is highlighted as a potential model for internal and external quality assurance processes and possible accreditation options (*Ibid.*, 7-8). One approach is to have two versions of a course: offering accreditation which can only be attained through a formal, facilitated presentation, alongside a certificate of participation which can be earned at any time (Schwerer & Egloffstein, 2016). Traeger (2015) alternatively envisages HEIs and businesses co-operating internationally to develop curricula. Pitt *et al.* (2017:377) and Teixeira & Jensen (2016:931) anticipate that this kind of co-ordination be endorsed by regional and national government.

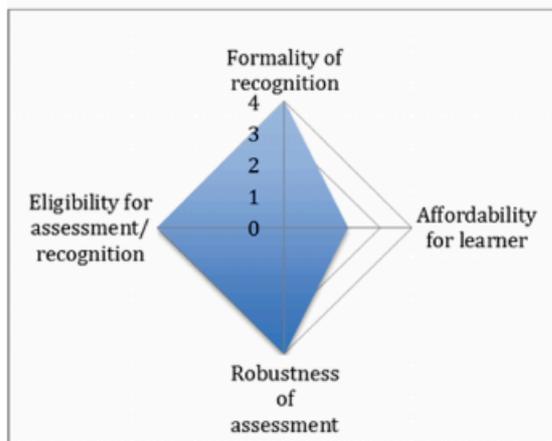
Silveria (2016:220) describes how the lack of shared, transparent accreditation standards risks creating a divide between those who can afford to pay for certification and those who cannot. Henderikx & Jansen (2018:49) highlight the case of the Erasmus+ Virtual Exchange which allows European / South Mediterranean youths to engage in meaningful intercultural experiences online, as part of formal or non-formal education. They contend that both physical and virtual mobility will be increasingly important in future, and HEIs should offer more flexible learning as well as both formal and non-formal recognition of learning.

Platforms are providing a route to both formal and non-formal accreditation. A report by Fundación Telefónica (2015:50) found this includes “certifying the completion of the courses in employment search portals or in social networks of a professional nature, which provides greater relevance to the candidate’s curriculum vitae”. Students who complete courses can also obtain a validation or college credits by paying the requisite fee. These could also be extended to be recognized by employers or the public sector (*Ibid.*:75). In practice, even where MOOC platforms and HEIs collaborate closely this often does not translate to an offer of credit (Smith *et al.*, 2018). Conversely, Dussarps (2018) found that some recruiters do not believe in accrediting MOOCs.

Accreditation (Non-formal)

Dos Santos *et al.* (2016) argue that non-formal approaches to accreditation result in a drop-off in the formality of how learning is recognised and the robustness of assessment methods. Figure 3 illustrates alternative approaches to recognition.

Example of a MOOC with robust assessment paid for by learners



Example of a typical MOOC with little or no recognition

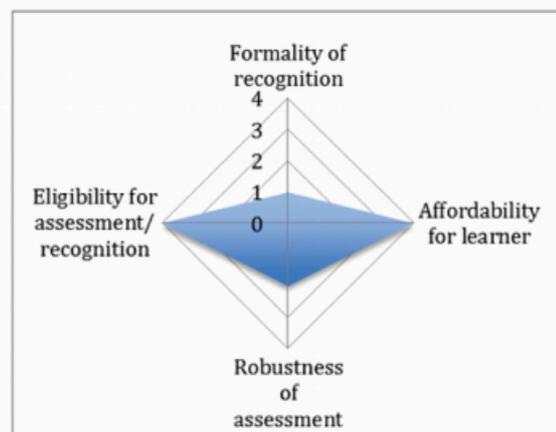


Figure 3. Comparison of MOOC with robust/non-robust assessment (Dos Santos *et al.*, 2016:89)

This flexibility in delivery indicates the potential for MOOC to meet a range of learning and training needs. Parkinson (2014) identifies how specific MOOC can fill a need for short, specific, professionally oriented education through professional development courses that aren't accredited by universities.

Alternative recognition of learning can be controversial. Traeger (2015) argues that MOOCs do not by default imply a better access to the higher education system: without any formal credits for completion, MOOCs remain just in-/non-formal learning. According to this position the claims of MOOC to be democratizing are

directly indexed to recognition of learning. Many studies (including Vrillon, 2017) have suggested that MOOCs are primarily used by relatively privileged individuals.

One study of Spanish MOOC learners found that only 8% of learners had no university experience or was not connected in some way with the university (FUNDAE, n.d.). Young people under 34 chose courses with more practical focus with career development in mind. Kalz *et al.* (2015:72) suggest that participation and accreditation of informal learning is under-appreciated by employers at present, and they often place a low importance on certification.

Policy Recommendations

Technology is transforming many aspects of life, and policy frameworks are adapting. Policy challenges for the future include food security (linked to demography) public health, new eating habits, animal health and welfare, climate change, Renewable energy and bio-economy, environmental impacts and agroecology (Bernhard, 2019). These global challenges are linked to skills needs at all levels. To address them requires a revolution in both working relationships and technologies: as a result, “MOOC are now essential” but teaching and research methods must be adapted to the expectations of the professional world (*Ibid*).

The European Commission (2017d) has set out a vision for 2025 would be a Europe in which learning, studying and doing research would not be hampered by borders.¹⁰ The proposed ‘European Education Area’ would emphasize trust, mutual recognition, cooperation and the exchange of best practice.

- making learning mobility a reality for all;
- removing obstacles to the recognition of qualifications, both at the level of schools and higher education;
- modernising the development of curricula;
- boosting language learning;
- creating world-class European universities that can work seamlessly together across borders;
- improving education, training and lifelong learning;
- driving innovation in education in the digital era;
- giving more support to teachers;
- and preserving cultural heritage and fostering a sense of a European identity and culture.

In service of this aim the following (macro) policy suggestions are made:

¹⁰ COM(2016)381; COM(2016)940: Investing in Europe’s youth; COM(2016)941: Improving and Modernising Education; COM(2017)248: School development and excellent teaching for a great start in life; COM(2017)247: A renewed EU agenda for higher education; 7 COM(2017)240

1. boost the Erasmus+ programme in all categories of learners that it already covers (pupils, students, trainees, apprentices and teachers) with the aim of doubling the number of participants and reaching out to learners coming from disadvantaged backgrounds by 2025;
2. work on a Council Recommendation on improving language learning in Europe, setting out a benchmark that, by 2025, all young Europeans finishing upper secondary education have a good knowledge of two languages, in addition to their mother tongue(s);
3. work on a Council Recommendation on the mutual recognition of higher education and school leaving diplomas/study periods abroad. This could be accompanied by a new process, building on experiences from existing cooperation schemes to facilitate such recognition and take further the cross-border validation of training and lifelong learning certificates ("the Sorbonne process");
4. strengthen the financing capacity of the Creative and Cultural Sectors Guarantee Facility by 2020 in order to allow banks and other financial institutions from an enlarged number of countries significantly to increase financing of small and medium-sized companies in the cultural and creative sectors;
5. work towards truly European universities that are enabled to network and cooperate seamlessly across borders and compete internationally, including the creation of a School of European and Transnational Governance (hosted by the European University Institute in Florence, Italy);
6. strengthen the European dimension of Euronews.

The European Commission (2012:14) has suggested that synergies are required to facilitate the transition from formal education to training at work, and that this can be supported by shorter cycle research into tertiary education. It is also considered important to forge stronger alliances between education, business and training providers.

"...some 72 percent of European workers, aged 16-29, state that they have obtained IT skills through learning by doing, according to the latest data from Eurostat. Similarly, nearly 40 percent of respondents to a recent Harvard Business Review survey stated that self-study and independent research were the preferred means to learn about new digital technology. At the same time, about 40 percent of European Internet users have used online resources to obtain information about education, training, or course offers in the past three months (Figure 4.3). Thus, although much of the focus of policy considers the role of formal educational institutions, ensuring that also low-income households have online access and the basic digital skills required to take part in online course offerings could have considerable long-term effects on the level of digital skills of the European workforce." Berger & Frey (2016:38).

Gruber (2015) notes that US-based digital companies have an advantage because of existing market share. It is argued European competition, industrial and infrastructure policy needs to evolve in order to remain appropriate to the digital economy. The Joint Employment Report (2018) recommends investment in national education systems as a route to upskilling; re-skilling; and facilitating downstream transitions in the labour market. The policy focus of vocational drift can be understood as supply-side (e.g. the employability of graduates and the relevance of higher-level vocational programmes) while the focus of academic drift can be understood as demand driven (meeting skills and knowledge requirements; attracting learners, etc.) (CEDEFOP, 2019:9). CEDEFOP (2019:10) recommend these policy aspects as pivotal to the development of support for higher VET and lifelong learning:

- a) juggling between meeting labour market demands and wider societal values;
- b) finding the right balance between academic and vocational principles;
- c) achieving parity of esteem between academically oriented and vocationally oriented qualifications at higher levels by improving awareness and visibility of the latter.

The European Commission (2016) has also published a scoreboard of key employment and social indicators identifying 10 countries as “critical” with respect to unemployment, youth unemployment, rate of NEETs, disposable income, poverty risk or inequality. Brown & Costello (2016) note the disconnection between national policy initiatives and wider macro level MOOC developments in Europe, highlighting a need for policy leadership and investment.

A policy review of 17 European countries suggests that “for nearly all countries sustainable employment seems to be the most important dimension when it comes to the relevance of higher education” (Vossensteyn *et al.*, 2018:8). Countries typically share this outlook even if their actual policy focus is diverse.

European countries differ in the priorities they afford to aspects of higher education and the markets they serve. A range of diagnostic indicators are available, but insight into the impact and effectiveness of policy interventions in higher education remains limited, lacking longitudinal and geographical coverage (Kaiser *et al.*, 2018:7). The European Union (2018d) provides a summary of the relevant policy climate for each EU country. European Union (2018b) points out that EU averages can hide significant differences between member states. Some European countries have no national policies regarding open online learning (Rutkauskiene & Gudoniene, 2016). From a study of four European countries, EADTU (2015a:9-10) concludes that governmental and institutional policies and strategies with regard to online education and training and MOOC” are often weak.

Bunescu & Gaebel (2018) nonetheless suggest that European level funding has been an important driver for reform of higher education across Europe; and that stimulating innovation in higher education practice should continue by sharing and

building on good practice. For instance, Milovanovitch (2018) recommends that piloting be used to evaluate any reform of VET before it is applied at scale in order to identify and address potential problems. Padilla Rodriguez *et al.* (2018) stress the need for consistent institutional policies with clear expectations.

One reason proposed for a lack of impact is that “implementation requires a supra-national perspective but supra-national organisations don't have the relevant pedagogical expertise” (Belleflamme, & Jacqmin, 2015:166). This leads to call such as from Whitaker *et al.* (2016:359-60) that large research universities should resume the leadership role they had in the 1990s and early 2000s, overseeing the investment of financial and human capital into the future of education. Castaño Muñoz *et al.* (2016:43-4) suggest that policy be used to drive awareness of MOOC; that greater steps be taken to provide recognition that aligns to ECTS credit; and alternative quality metrics should be used for open education. The European higher education climate is characterised by uncertainty, rapid change and high-level policy directives which are sometimes difficult to adjust to (Limone, 2017). In service of greater co-ordination, Henderikx & Jansen (2018) argue that governments should contribute to national platforms and fund research and feasibility studies.

Kaiser *et al.* (2018) present examples of policy impact in Spain, Germany, Ireland, The Netherlands and France, drawing the following respective conclusions:

- Labour market information allows students to make better educational choices
- Extra funding can increase the attractiveness of STEM disciplines for female students
- Organising part-time studies for the unemployed increases their employability
- The introduction of associate degree programmes and excellence education tracks show positive effects for all three relevance dimensions
- A comprehensive policy approach to promote employability in various ways creates strong awareness and relevant activities

They propose that policy interventions be designed for specific national contexts, with effectiveness improving when a wide range of stakeholders are involved (*Ibid.*). Writing about the case of Norway – where the threshold for gaining access to higher education is relatively low – Koch & Lanestedt (2016) argue that digitalisation of higher education is not happening fast enough, and the implementation capacity of HEIs is too weak. They call for massive investment and government support (national strategy, co-ordination, incentivization) for the innovative use of MOOCs to address lifelong learning and CPD.

Hyvönen (2016) insists that (i) MOOC policy should not be thought of as an issue separate from general national higher education policy; and (ii) interoperability and standardization are key at the international level. Calise & Reda (2016) make a similar request and point to the example of the Federica platform in Italy, which sees itself not as a course provider but as a comprehensive educational environment embedded with other online resources. Federica acts as an autonomous unit, acting

to increase its range of international activities and expanding its network of institutional and corporate qualified partnerships.

Two important policy principles are emphasized in the literature: openness and recognition.

Openness:

- Silveira (2016:220) requests that the authentic principles of openness be used to guide policy so that evaluation and accreditation standards have a democratizing effect.
- Need for policymakers to embrace multiple and diverse perspectives, and involve wider networks of stakeholders (EADTU, 2017c:18; Ubachs & Konings, 2016)
- Accessibility should be considered when developing MOOCs (MOOCAP, n.d.) with universal design offering one route (Gilligan, Chen & Darzentas, 2018).
- Anticipate future linguistic diversity (TRAMOOC, n.d.)

Recognition:

- Most universities do not offer credit for completed MOOC (Ossiannilsson, Altinay & Altinay, 2016). Institutions that provide MOOCs should recognize their own courses for ECTS credits (Jansen & Konings, 2017:5).
- Treat blended and online education as of equal value to face-to-face education (Henderikx & Jansen, 2018:79)
- Littlejohn & Hood (2018:103) argue that the ability to learn autonomously should be viewed as a critical literacy in a world where open online learning is significant.

Educational Institutional Practice

A range of HEIs and other educational institutions are developing their offer based on MOOC technologies. Jansen & Schuwer (2015) report that the typical strategic objective of HEIs using MOOC is to increase institutional visibility and project a desired reputation. Similarly, Castaño Muñoz *et al.* (2016:5/15) suggest that HEIs have different motivations for engaging with MOOC, but promoting the visibility of the organization and reaching additional learners are common. HEIs offering OER typically emphasize free access to education while many institutions which offer MOOCs see this social aspect as of less importance.

Several paper and reports identify the expansion of MOOCs as part of managing the transition from a post-industrial to a knowledge economy (EADTU, 2017a:5). Berger & Frey (2016:31) argue that digital skills should be integrated into school curricular as to teach children basic digital skills from the outset; “[t]aking a more holistic perspective, infusing the curricula with digital learning from the earliest stages of formalized schooling throughout higher education is key to address the digital

divide". They also suggest (2016:43) that it is efficient to make use of curriculum profiles that have already been developed by others (and shared openly) in order to scale up provision more efficiently.

Traeger (2015) suggests that HEIs lead the way when it comes to recognizing learning. But despite the presence of prestige universities among in the MOOC marketplace, the synchronization with workplace requirements is often lacking. A number of companies are using MOOC to identify future talent (Littlejohn & Hood, 2018:31) but HEIs typically do not co-ordinate around this data. This could be done by aligning against a shared framework for recognition. For instance, quality assurance processes should conform to the European Quality Assurance Reference Framework for Vocational Education and Training (EQAVET) protocols, including valid learning outcomes and tracking of career progression (European Commission, 2017c).

Stracke *et al.* (2017:1713) conclude that, on the whole, more support is needed within HEIs: "educational professionals and HE institutions are lacking support for designing, deploying, managing and assessing high quality MOOCs. Dissemination of techniques on the appropriate use of learning outcomes when describing and defining qualifications, parts of qualifications and curricula in massive learning is vital."

Continuing Professional Development

It is anticipated that in the future "a growing variety of education and professional training options available online through MOOCs to students, professionals and life-long learners and provide them with a rich range of opportunities to improve their creative and innovative potential and thus their career prospects, professional development and their life as a whole" (BizMOOC, 2019: Ch.5). Calonge & Shah (2016) suggest that MOOCs offer CPD at scale to distributed workforces, as refresher courses using a "learn-certify-deploy" pattern. Henderikx & Jansen (2018) propose 'just-in-time' CPD through MOOCs.

Healthcare seems to have been of particular interest to writers in this area. Andrade *et al.* (2018:3) proposes a model for CPD in the context of healthcare professionals which could indicate a potential route for MOOC in professional learning. They argue that non-profit associations act as independent accreditors to build credibility in CPD through a "credibility cascade":

- from private to public commitment, to external assessment of the commitment (accreditation), and participation in the development of a Europe-wide approach to define principles and rules
- from a highly fragmented approach to a harmonised vision, principles and rules for planning and delivery;

- from no political influence of the profession to the development of unified principles, to be used in political lobbying for the creation of a Europe-wide harmonised standard.

Parkinson (2014:15-17) argues that healthcare training may be fundamentally altered by the MOOC proposal. Nurses stand to benefit from flexible learning that can be accommodated by their schedules, but this continuing education must be targeted to short, specific and professionally approved learning outcomes. It is anticipated that "Online interaction between nurses on a large-scale, international basis could lead to greater understanding, cooperation and sharing of experience." (*Ibid.*:17). Petronzi & Hadi (2016:117) similarly found that a healthcare MOOC encouraged reflection by participants that improved the quality of care provided. In a case study of learners on a MOOC focused on supporting dementia sufferers, Petronzi & Hadi (2016:115) identified 8 key themes as influential for learners. These were: (a) Workplace Knowledge and Skills Enhancement; (b) General Knowledge and Changing Perceptions; (c) Career/Education Preparation and Change; (d) Supplementary Learning; (e) Personal Reasons; (f) Continuing Professional Development; (g) Knowledge Refresh/Development, and (h) Understanding of Methods and Attitudes across Countries.

In larger organizations, MOOCs offer the possibility of learning at scale; for smaller organizations they can offer up-to-date training where there is little budget available (Pitt *et al.*, 2017:377). However, national and regional agencies often focus on the unemployed and large companies, not SMEs (EADTU, 2015a:8). Levels of awareness of MOOC among professionals is low (EADTU, 2015a:5) and learners in different communities may have different levels of esteem for MOOC qualifications (Jobe 2014; King *et al.*, 2018). These can also act as barriers to the successful employment of MOOCs in CPD.

In the context of CPD, MOOC need to respond quickly to authentic business needs (Karnouskos, 2017). Stracke *et al.* (2017:1713) highlight the qMOOC or "qualification-focused" MOOC (alternatively, "quality-focused" MOOC). These are intended to provide an empirically grounded framework of qualifications and skills that align to verifiable learning outcomes. In a qMOOC, traditional academic qualifications are downplayed. The focus is instead on deep learning experiences, problem focused education, and 3D virtual immersive environments (Mystakidis & Berki, 2014). As such, it aspires to develop both job specific and transversal skills. Rothe, Täusche. & Basole (2018) anticipate professional degrees that are built from structured certification from MOOC learning over longer periods and completed while working.

It is important not to overlook the expectations made of CPD learners. Being effective in professional environments requires learning on a daily basis, openness to CE and curiosity (Dussarps, 2018:10). Initiative may be an important part of MOOC learner success. One survey of French MOOC learners (N=1847) found that 82%

had registered as a result of their own motivation and 9% as a result of management expectation (Condé & Cisel, 2019). Employers were more likely to recommend MOOCs to whole groups of staff than identify which might be useful for a particular individual. It was also found that only 2% of respondents were allowed/encouraged to study in work time even though the study had been recommended. This may reflect a lack of consistent strategy using MOOCs for CPD, but perhaps also indicates that many staff could be further incentivized or rewarded for MOOC learning.

Condé & Cisel (2019) suggest that, because MOOCs lie outside of collectively negotiated training and CPD options there is a risk that people have to negotiate with their employer the conditions of training in an individual manner, with an unfavourable power balance (e.g. encouraged to follow a MOOC but without official support).

Training

CPD represents an ongoing commitment to developing skills and knowledge, people undertake training to gain proficiency in a particular task. Consequently, training is less abstract and more linear. There is a range of evidence to suggest that there is scope to make more and better use of eLearning tools in technical training (Berger & Frey, 2016:42).

A shifting environment such as the one we live in now, where professional development will involve a better adaptation to different types of activities and a better updating of knowhow due to the rate of change of the environment, underscores the need for ongoing training throughout the professional life of the workers. (Fundación Telefónica, 2015:17)

A further dimension for work and training that is being enabled by technology is platformisation, which has already transformed several sectors (CEDEFOP, 2019a). A growing number of people (up to 11%) are earning some or all of their income through a digital platform, and it has been suggested that in a decade such platforms could mediate a third of all labour transactions (Lehdonvirta, Margaryan, & Dabies, 2017). Most crowdworkers are engaged in some form of self-regulated learning, but there is little understanding around how this matches to skills. There also remains a question around how crowdworkers become informed about skills demands or learning opportunities. An international standardization and modularization of tasks that would allow results to be monitored and quantified is anticipated, but still some way off.

BizMOOC (2019:Ch.9/15) make a number of recommendations for using MOOC in a work environment, including:

- Carefully selecting MOOC to ensure learning needs are being met
- Identify the expectations of learners
 - Motive for learning
 - Consider the importance of official endorsement/recognition
- Choose the right learning environment (LMS)
- Make registration easy
- Allow flexibility in course delivery
- Provide options for anonymity
- Monitor data analytics and use to inform user experience, moderation, etc.
- Develop a convincing strategy you can show to decision-makers
- Use language all stakeholders can understand
- Build trust through professionalism
- Consider adapting an existing MOOC
 - Fit open content to a company learning programme
 - Use MOOC as part of official company training
 - Establish whether MOOC will be complementary or supplemental
 - Write additional content if needed

In a study of Italian MOOC academic learners (Limone, 2017) the University of Foggia ultimately reformulated its organisational model (departmental and administrative) in order to consolidate the effects of the intervention. One challenge relating to this was the need to design content that would appeal to newly hired teachers as well as established staff. Learners were involved in the didactical process from an early stage, and the curriculum was supported by (i) an ongoing programme of research into training needs; and (ii) a manual that deals with the fundamental themes of teaching at a design, methodological, managerial and evaluative level.

Careful consideration needs to be given to the selection of MOOC methods and materials to support particular training needs. Berger & Frey (2016:43) suggest that “online learning provides an effective and financially attractive way to teach high level technical skills, while tutorial style teaching is best suited to deliver creative, social and leadership skills”. MOOCs are overwhelmingly set up for individual learners, but teamwork is an important part of developing certain competencies (Karnouskos, 2017:4).

In addition, feedback loops can be used to support the authenticity of learning. Esfer & Cagiltay (2018) conducted a needs analysis with SMEs in Turkey. They suggest that “conceptual learning should be minimized, and procedural learning should be maximized in digitalized workplace learning... we should provide the needed information to solve a real-life issue, with small steps, with guidance and encouraging learners in every stage of the learning process.”

Brandt (2015) makes the following recommendations:

- Improve vocational training in secondary education (c.f. FIPAS, 2017).
- Strengthen basic skills training
- Simplify funding and governance of vocational training

- Consolidate information on the quality of training providers

The European Commission (2017c:13) has suggested a model for co-ordination where “in-company trainers should be designated and tasked to cooperate closely with vocational education and training providers and teachers to provide guidance to apprentices and to ensure mutual and regular feed-back”. Whitaker *et al.* (2016:359) suggest that business schools cultivate working partnerships with firms and industries to act as pathways for knowledge transfer and refine training strategies.

Anticipating Technological Impacts

The almost universally shared assumption is that technological advances will drive new models for services and business opportunities. Digital technologies are themselves creating new opportunities for skills development (Gruber, 2018). Technological innovation offers a route to adaptive learning, badging and accreditation, and authentication (e.g. retina or keystroke scan) (Department for Business, Innovation and Skills, 2013).

Hanlon (2015:9; citing Forfás, 2013) characterizes the disruptive elements of new technologies as:

- The penetration of cloud computing will facilitate a disruptive delivery model for IT software and services;
- The internet of things will allow machine to machine connections;
- Exponential growth of Big Data driven by the increase in mobile digital devices
- Incorporate of Social technologies by business transforming the customer – business relationship with resulting impact on supply chains.

Berger & Frey (2016:37) discuss integrating jobs seekers and vacancies through online tools which candidates having their skills better matched for available jobs. This also could incorporate qualifications and informal learning impacts. “... MOOCs may also contribute to lifelong learning, by providing modularized approaches to education that enables workers to acquire specific skills and competencies at any point during their career, without completing an extensive academic program. In that sense, online learning tools provide opportunities for both flexible and low-cost ways to reskill and upgrade workers’ skillsets throughout their work life.” Berger & Frey (2016:37) suggest that “the availability of big data and sophisticated algorithms will enable “interactive tutors” that generate assessment and teaching strategies that are optimized for each individual student”.

As technologies and competencies are acquired (and possibly discarded) more rapidly, an improved wider understanding of technology and its possibilities becomes possible. This more reflective attitude to technology could lead to alternative innovation processes (Karnouskos, 2017:7). For instance, learning analytics could be

used to better personalise and tailor MOOCs to learners and learning contexts (Hood & Littlejohn, 2016; Truyen 2016:51)

Fundación Telefónica (2015:61) anticipate that over time the MOOC phenomenon will be consolidated, with key improvements being seen in CV/resume presentation, more professionalism, and heightened employability. Also predicted is a more proactive approach to supporting part-time training systems that can be applied throughout one's professional life (*Ibid.*:17-18).

Eurostat (n.d.). provides detail on the ways that ICT has affected methods and patterns of production and employment in Europe. So impactful is having ICT specialists within a country that monitoring their employment has become pressing. One central objective of European employment policy is to prevent the loss of ICT jobs to other world regions.¹¹

Service Models

Several alternative service models for MOOC have been proposed. SCORE2020 (EADTU, 2017c:12-17) describe a service model which operates between HEIs and is not outsourced to private companies. Here the most important services would be: a) design and development of MOOCs; b) co-creating MOOCs with other organisations or institutions; c) services that facilitate and promote the sharing and reuse of MOOCs and d) support of a quality assurance framework. Fundación Telefónica (2015:20-32) also describe a range of services, including social media, big data and analytics, adaptive learning platforms, open content and immersive technologies.

ESCO (2017b) provides a technical standard for publishing real-time job market data as Linked Open Data (LOD) to offer rapid insights through the collection, comparison and dissemination of data through tools that capture skills intelligence and statistics.

At a national level, CRUI (2015) describe the operation of the national MOOC observatory in Italy which monitors the activity of MOOC associated with national initiatives. Their activities, which consolidate a range of services, include:

- Maintenance of the national MOOC catalogue
- Updating co-ordination agreements between universities
- Commissioning new courses
- Quality monitoring
- Analysis of best practice
- Providing and validating datasets about MOOC
- A web portal for external stakeholders
- Cultural dissemination events
- Constant updating about MOOC in production; impact; opportunities

¹¹ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=ICT_specialists_in_employment

- Collaborative spaces for networking, exchanging experiences and planning.

It is similarly proposed that National Support Centres be used to maximise uptake by society, stimulate innovation and CPD, conduct research, recognise learning, and strengthen collaboration (EADTU, 2016b; 2015a).

EADTU (2016a) describe a model for a Regional Support Centre (RSC) and how it would apply in potential scenarios in several European countries. The RSC provides a comprehensive range of services for faculty, HEIs, commercial partners, and other stakeholders. Their goal is to boost the development and delivery of MOOCs. Results of the SCORE2020 project are used to classify the levels of development for an RSC:

- level 1: institutional support open to others (e.g. Open University of the Netherlands)
- level 2: regional / inter-institutional support structure open to participating organisations (e.g. FIED initiatives in France)
- level 3: national support center most likely with governmental support (e.g. FUN in France, the Norwegian MOOC Commission, the Slovenian initiative)

Exchange, translation and localization of MOOCs (Henderikx & Jansen, 2018) may generate new service models. Colas *et al.* (2016:1) used different facilitators for different linguistic communities: "The Hands-On ICT (HANDSON) MOOC included seven teams of facilitators, each catering for a different language community. Facilitators were responsible for promoting active participation and peer tutoring."

Other services that have been described in the literature:

- Assessment and recognition of qualifications (Castaño Muñoz *et al.*, 2016)
 - Recognition of OER (Dos Santos *et al.*, 2016)
 - Authentication of learning e.g. through integration with social networks for credentialing and identity verification (Talmo *et al.*, 2016:11)
- European Open Innovation network in advanced technologies (European Commission, n.d.)
- Instructional design and support for instructional design (moocs4all, n.d.; Osuna Acedo & Camarero Cano, 2016; Brasher *et al.*, 2016; Esfer & Cagiltay, 2018; Niederman *et al.*, 2016)
- Learner data collection and storage Kalz *et al.* (2015)
- Learning analytics (Osuna Acedo & Camarero Cano, 2016; Brasher *et al.*, 2016) and associated services/support
- Moderated wikis and forums (Schwerer & Egloffstein, 2016; Talmo *et al.*, 2016). Stracke *et al.* (2018a) propose that MOOC facilitation can be a service provided alongside content.
- Online reputation builders (Niederman *et al.*, 2016)
- Quality assurance (Castaño Muñoz *et al.*, 2016; Stracke, 2016b)
 - Quality Reference Framework; public rankings of courses and universities (Stracke *et al.*, 2017:1713)
 - Silveira (2016:219) suggests that quality assurance frameworks be transparent and open

- Labord & Costa (2016) anticipate the emergence of peer review services to support MOOC

The range of services relevant to specific MOOCs will depend on the scale and learning objectives, but one key question is whether services be offered as packages or 'unbundled'. BizMOOC (2019:Ch.15) describes this process: "Universities typically offer a bundle package including a range of services such as teaching, assessment, accreditation and student facilities to all learners, whether they require them or not. MOOCs are opening up a discussion around the unbundling of such services. Unbundling means that parts of the process of education are not provided by one, but several providers, or that some parts are outsourced to specialised institutions and providers. Regular examples are support of the study choice process, study advice and tutoring, content creation and development, examination training, assessment and proctoring, learning platforms, learning analytics services, etc."

Whitaker *et al.* (2016:362) identify the case of edX courses being recognised for credit by the American Council on Education and accepted by more than 2,000 institutions. Identity verification, proctoring, transcription and certification are services that are outsourced to different contractors. Jansen & Konings (2017) argue that outsourcing should be avoided because it risks disruption to the learner experience. Niederman *et al.* (2016) contend that unbundling can lead to relatively low-cost economic opportunities for those willing to pay for and receive a subset of content or services, but questions whether these opportunities reflect an incomplete learning experience.

The European Commission has suggested that support needs to be provided beyond the MOOC platform and in the workplace itself: "career guidance, mentoring and learner support should be provided during the apprenticeship to ensure successful outcomes and reduce drop-outs. Apprenticeships should be promoted through awareness-raising activities" (European Commission, 2017c).

Collaboration Models

There is an often expressed view that MOOC operate best at scale and where there is collaboration between a set of organizations (EADTU, 2017b; Jansen & Konings, 2017; van Valkenburg, 2016). Teixeira & Jensen (2016:920) report that "many European HEIs are willing to collaborate on scalable services in MOOC provision, and that a regional collaboration is much more likely than outsourcing those services to corporates parties". This preference for non-profit collaboration is also reported by Jansen & Konings (2017:5).

EADTU (2017a) recommends that collaboration be guided by policies at the regional and national levels with a multi-stakeholder approach: "Investment in networked models (involving regional, national and corporate entities) is needed to promote

open, flexible and online education for all. Open, online education acts on transnational and global levels. It needs sustained collaborative efforts between educational institutions, civil society organisations, and companies. Co-operation should include diverse stakeholders involved, but present case studies show little involvement of all actors”.

Based on a study of 35 reports drawn from seven partner institutions and results of several surveys (over 100 HEIs) EADTU (2017c) mapped the needs of stakeholders at the micro, meso and macro levels. This demonstrated that many European higher education institutions are willing to collaborate on scalable services in MOOC provision, and that a regional collaboration is much more likely than outsourcing services to commercial parties. Priority services for HEI collaboration are: a) design and development of MOOCs; b) co-creating MOOCs with other organisations/institutions; c) services that facilitate and promote the sharing and reuse of MOOCs and d) support of a quality assurance framework.

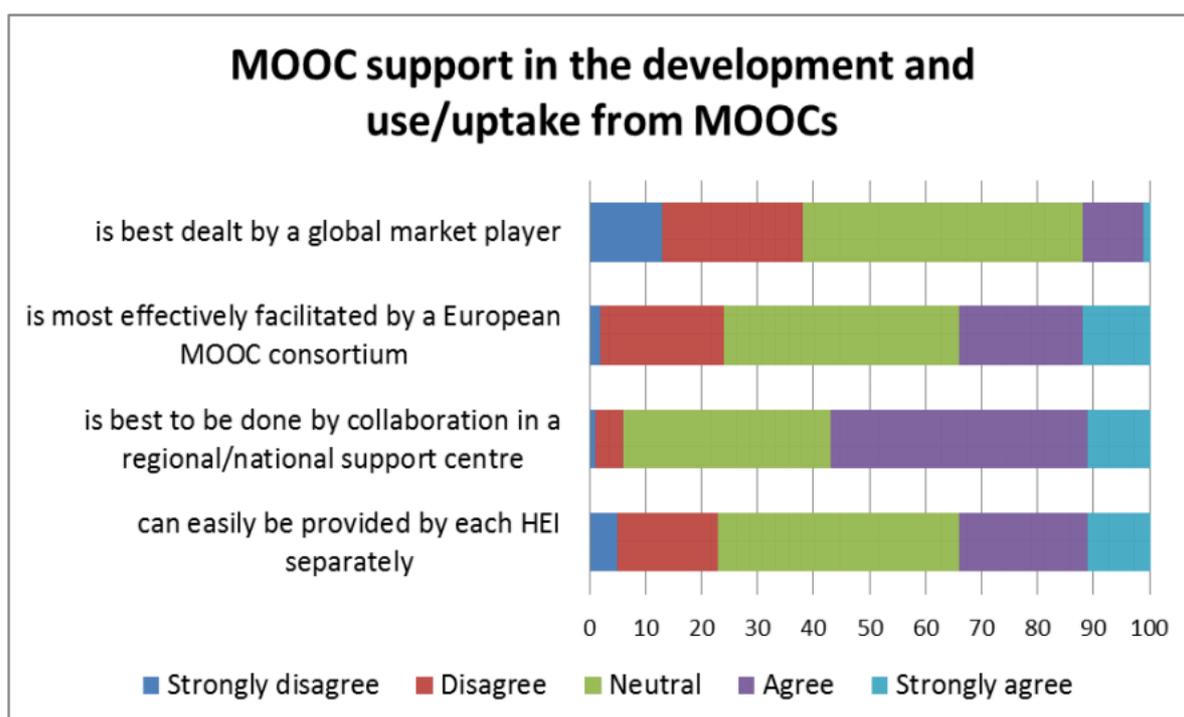


Figure 4. Response of European HEIs on ideal forms of MOOC support (EADTU, 2017c:15)

Milovanovitch (2018) observes that in 14 of 25 countries that are part of the Torino process reforms to VET are preceded by the creation of new or supplementary institutions (or re-delegation of existing duties).

Becker & Eube (2018) explicitly link innovation with open values and practices. They argue that collaboration between universities and business can be improved by a network approach and highlight MOOCs and OER as an example of open approaches

that can benefit both sectors. Openness here can act as a model for wider stakeholder participation. Belleflamme & Jacqmin (2015:166) similarly argue that HEIs play a catalytic role when operating with support from regional and national government.

BizMOOC (2019:Ch.6) suggest that national and regional legislation can be a useful way to promote collaboration between business and HEIs. This co-partner model for development and delivery is highlighted by others (Hanlon, 2015; Henderikx & Jansen, 2018)

Co-production of courses on “highly-debated” by “innovation communities” for global delivery on an online platform (European Institute of Innovation & Technology, n.d.)

The following principles have been suggested to facilitate effective collaboration:

- Emphasis on involving as wide a range of stakeholders as possible (EADTU, 2017c; Lester, 2016:23; European Commission, 2017a).
- Make content re-usable (Padilla Rodriguez *et al.*, 2018)
- Kalz *et al.* (2015:63) propose a joint research instrument that could collect data from across Europe systematically in order to inform policymaking and strategic decisions.
- Exchanges between HEIs at national and international levels (Bunescu & Gaebel, 2018)
- Align MOOCs with vocational objectives (Canals & Mor, 2014)
- Collaborate to produce short courses (5-60 ECTS) (Henderikx & Jansen, 2018)
- Use MOOC as a way to maintain alumni networks and encourage refresher learning Truyen (2016:51)
- The MOOC Maker (n.d.) project used a “MOOC-Maker Cooperation Network Establishment Agreement” to facilitate a network of innovation

Several specific collaboration models are highlighted below.

Agrifood

Reskill (2017a) describes collaboration between social partners, students, job seekers, companies, training structures and experts of the Agrifood (agriculture, horticulture & food production) sector among 3 European countries: France, Greece and Romania. Survey-based research found that:

- Major developments are taking place in the sector (including stronger regulation; greater social responsibility; improvements in supply chain) (c.f. Täuscher & Abdelkafi, 2017)
- Future skills needed include personal maturity; innovation; interpersonal and technical skills
- Work-based learning needs to provide better qualifications to jobs seekers and employees (with funding allocated accordingly)

- All three countries require permanent incentives for promotion of entrepreneurship.

Enterprise MOOC

Enterprise MOOC (Schwerer & Egloffstein, 2016:269-75) are (closed) xMOOC for a specific and targeted stakeholder group which can help “deal with an increasingly complex and rapidly evolving business environment, shortened lifecycles of products and services, and a global stakeholder network in demand for highly topical job-relevant knowledge”. They have tended to be popular in the Asia Pacific region, and most participants have an academic and/or IT background. Learners seek out targeted content rather than full courses and it is proposed that this matches more closely authentic workplace needs. However, awareness of such approaches among HR managers and businesses remains low.

Europass

Europass (2019) is an online tool to compile a CV and describe formal and informal education and training outcomes. The certificate supplement could be used by MOOC providers as a standardised way to describe the MOOC learning outcomes through metadata. The European Commission (2017a:10) has described its particular relevance to migrant communities:

“Understanding the skills, qualifications and professional experiences of newly arrived migrants is a challenge for many EU countries. Tools developed through Europass, the EQF and peer learning and exchange between Member States and competent authorities can support skills profiling and integration of migrants. Identifying migrants' skills early on can help determine the first steps needed to integrate them into their host society and the labour market. This may involve referring them to appropriate training (including language training, business training or apprenticeships available through the European Alliance for Apprenticeships), or to employment services.”

European MOOC Platform

Santos, Costa & Aparicio (2014:105-6) anticipate the emergence of “a shared European MOOC platform, where HE institutions could publish their courses, in order to generate economies of scale and interoperability benefits...enable the collaboration of (pan-)European HEI in the development of didactical models and educational materials...with the quality assurance provided by the OpenupEd Quality Label...sharing and quality control of educational resources...a strong base of support within institutions – both in terms of leadership and resources, and an

existing culture of openness, including policies and practices around the creation and use of OER.”

European Qualifications Framework (EQF)

One potential opportunity is to have organisations that can act as brokers or translators between academia and business to establish a pan-European qualifications framework that will enable comparison, interoperability and mutual recognition across borders (ESCO, 2017a). This is facilitated by Directive 2005/36/EC. However, the EQF is not a method for assessing individuals nor a framework to harmonise qualifications or qualifications standards between EU Member States (European Commission, 2018f).

Kiron Academic Model

Rampelt & Suter (2017) propose a model for MOOC-based online learning in a non-formal digital learning environment that provides refugees with the potential to transfer to a regular study programme. It emphasizes collaboration with smaller, younger and more agile organizations. The “MOOKlets” quality assurance tool offers comparison of MOOCs from different platforms and higher education institutions.¹²

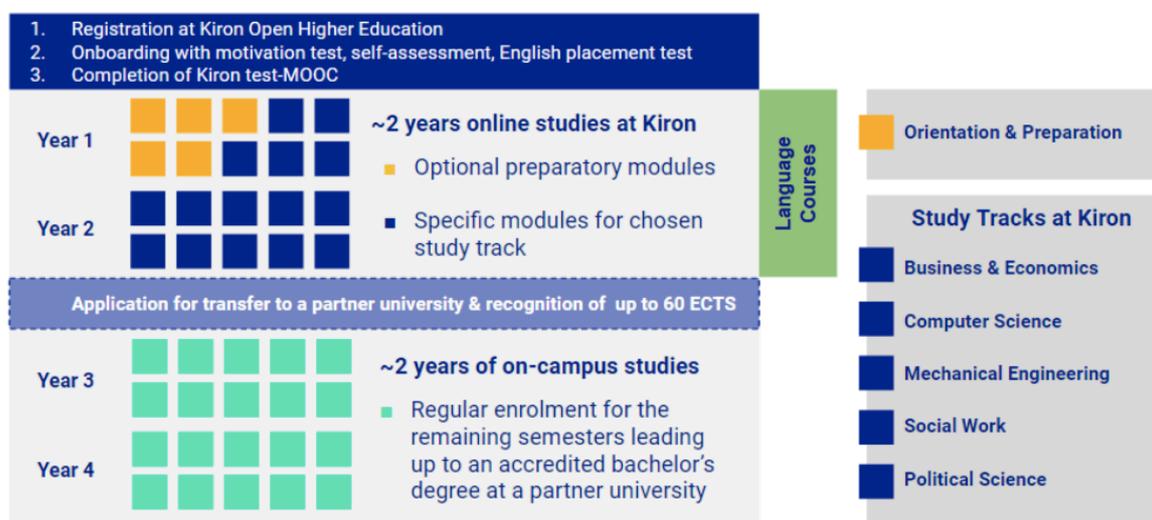


Figure 5. Kiron Academic Model

¹² In this case, the recognition of open learning is a traffic-light ranking (adapted from Witthaus *et al.*, 2016) across six vectors: learner identity verification; partnership & collaboration; credentialing; quality assurance; certification/badging; supervised assessment (Rampelt & Suter, 2017:6648)

Crucially, there are 12 learning agreements in place with German universities and both recognition of prior learning and MOOC credentialization validated in a small pilot study.

National Digital Competence Centres

Berger & Frey (2016:42-3) proscribe the setting up of National Digital Competence Centres in each Eurostat NUTS2 (Nomenclature of Territorial Units for Statistics) region to address the lack of basic digital skills.

- (i) they should support and incentivize the adoption of digital technology in local companies; and
- (ii) engage with local stakeholders—including community organizations, employment agencies, and training providers—to promote the development of basic digital skills of individuals located in disadvantaged regions and urban areas, which would involve promoting exposure to digital technology.

These centres are anticipated to “contribute to a more balanced regional development and could be linked to and create synergies with existing e-government centres and telecentre initiatives throughout Europe, as well as the more recently established networks of national and local coalitions for digital jobs established under the European Commission’s Grand Coalition for Digital Jobs.” An important feature of the centres is that they focus on sharing technological expertise with SMEs since they tend to lag behind the curve with digital transformation.

Importantly, by sharing technological knowledge with local businesses and training the local workforce, these centres could help boost local productivity. A special focus should be on addressing and supporting very small companies, since these tend to be the most behind in terms of moving ahead and reaping the benefits of digital transformation. It is anticipated that the centres act as decentralized hubs for a wide range of stakeholders including European- and national-level associations of different types (e.g. chambers of commerce) as well as regional higher and executive education and training institutions. It is suggested that this initiative be aligned with the Europe 2020 Strategy’s Pillar VI (“Enhancing digital literacy, skills and inclusion”) and embedded in the actions of the European Regional Development Fund or the European Social Fund.

The European Commission (2017a:8) make a similar recommendation for national digital skills coalitions which connect the public and private stakeholders in order to co-ordinate and support national efforts pertaining to digital upskilling. Hyvönen

(2016) calls for a national centre in Finland (which has maintained a national learning activity data warehouse since 2014) to standardize data and courses.

National Employment Agencies Co-ordination

Berger & Frey (2016:44-5) develop the National Digital Competence Centres model further by suggesting co-ordination at a supra-national level. This would ensure that national systems align with European initiatives and would rely on improved use of information and management information. The examples given are *die Arbeitsmarktmonitor* (labour market monitor) and *Berufsentwicklungsnavigator* (navigator for career advancement) run by the *Bundesagentur für Arbeit* (German employment agency). The following benefits are anticipated:

- Exploiting labour market intelligence to offer relevant learning opportunities
- Empower workers to plug skill gaps as they emerge over the course of work life
- Provision of short and flexible digital apprenticeships
- Continuous development and realignment of eLearning to meet emerging skills gaps

Pan-European Universities with vocational focus

European Commission (2017d) suggests that we work towards “truly European universities, which are enabled to network and cooperate seamlessly across borders and compete internationally, including the creation of a School of European and Transnational Governance (hosted by the European University Institute in Florence, Italy)”. This would be supported by an expanded Erasmus+ programme and an EU-wide student card scheme. This facilitates student mobility across borders and offers the potential for new forms of cross-border validation and recognition of learning and training.

The Joint Employment Report (2019:53) makes a similar recommendation, noting that “in 15 countries (Belgium, Denmark, France, Greece, Ireland, Italy, Latvia, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Sweden) a coordination mechanism has been set up to promote exchange and consistency in validation efforts across education and training sectors, the labour market and the third sector”.

Social MOOC (sMOOC)

Osuna Acedo & Camarero Cano (2016) describe the use of sMOOCs in regional hubs, suggesting that they foster ‘intercreativity’. sMOOCs (Ostashewski & Reid, 2012) are organized around a social network, and in this case the presentation and learning methodology are strongly influenced by Constructivism and Connectivism.

Interactions between learners and teachers are encouraged, as is becoming an active producer of knowledge. sMOOC can be considered pedagogically collaborative.

Business Models

MOOC can be seen to challenge traditional economic and business models since openness brings a kind of abundance where there was previously scarcity (Stacey, 2015; Weller, 2011). If MOOC are understood to be free at the point of delivery, how can they make business sense? Canals & Mor (2014:12) suggest that traditional approaches do not form a sound basis for strategy.

A study of 35 MOOC platforms and 6,351 MOOCs (Rothe, Täuscher & Basole, 2018) found that market leaders imitate the business model innovations of smaller competitors to augment their market position. The majority of MOOCs are exclusive to a single platform, and volatile battles for market share take place through ecosystem differentiation. Companies therefore converge towards common business models by incorporating the innovations of others. Arguably, as a consequence the diversity of the MOOC field falls (Schumann, 2016).

Rothe, Täusche. & Basole (2018) suggest that MOOC platforms tend to differentiate themselves by leveraging the uniqueness of its ecosystem partners. Early to market platforms experience an advantage due to an established place in the ecosystem. Gilliot & Bruillard (2018) find that certification represents the nodal point held in common by MOOC business models. Slavova (2017) suggests that business models (certification/academic credit/advertising/subscription) tend to be tailored towards the communities that form around specific MOOCs.

Friedl *et al.* (cited in Ubachs & Konings, 2018:918) suggest three potential business models:

- Supplement existing study programmes with MOOCs;
- MOOCs are sponsored by industry or government bodies;
- MOOCs are incentivized by fiscal policy (accompanied by quality regulation)

Slavova (2017:58) alternatively suggests a simple division of two main business models:

- Free basic part of the course (video and additional materials, tests) and a paid part, which includes examinations with certification or accreditation of the module as part of a programme for educational degree;
- Selling the course at a price below its cost in order to attract a large number of students to the traditional paid bachelor and master programmes of universities.

Padilla Rodriguez *et al.* (2018:2) review five business models for MOOC (though ultimately make little judgement between them):

- integration with mainstream education (supplementary courses; upselling; offering credits; additional services)
- freemium approach (charge for additional services such as examination)
- partnerships with enterprises (focus on human resource development)
- involvement of target audience (peer assessment, moderation, support)¹³
- philanthropy (funding provided by charity/foundation/NGO/government)

Belleflamme & Jacqmin (2015:155-162) suggest the essential features of six potential business models:

- MOOC platforms as multisided platforms
 - Facilitates interactions between stakeholders
 - Subsidises the participation of each side
 - Requires understanding of mutual needs
- Certification model
 - Retains the degree as the prestige qualification
 - Revenues depend on completion, not enrolment
 - Risks lowering academic standards
- Freemium model
 - Free learning followed by paid content
 - Costs associated with paid services decrease scalability
 - Lack of platform differentiation
 - Can result in sub-optimal experiences (King *et al.*, 2018)
 - Monetary benefits are hard to calculate (Littlejohn & Hood, 2018:104)
- Advertising model
 - Preferred online route to monetization
 - Possible negative effect on learning; brand
- Job matching model
 - Uses user data to address asymmetry in job market information (c.f. GMV Conseil, 2018).
 - Continuous monitoring raises privacy concerns
 - Unproven in practice
- Subcontractor model
 - Outsources some core HEI function to MOOC platform
 - Judicious use could improve productivity in other areas
 - Sell content; design learning/training

Alternative business models outlined here indicate that there are a range of options available to MOOCs to achieve sustainability. These can involve alternative provision or augmenting existing provision; freemium or 'taster' models; seed funding through

¹³ Teixeira de Sampayo *et al.* (2014) found that high quality peer review on an architecture MOOC led to the development of higher order and critical thinking skills; students reacted positively to this peer assessment exercise. Taking up the role of the critic leads to a reflection process on the part of the learner.

governmental initiatives;¹⁴ subscription; credentialing; and involvement with a wide range of stakeholders to deliver specific services. However, there is still no obvious path to monetization.

Overall, MOOCs do not yet have a proven sustainable economic model, and this is a crucial point. MOOC production costs are high if the quality is to be competitive, and their benefits or potential returns are indirect and often long term. However, improved image and visibility, a stronger brand, higher student enrolment thanks to a positive opinion gained through MOOCs and new collaboration avenues are (indirect) long-term benefits which are absolutely key in today's global competitive educational services environment. (BizMOOC, 2019:Ch.5)

Many MOOCs serve specific roles within or for institutions such as improving reputation and visibility (Dos Santos *et al.*, 2016). BizMOOC (*ibid.*, Ch.15) identify the following potential indirect revenue streams which could increase income in the longer term:

- Raising institutional visibility
- Building a stronger brand
- Improved pedagogy (large samples of data contribute to increasing teaching and learning effectiveness)
- Increasing student enrolment
- Reaching new students in conditions of continuously changing student demographics¹⁵
- New projects and partnerships due to enhanced exposure and stakeholder expansion

In order to be successful in these areas, HEIs need to consider how to cost effectively bring together persons with domain expertise and technical know-how through division of labour and specialization (moocs4all, n.d.).

Jansen & Konings (2017:5) report that financial return is a low priority for HEIs with respect to MOOC. This may be because high production costs are unlikely to be directly recouped (Silveira, 2016:219). The high cost of developing and maintaining entry to the MOOC market can act as a barrier to HEIs (EADTU, 2016b). Jansen & Teixeira (2015) suggest that MOOC can only be sustainable within a wider context of higher education: as a single offering they have no clear return on investment. The value of open content instead could lie in acting as a driver for visibility; funneling (paying) students; or through related services (e.g. accreditation); more generally the value of MOOC is as "an alternative solution for Life Long Learning, compatible with the individual private and corporate constraints".

¹⁴ The SCORE2020 survey (EADTU, 2017c:16) found support (62%) for the idea that MOOC investment and infrastructure should be publicly funded. (The alternatives were private (11%) and participant-funded (27%).)

¹⁵ A study of DelftX MOOCs at TU Delft (van Valkenburg, 2016:41) was attended by more than 900,000 learners at a university that caters for 21,500 campus students.

EADTU (2017a:10/14) claims that co-operation at scale is required since MOOCs can only break even when they achieve a critical mass: open online education must be intrinsically transversal if it is to be successful.

Less has been written about the specifics of MOOC business models and in the private sector. Whitaker *et al.* (2016:346) note that there is a lack of consensus surrounding the use of MOOCs in business education. In a study of 56 business representatives in 11 European countries during 2016-2017 Pitt *et al.* (2017:369) found that learners perceive MOOCs to benefit them in terms of improved job performance, personal improvement, and the development of skills for a potential new job. However, a number of interviewees noted that those of little education or who have never had a career get few employability benefits from MOOCs (Pitt *et al.*, 2017:378). Overall European awareness of MOOCs and familiarity with the concept is low: approximately half of organisations, mostly based in Western Europe (Pitt *et al.*, 2017:375).

Burd *et al.* (2015) highlight several business opportunities described by Moodys:

- New revenue opportunities through fees for certificates, courses, degrees, licensing, or advertisement
- Improved operating efficiencies due to the lower cost of course delivery on a per student basis. & Heightened global brand recognition and the removal of geographic campus-based barriers to attracting students and faculty.
- An enhanced and protected core residential campus experience for students at traditional not-for-profit and public universities.
- The longer-term potential to create new networks of much greater scale across the sector, allowing more colleges and universities to specialise while also reducing operating costs.
- New competitive pressure on for-profit and some not-for-profit institutions that fail to align with emerging high-reputation networks or find a viable, independent niche.

Aydin (2016:94-5) suggests that corporations need to consider value proposition, infrastructure and finance for any MOOC. The key business model decision here is whether the costs of implementation will be paid by corporation or whether providers charge corporations (and potentially other platform users). Thus, there is a need to strike a balance between costs of MOOC investment and benefits of employee development (Karnouskos, 2017). Littlejohn & Hood (2018:102) suggest that professional learning is a growth area for MOOCs though a clear strategy for CPD seems to be crucial.

The dynamics of the MOOC market has changed since the initial rush as businesses seek a return on investment. Increasingly services like the ones described in the previous section are available on a premium basis, though access to MOOCs remains typically open. Figure 6 shows how corporate training and professional services are increasingly offered by the main MOOC platforms.

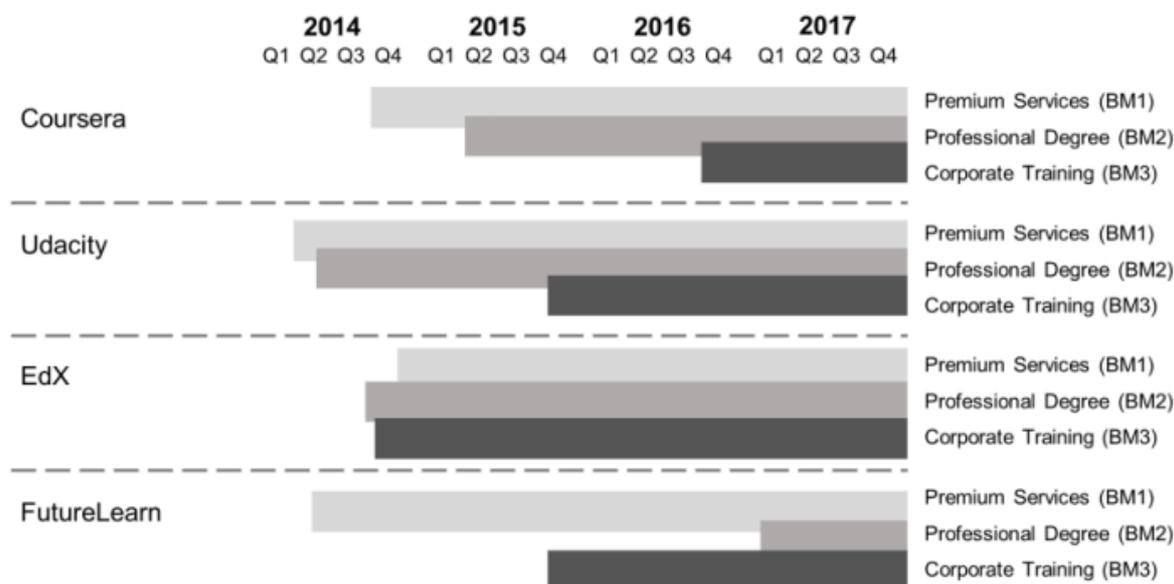


Figure 6. Timeline of MOOC Business Launches (Rothe, Täusche. & Basole, 2018:11).

Daniel, Cano and Cervera (2015:219) suggest that in reality the freemium model is simply being replaced with premium offerings. However, in their discussion of premium services, Rothe, Täusche. & Basole (2018) note that charging for certification or other services can be made compatible with the original social mission of MOOCs if revenues are shared between platforms and partners (e.g. Coursera). Padilla Rodriguez *et al.* (2018:5-6) suggest that some platforms give a percentage of revenue from certification to their course instructors to increase volunteer availability, develop goodwill, and ensure materials are regularly updated.

The following models have been suggested specifically for MOOC development.

Dual Mode Universities

Dual-mode universities (Ubachs & Konings, 2016:350-1) offer both traditional and distance education, typically with the same admission requirements and study materials. There is an overlap in this area with open and distance learning. Some HEIs have taken advantage of the MOOC offer to develop a distance learning or virtual university operation. "Open universities" were well established in Europe, and the transition from distance learning to eLearning required significant institutional change (Van Dijck & Poell, 2015). Furthermore, universities are typically understood as a public good in Europe in contrast to the fee-based model more common in the USA and widely used to finance MOOCs. Delgado Kloos & Méndez (2016:38) contend that the formal education system is being complemented by open and non-formal elements, but remains committed to hierarchical degree-granting principles.

Jansen & Konings (2017:4) report a survey of HEIs (n=101) that indicates a majority who offer MOOC are not connected to a large MOOC provider, preferring to offer their content through an institutional or national platform.

Business Model Canvas

The Business Model Canvas (Fielt, 2013; Osterwalder, 2010) is a framework for documenting or conceptualizing business models. The components of the canvas (BizMOOC, 2019:Ch.15) are:

- *Value Propositions*: A promise of value to be delivered and acknowledged and a belief of the customer that value will be delivered and experienced. A value proposition can apply to an entire organisation, parts thereof, customer accounts, or products or services;
- *Customer Segments*: What group(s) of customers is/are a company targeting with its product or service by applying filters such as age, gender, interests and spending habits;
- *Channels*: What channels does a company use to acquire, retain and continuously develop its customers;
- *Customer Relationships*: How does a company plan to build relationships with the customers it is serving;
- *Revenue Streams*: How is a company pulling all of the above elements together to create multiple revenue streams and generate continuous cash flow;
- *Key Activities*: The most important activities in executing a company's value proposition;
- *Key Resources*: The resources that are necessary to create value for the customer;
- *Partner Network*: Complementary business alliances also can be considered through joint ventures, strategic alliances between competitors or non-competitors.

The Business Model Canvas was initially proposed by Osterwalder (2004) based on his earlier work on Business Model Ontology. Since then, new canvases for specific niche markets have appeared Lean Canvas to support startups and the Open Business Model Canvas (including CC licensing) & planning for social good.

Business Model for Sustainability (BMfS)

Täuscher & Abdelkafi (2018) offers a conceptual model which can be extended to other projects or ventures in a generic way, in order to test hypotheses about financial and sustainability performance over time. This approach uses simulation modelling and is intended to reveal performance patterns under different scenarios (n.b. not 'predict'). The possible limitation of such an approach is that it cannot anticipate or incorporate the kind of radical change that is characteristic of innovation. However, it can serve as a platform for testing various hypotheses at low cost; clarify a company's value proposition; and how it creates value.

Finally, several sources highlight the potential of MOOC to support efficacy savings. These include the effective use of ICT to reduce both fixed and variable costs (EADTU, 2017a:8); using data generated by learners to create value (Burd *et al.*, 2015); and ameliorating the cost of human assessment by machine-grading (of tests or essays) or peer-assessment (moocs4all, n.d.).

Synthesis

The number of MOOCs (9,400), MOOC learners (81 million) and providers (800+) is continuously booming (Stracke *et al.*, 2018a) but MOOCs remain controversial. As Weller (2015) notes, MOOCs were often presented as an over-hyped, radical solution to a broken educational model. The promise of increased access to education, financial rationalization and pedagogical innovation has proved enduring, but many of the hyperbolic claims associated with MOOC providers have given way to a new, more mature phase of development which is anchored using technologies to address authentic workplace training needs.

This section draws together the previous sections and provides a concise summary of the evidence base for each element of the research question.

RQ1. How can MOOC best support employability, innovation and entrepreneurship in the European area?

- A. What are the most effective forms of learning with MOOC?
- B. What is needed to support employability, innovation and entrepreneurship in European labour markets?
- C. How can MOOC systematically support CE/CPD and career development in Europe?

What are the most effective forms of learning with MOOC?

MOOCs are a relatively new phenomenon. First trialled more than a decade ago (Cormier, 2008), they came to worldwide attention four years later (Pappano, 2012). The original MOOCs were based on connectivism: a relatively new approach based on learning through active connection of materials related to knowledge (Siemens, 2005). However, the speed at which MOOCs were implemented internationally left educational institutions and educators little time to consider how best to adapt face-to-face approaches to teaching and learning. It is not surprising, therefore, that many reviews of MOOCs – especially those that focused on early offerings without taking into account connectivist versions – found their pedagogy was unadventurous (Yousef *et al.*, 2014:16-17). There are currently three distinct approaches: cognitive-behaviourist; social-constructivist, and connectivist.

Measuring and comparing different forms of learning is a difficult process in any context. One approach is to test learners on subject matter and skills before they begin a course of study, and to test them again afterwards. If these pre- and post-tests are done under experimental conditions, with students studying the same material in different ways, they can indicate what form of learning works best under those controlled conditions. Another approach is self-report – asking learners what

they learned, and then relating their accounts to the way in which their course of study was structured. Neither approach is straightforward to apply in a MOOC where students are learning voluntarily, organising their own study time, and may not have the time or inclination to participate in a research project.

Supported Open Learning (SOL) has been proposed as a model for a high level of support for MOOC learners (Jones, 2015). As an exemplar, The Open University uses an integrated multimedia approach to support interaction that has been taken up worldwide. Communication from the university to the students via print, broadcasting, and other methods was complemented by two-way communication involving both tutors and students, involving face-to-face tutorials, short residential periods, and correspondence tutoring. Alternative approaches include reconceiving the roles of teacher/learner as members of a collaborative knowledge community (Okada, Rabello, & Ferreira, 2014) or supporting learners through peer interactions.

Whichever model of learner support is chosen, sound pedagogy, effective learning design and evaluation are essential. Many studies recommend that eLearning can be better and more effectively used in addressing the digital skills gap in Europe (Berger & Frey, 2016). Smith *et al.* (2018) have argued that, although simple pedagogies are usually preferred on large platforms, there can be no single preferred approach. Limone (2017) envisages that new generations of university professors will have different methodological and reflexive competences; they will assume a more critical attitude towards their own teaching; and they will be empowered to access the international scientific sources of the pedagogical-didactic disciplines independently of their institutions.

MOOC design and facilitation is a field of expertise (Trager, 2015). Platforms used should make course creation easy, use open source software and open licensing where possible, offer a range of tools for assessment and accreditation, high levels of security and accessibility, good usability and a low operating cost (Perifanou, 2015). In some professional contexts access to a MOOC might be restricted, but openness should generally be emphasized as an expectation.

MOOC learners are diverse physically, culturally, economically, geographically, linguistically and in terms of their motivations, skills and prior learning. Participation can depend on facilitation language of participation, group size, and a pre-existing sense of community (Colas *et al.*, 2016). To maximise their potential, MOOC learners need to develop digital skills, heutagogical skills, peer learning skills, skills for engaging with online resources and time management skills. MOOCs can therefore be understood as part of a lifelong learning strategy (Pitt *et al.*, 2017:369; Calonge & Shah, 2016:71; Okada, Rabello & Ferreira, 2014). Supporting these learners means developing these transversal skills. Language and communication skills are of particular importance. Perifanou (2015) reports that European initiatives have not increased multilingualism; that linguistic barriers are very much still in existence. TRAMOOC (n.d.) found limited availability of multi-lingual MOOC. Colas *et al.* (2016:1) suggest that English instruction be juxtaposed with course materials that

are offered in one's preferred language. Furthermore, Europe's rich linguistic heritage could be leveraged to promote cross-cultural and multilingual learning (*Ibid.*, 2)

When evaluating MOOC, this diversity needs to be remembered since people take MOOC for reasons other than those intended by the designer. Several MOOC specific quality models have been proposed, including Biggs 3P (Hood & Littlejohn, 2016), the CRUI (2017) framework and the scoring grid provided by Costa & Labord (2016). For effective practice, evaluation data and web analytics can be used to iteratively refine an offer. In the context of supporting employability, alternative, authentic performance indicators such as micro-credentials may be used in assessment to validate work-related learning.

Current best practice in MOOC provision is characterized by an innovation mindset which recognizes their disruptive potential while being realistic about what can be achieved (Flynn & Min, 2013; Yuan & Powell, 2013; Mazoue, 2014; Ubachs & Konings, 2018:63). For greatest innovation impact – especially in the context of EMC-LM – collaboration can cross disciplinary and professional boundaries. Furthermore, approaches which emphasize the flexible delivery of learning are especially suited to workplace upskilling.

What is needed to support employability, innovation and entrepreneurship in European labour markets?

This study approached this sub-question through identifying the relevant drivers and barriers. These are extracted from the earlier sections and presented in Table 8 along with identified actions that can support these activities.

Table 8. Supporting Employability, Innovation and Entrepreneurship

	Drivers	Barriers	What is needed?
Employability	<p>Online learning tools (European Union, 2018a)</p> <p>Higher education policy (Kaiser <i>et al.</i> (2018; Vossensteyn <i>et al.</i>, 2018)</p> <p>Key competences framework (European Commission, 2017a)</p> <p>Agile & dynamic working partnerships (Canals & Mor, 2014)</p>	<p>Lack of adequate literacy and numeracy (European Commission, 2019a; Brandt, 2015)</p> <p>Aging and shrinking EU workforce (European Commission, 2017)</p> <p>Skills mismatch</p> <p>Quality of training options varies widely</p>	<p>Adequate and appropriate education and training</p> <p>Investment in national education systems (Joint Employment Report, 2018)</p> <p>Improved management of work transitions</p> <p>Part-time training options</p>

	<p>Job application and workplace skills (Kapanen <i>et al.</i>, 2016)</p> <p>Individual self-efficacy, self-confidence and self-esteem (Dacre, Pool & Sewell (2007)</p> <p>(International) mobility of workers and learners (European Commission, 2017b; <i>Ibid.</i>, 2018a)</p> <p>Apprenticeships (European Commission, 2017c)</p> <p>Wages and recognition (Joint Employment Report, 2018)</p> <p>Sharing labour market data (ESCO, 2017d)</p> <p>Training ICT specialists (Eurostat, n.d.)</p>	<p>Friction in transition between education and work</p> <p>Lack of transversal, problem-solving, communication, digital and entrepreneurship skills</p> <p>Shortage of digital specialists (Berger & Frey, 2016)</p> <p>Resistance to digitalisation (Labord & Costa, 2016)</p> <p>Low uptake of vocational qualifications (CEDEFOP, 2019) and poor-quality apprenticeships (European Commission, 2017c)</p> <p>Lack of focus on SMEs among employment agencies (EADTU, 2015)</p>	<p>Lifelong learning</p> <p>Tertiary education</p> <p>Recognition of prior learning (Martins Ferreira, 2016)</p> <p>New routes through education, training and work</p> <p>Services for learning (Joint Employment Report, 2019)</p> <p>Publish real-time job data openly (ESCO, 2017b)</p> <p>Build credibility in CPD (Andrade <i>et al.</i>, 2018)</p> <p>Mechanisms that can validate and authenticate non-formal learning</p> <p>Soft skills</p> <p>Transversal skills</p> <p>Digital skills</p> <p>Access to the Internet</p> <p>Learning mobility (European Commission, 2017d)</p>
Innovation	<p>Competition / Co-operation (BizMOOC, 2019; Limone, 2017; Schwerer & Egloffstein, 2016; Pitt <i>et al.</i>, 2017; EADTU, 2017a)</p>	<p>Lack of co-ordination across the European area (European Commission, 2019a)</p> <p>Structural barriers to participation in higher education</p>	<p>Build trust and familiarity for the MOOC concept</p> <p>Seek opportunities for collaboration</p>

	<p>High quality business networks</p> <p>High quality scientific institutions and educational research</p> <p>Large scale collaboration</p> <p>Protection of intellectual property</p> <p>Innovation networks (European Commission, n.d.)</p> <p>Technological change</p> <p>Digital experimentation in education (Belleflamme & Jacqmin, 2015; Ossiannilsson, Altinay & Altinay, 2016)</p> <p>Standardisation of protocols and technologies (ESCO, 2017b)</p> <p>Organisations that learn through generating and absorbing knowledge (OECD, 2014)</p> <p>Diversity and inclusion (Lanvin & Evans, 2018)</p> <p>Policy as 'first mover' (Gruber, 2015) or innovation driver (Henderikx & Jansen, 2018)</p> <p>Making opportunities more flexible and accessible to all (EADTU, 2017a) including rural areas</p>	<p>Resistance to change among institutions and staff who do not wish to rethink basic assumptions</p> <p>Failure to provide evidence of need to innovate</p> <p>Inertia within VET tradition</p> <p>Lack of transparent data (Slavova, 2017)</p> <p>Slow access to market / lack of agility (Labord & Costa, 2016)</p> <p>Lack of collaboration (EADTU, 2017b; Jansen & Konings 2017)</p>	<p>Engage with a wide range of stakeholders</p> <p>Work with greater transparency and sharing</p> <p>Encourage visionary policy-making (Henderikx & Jansen, 2018)</p> <p>Improved dialogue</p> <p>Innovation mindset</p> <p>Adopt a reflective attitude towards technology (Karnouskos, 2017)</p>
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	(Littlejohn & Hood, 2018)		
Entrepreneurship	<p>Entrepreneurial mindset/thinking (BizMOOC, 2019; Wilson <i>et al.</i> 2009) rather than entrepreneurial practice</p> <p>Economic growth</p> <p>Supply of highly skilled labour</p> <p>Promote collaboration between researchers and practitioners in education and entrepreneurship</p> <p>Practice-based learning (Canals & Mor, 2014)</p> <p>Entrepreneurial education (Reskill, 2017a)</p> <p>Agile orientation</p> <p>Migrant businesses</p>	<p>Lack of entrepreneurial mindset and skills (European Commission, 2017a)</p> <p>Uptake of entrepreneurial education typically low</p> <p>Low motivation to engage with entrepreneurial / intrapreneurial approaches</p> <p>Entrepreneurial education is in early phase of development</p>	<p>Stakeholder collaboration (e.g. Enterprise MOOC)</p> <p>Motivate employees to engage with entrepreneurial approaches, develop mindset</p> <p>Stronger connections between theory and practice</p> <p>Move beyond knowledge transfer model of entrepreneurial education</p> <p>Modernise curricula</p>

How can MOOCs systematically support CE/CPD and career development in Europe?

For Europe, there are many challenges surrounding the modernisation of education. There remains an ongoing need for evidence-based guidance on new forms of learning and supportive approaches (European Union, 2018a). The European Union (2018a) sets out a series of recommendations for lifelong learning, drawing attention to The European Pillar of Social Rights which articulates that “everyone has the right to quality and inclusive education, training and lifelong learning in order to maintain and acquire skills that allow full participation in society and successful transitions in the labour market”.

In this report we looked at several interstices where the worlds of higher education, vocational educational, training and open online learning come are converging. MOOCs can be understood as change agents (Ossiannilsson, Altinay & Altinay, 2016) which balance the needs of different stakeholders. This requires careful consideration of the priorities of those involved, but can place MOOCs at the heart of the modernization of higher education, vocational learning and training (Gilliot & Bruillard, 2018).

MOOCs are continuously evolving and it is expected that they will continue to adapt towards relevance for workplace place skills and legacy technologies (Fundación Telefónica, 2015:78). Jobs are becoming more flexible and complex: by 2025 it is projected that half of all jobs will require high-level qualifications (European Commission, 2017b). The number of adults in who need more training to keep up with digital revolution is growing (European Union, 2016).

In addition to work-based learning, new forms are emerging in vocationally oriented education and training at higher education. Various practice-oriented pedagogical and didactic models are used, including case studies, problem-based learning, business games, entrepreneurial companies, and new laboratory forms (Markowitsch et al., 2004; European Commission, n.d.). New technologies are also increasingly used and provide new opportunities – including MOOCs. This trend has been accelerated over the past 10 years because of the technological change and catalyzation associated with computers, internet, artificial intelligence and expert systems.

Berger & Frey (2016) conclude that there is serious growing gap in digital skills in Europe and governments and state that local authorities must accelerate initiatives and promote existing innovative methodologies to ensure that Europe is not left behind. Their report underlines the shortage of digital specialists how eLearning (especially self-directed learning) should be encouraged. Another recent report on changes in vocational education in Europe (CEDEFOP, 2019) concluded that countries have opened higher education to people with vocational qualifications or/and with work experience, but actual use of this non-traditional access route (also in professional HE) is still relatively low in many cases. CEDEFOP (2019) report that over the last 20 years many European countries have added new vocational or professionally-oriented programmes available as part of degrees. However, the perception of such offerings is variable, and they are typically seen to be inferior to academic qualifications (though in some markets certain skills are in demand and they are esteemed more highly). Through enhancing opportunities for flexible delivery of education, MOOC can innovate the way that we approach degree programmes, lifelong learning, CE and CPD (Henderikx & Jansen, 2018, Mongenet, 2016).

Evidence has been provided for the claim that MOOCs represent a potential strategy for closing the skills gap through uses like:

- MOOCs as reflective career management tool (Dussarps, 2018)
- MOOCs as strategic, local collaborations to enhance skills and capabilities (Patru & Balaji, 2016)
- MOOCs supporting basic literacy and numeracy (Brandt, 2015)
- Implementing MOOCs to address identified competency shortages
- Preparing for automation (Reskill, 2017a)
- Portfolio recognition (Canals & Mor, 2014)
- Corporate training through MOOC (BizMOOC, 2019; Shah, 2018)
- Use MOOC to train a flexible, adaptive and qualified labour force (Karnouskos, 2017)
- Offer CPD at scale through MOOCs (Calonge & Shah, 2016)
- Providing evidence of CPD (Canals & Mor, 2014)
- Mapping and documenting skills (European Commission, 2019a)
- Flexible and modular delivery of learning (European Commission, 2019)
- Collaboration between business and HEIs to develop MOOC curriculum (Trager, 2015)
- Identifying talent through MOOCs (Littlejohn & Hood, 2018)

It is worth noting that many of these proposals arise from empirical studies but do not represent existing use cases. Awareness of MOOCs remains low in many sectors, and HEIs often do not offer MOOCs that address core business competencies (Pitt *et al.*, 2017). Formal recognition of MOOC learning is rare (Castaño Muñoz *et al.*, 2016) and recognition frameworks are often partial (Dos Santos *et al.*, 2016).

Accreditation remains an obvious route to closing this gap, with benefits for HEIs (Labord & Costa, 2016). Efficient and effective assessment; and reliable authentication of learner identity are key considerations (EADTU, 2017c). Extending the validation of learning to a wider network (e.g. assessment by trade associations or employment portals) has been proposed. It seems that a cultural change may be needed: Kalz *et al.* (2015) find informal learning and certification is under-appreciated by employers. Parity of esteem between business and higher education is needed (CEDEFOP, 2019). This may require some rethought of the roles HEIs typically use MOOCs for (marketing, recruitment, etc.) and a reorientation towards synchronisation with workplace collaborators for more authentic CPD (Karnouskos, 2017). It is essential that such a reorientation does not compromise educational or practice standards.

Two approaches of interest were identified:

- qMOOC – focused on an empirically grounded framework of qualifications and skills that align to verifiable learning outcomes where traditional academic expectations are downplayed (Stracke *et al.*, 2017)

- Professional degrees built from structured certification from MOOC learning completed while working over longer periods (Rothe, Täusche. & Basole, 2018)

To support CPD and lifelong learning, businesses need to encourage flexible learning among their staff and provide sufficient resourcing (Condé & Cisel, 2019). It seems most effective to encourage learners to follow their curiosity, interest and openness – the same qualities successful workers use in their daily lives (Dussarps, 2018). This search for authenticity can extend to teamworking and the development of transversal skills and MOOCs should support this (Karnouskos, 2017). Having authentic and granular descriptions of learning opens the possibility of catalysing job matching and providing targeted learning and training. MOOCs can also be based around specific communities (Slavova, 2017). The loop is closed through effective use of learner data and evaluation to improve pedagogy and learner experience.

Alternative ways of delivering such a vision have been proposed, but effective collaboration seems to be key. There have been many proposals and initiatives to support this, often drawing together a range of expertise at a macro or meso level. At the European level these include the European Qualifications Framework (ESCO, 2017a) and European MOOC Platform (Santos, Costa & Aparicio, 2014). Proposals at the national level include the National MOOC Observatory (CRUI, 2015); National support centres (EADTU, 2016b; 2015a); National Employment Agencies Co-ordination and National Digital Competence Centres (Berger & Frey, 2016). More challenging perhaps are smaller scale attempts to co-ordinate at an institutional or SME level. Stakeholder engagement may be encouraged through Enterprise MOOC (Schwerer & Egloffstein, 2016)

Burd (2015) identifies a range of revenue opportunities associated with MOOCs, such as supplementary services, working at scale, operating efficacies, and improved networking. Services in particular represent an area that is being explored by many and has natural affinities with the private service sector. Service models have been proposed for curriculum management; commissioning; quality assurance; analysis of best practice; translation; facilitation; authentication; assessment; credentialing; instructional design; and data interpretation. Many of these functions are traditionally bundled together in higher education, so in their 'unbundling' there is potential for innovation and new markets.

Sustainability remains a key issue for MOOC platforms, however, and value propositions need to be carefully considered. A balance therefore must be struck between tradition and innovation. To this end, several relevant business models were identified in the literature. The two most relevant extracts for EMC-LM concern interactions between HEIs and wider society.

Padilla Rodriguez *et al.* (2018) propose five business model types:

- Integration with mainstream education (supplementary courses; upselling; offering credits; additional services)

- Freemium approach (charge for additional services such as examination)
- Partnerships with enterprises (focus on human resource development)
- Involvement of target audience (peer assessment, moderation, support)
- Philanthropy (funding provided by charity/foundation/NGO/government)

Belleflamme & Jacqmin (2015:155-162) suggest the essential features of six potential business models:

- MOOC platforms as multisided platforms, facilitating stakeholder interactions and mutual understanding
- Certification model (retains degree as gold standard)
- Freemium model (free learning followed by paid content)
- Advertising model (using data to serve adverts)
- Job matching model (using data to address job market asymmetry)
- Subcontractor model (outsources some core HEI function to MOOC platform)

The 'dual mode' university is the most common MOOC implementation, with a majority of MOOCs now being offered by HEIs on their own platforms rather than in partnership with a major MOOC provider (Jansen & Konings, 2017; Rothe, Täuscher & Basole, 2018). But there remains much potential for exploring alternative models. Frameworks like the Business Model Canvas and Open Business Model Canvas (Fielt, 2013; Osterwalder, 2010; BizMOOC 2019:Ch15) offer a way for collaborators to document or conceptualise their activities. The Business Model for Sustainability (BMfS) (Täuscher & Abdelkafi, 2018) could help to model future innovation scenarios.

Limitations

Resources allocated to this review were limited, but there were many distinct areas of interest. This meant that some evidence could not be reviewed or was de-prioritised. There were also some issues with accessing papers (typically paywalls) and with papers not being available in the first language of a reviewer.

In this report we attempt to draw together conclusions drawn by different reviewers into a coherent whole. Clearly, this runs the risk of being reductive in some areas as the overall state of evidence is described. The conclusions drawn in this study should be taken as representative of the evidence that was reviewed rather than exhaustive. A rapid evidence assessment emphasizes mining of relevant data and the process of extraction and synthesis introduces the possibility of errors (Tricco *et al.*, 2015). Synthesis in this case relies on bringing together conclusion from different studies – some of which involve very different populations or interventions. Furthermore, the evidence was proposed and selected by a consortium of organizations from the public and private sector, no doubt introducing some bias. The goal of this review was primarily to describe an evidence base and develop a shared understanding of potential future actions. As a result, it should be remembered that the primary purpose of this document is to support the activities of the EMC-LM project which is focus on knowledge alliance and exchange rather than research *per se*.

References

- Aguaded Gómez, I.; Vázquez-Cano, E. & López-Meneses, E. (2016). El impacto bibliométrico del movimiento MOOC en la Comunidad Científica Española. [The bibliometric impact of MOOC movement in the Spanish Scientific Community]. *Educación XX1*, 19(2), 77-104, doi: 10.5944/educXX1.13217
- Al-Imarah, A. A. & Shields, R. (2018) MOOCs, disruptive innovation and the future of higher education: A conceptual analysis. *Innovations in Education and Teaching International* 56(3). <https://doi.org/10.1080/14703297.2018.1443828>
- Anthony, L. (2015). The changing role and importance of ESP in Asia. *English as a Global Language Education (EaGLE) Journal*, 1(1), 1-21.
- Aydin, C.H. (2016). MOOCs as a Tool for Opening Up Turkish Higher Education. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU.
http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf
- Bayne, S. & Ross, J. (2014). *The pedagogy of the Massive Open Online Course: the UK view*. The Higher Education Academy.
https://www.heacademy.ac.uk/sites/default/files/HEA_Edinburgh_MOOC_WEB_240314_1.pdf
- Beaven, T., Hauck, M., Comas-Quinn, A., Lewis, T., & de los Arcos, B. (2014). MOOCs: Striking the right balance between facilitation and self-determination. *Journal of Online Learning and Teaching*, 10(1), 31–43.
- Becker, B. A., & Eube, C. (2018). Open innovation concept: integrating universities and business in digital age. *Journal of Open Innovation: Technology, Market, and Complexity*, 4(1). MDPI AG. <http://dx.doi.org/10.1186/s40852-018-0091-6>
- Belleflamme, P. & Jacquemin, J. (2015). An Economic Appraisal of MOOC Platforms: Business Models and Impacts on Higher Education. *CESifo Economic Studies*, Volume 62, Issue 1, 1 March 2016, Pages 148–169, <https://doi.org/10.1093/cesifo/ifv016>
- Berger, T. & Frey, C. B. (2016). Digitalization, jobs and convergence in Europe: strategies for closing the skills gap. Oxford Martin / University of Oxford.
https://www.oxfordmartin.ox.ac.uk/downloads/reports/SCALE_Digitalisation_Final.pdf
- Bernhard, C. (2019). L'enseignement agricole, un atout pour réussir les transitions de l'agriculture française. Dans : Sébastien Abis éd., *Le Déméter* (pp. 179-197). IRIS éditions.
- BizMOOC (2018). *Massive Open Online Courses for Business Learning: Key research, best practices and pathways to innovation*. <https://mooobook.pressbooks.com/>
- Bogdan, R., Holotescu, C., Andone, D. & Grosseck, G. (2017). How MOOCs are being used for corporate training?. The 13th International Conference eLSE, Bucharest, 27-28 April 2017. DOI: 10.12753/2066-026X-17-000

- Brandt, N. (2015), "La formation professionnelle au service de l'amélioration des compétences en France", OECD Economics Department Working Papers, No. 1260, OECD Publishing, Paris, <https://doi.org/10.1787/5jrw21kcn8vc-fr>.
- Brasher, A. Weller, M. & McAndrew, P. (2016). How to design for persistence and retention in MOOCs? In: *MOOCs in Europe* (Jansen, D. and Konings, L. eds.), EADTU, pp. 179–187. <http://oro.open.ac.uk/47140/>
- Brown, M. & Costello, E. (2016). MOOCs in the Republic of Ireland: A Gap in the Policy Landscape. In: Jansen, D. & Konings, L. (2016). European Policy response on MOOC opportunities. EADTU.
http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf
- Bunescu, L. & Gaebel, M. (2018). National Initiatives in Learning and Teaching in Europe: A report from the European Forum for Enhanced Collaboration in Teaching (EFFECT) project. European University Association.
<https://eua.eu/downloads/publications/national%20initiatives%20in%20learning%20and%20teaching%20in%20europe.pdf>
- Burd, E. L., Smith, S. P., & Reisman, S. (2014). Exploring business models for MOOCs in higher education. *Innovative Higher Education*, 40(1), 37-49.
<https://doi.org/10.1007/s10755-014-9297-0>
- Cagiltay, K. & Esfer, S. (2016). Best Practices Analysis of MOOCs. In Proceedings of E-Learn: World Conference on E-Learning (pp. 138-144). Washington, DC, United States: Association for the Advancement of Computing in Education (AACE).
<https://www.learntechlib.org/primary/p/173931/>.
- Calise, M. and Reda, V. (2016). Federica WebLearning and the Italian MOOCs challenge. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU.
http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf
- Calonge, D., & Shah, M. (2016). MOOCs, Graduate Skills Gaps, and Employability: A Qualitative Systematic Review of the Literature. *The International Review of Research in Open and Distributed Learning*, 17(5).
<https://doi.org/10.19173/irrodl.v17i5.2675>
- Canals, E. & Mor, Y. (2014). Support service to foster Web Talent in Europe by encouraging the use of Massive Open Online Courses focused on Web Skills. Final Report. European Commission.
- Castaño Muñoz, J., Punie, Y., Inamorato dos Santos, A., Mitic, M. & Morais, R. (2016): How are Higher Education Institutions Dealing with Openness? A Survey of Practices, Beliefs and Strategies in Five European Countries. Institute for Prospective Technological Studies. JRC Science for Policy Report, EUR 27750 EN; doi:10.2791/709253

CEDEFOP (2018). Spotlight on VET – 2018 compilation. Vocational education and training systems in Europe. <http://www.cedefop.europa.eu/en/publications-and-resources/publications/4168>

CEDEFOP (2019). Skills formation and skills matching in online platform work: policies and practices for promoting crowdworkers' continuous learning (CrowdLearn). http://www.cedefop.europa.eu/files/crowdlearn_literature_review.pdf

Cegos Group (2018). Development, Skills and Transformation: Long-term Commitment. <https://www.cegos.es/observatorio-cegos/barometro-europeo-de-formacion-y-desarrollo-2018/>

Colas, J.-F., Sloep, P., & Garreta-Domingo, M. (2016). The Effect of Multilingual Facilitation on Active Participation in MOOCs. *The International Review of Research in Open and Distributed Learning*, 17(4). <https://doi.org/10.19173/irrodl.v17i4.2470>

Condé, J. & Cisel, M. (2019). On the Use of MOOCs in Companies: A Panorama of Current Practices. *Lecture Notes in Computer Science (LNCS, volume 11475)*, p. 37-46, https://link.springer.com/chapter/10.1007/978-3-030-19875-6_5

Conecta Empleo (n.d.). Conecta Empleo. Fundación Telefónica. <https://www.fundaciontelefonica.com/empleabilidad/conecta-empleo/>

Cormier, D. (2008). *The CCK08 MOOC – Connectivism course, 1/4 way* (2 October). <http://davecormier.com/edblog/2008/10/02/the-cck08-mooc-connectivism-course-14-way/>

CRUI (2015). MOOCs Massive Open On-line Courses Prospettive e Opportunità per l'Università italiana. Conferenza dei Rettori delle Università Italiane

CRUI (2017). Progetto MOOCs Italia Linee guida nazionali per la predisposizione di MOOCs di qualità erogati dalle Università italiane. Conferenza dei Rettori delle Università Italiane

Da Costa, P & Labord, F. (n.d.). MOOC développement durable: un cas d'innovation technologique. https://www.researchgate.net/profile/Pascal_Da_Costa2/publication/324981270_MOOC_developpement_durable_un_cas_d%27innovation_technologique/links/5af6c7e7a6fdcc0c030cceab/MOOC-developpement-durable-un-cas-dinnovation-technologique.pdf

Dacre Pool, L. & Sewell, P. (2007) The key to employability: developing a practical model of graduate employability. *Education + Training*, Vol. 49 Issue: 4, pp.277-289. <https://doi.org/10.1108/00400910710754435>

Daniel, S. J., Cano, E. V., & Cervera, M. G. (2015). The future of MOOCs: Adaptive learning or business model?. *RUSC: Revista De Universidad Y Sociedad Del Conocimiento*, 12(1), 64-73. doi:10.7238/rusc.v12i1.2475

de Andrade, F., Griebenow, R., Costello, R. W., Guenova, M., Schaefer, R., Chalmers, J. D., Tichelli, A., Raguz, D. & Stein, J. (2018) The future of accreditation of continuing medical education (CME)-continuing professional development (CPD) in

Europe: harmonisation through dialogue and consensus. *Journal of European Continuing Medical Education*, 7:1. <https://doi.org/10.1080/21614083.2018.1506202>

Deimann, M. (2015). The Dark Side of the MOOC: A Critical Inquiry on their Claims and Realities. *Current Issues in Emerging eLearning 2* (1). <http://scholarworks.umb.edu/ciee/vol2/iss1/3/>.

Delgado Kloos, C. & Méndez, E. (2016). Higher Education in the Post-MOOC Era: Reflections from UC3M. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU. http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf

Department for Business, Innovation and Skills (2013). The maturing of the MOOC: Literature review of massive open online courses and other forms of online distance learning. BIS Research Paper Number. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/240193/13-1173-maturing-of-the-mooc.pdf130.

Divina F.-M. (2019). Créativité, éducation aux médias et à l'information, trans littératie : vers des humanités numériques. *Quaderni [En ligne]*, 98 | Hiver 2018-2019. <http://journals.openedition.org/quaderni/1482>

Dos Santos, A. I., Punie, Y. & Castaño-Muñoz, J. (2016). Opportunities and challenges for the future of MOOCs and open education in Europe. In *From Books to MOOCs? Emerging Models of Learning and Teaching in Higher Education*; de Corte, E., Engwall, L., Teichler, U., Eds.; Portland Press: London, UK, 2016; Volume 88, pp. 81–91.

Downes, S. (2013). The quality of massive open online courses. <http://mooc.efquel.org/week-2-the-quality-of-massive-open-online-courses-by-stephen-downes/>.

Dussarps, C. (2018). Les MOOC : quels enjeux pour valoriser une candidature à un emploi ?. *Communication & Organisation*, 53(1), 53-69. <https://www.cairn.info/revue-communication-et-organisation-2018-1-page-53.htm>

e-VALUATE (n.d). <https://www.nuffic.nl/en/subjects/e-evaluate/>

EADTU (2015a). Output 10 SCORE2020: SWOT analysis / benchmarking regional support centres http://score2020.eadtu.eu/images/Results/Final_outputs/O10-SWOT_analysis_-_benchmarking_regional_support_centres.pdf

EADTU (2015b). Output 4 SCORE2020: Conditions for and characteristics of MOOCs design models. https://score2020.eadtu.eu/images/Results/Final_outputs/O4-Conditions_for_and_characteristics_of_MOOCs_design_models.pdf

EADTU (2016a). Output 11 SCORE2020: Scenarios for support of different target groups. http://score2020.eadtu.eu/images/Results/Final_outputs/O11-Scenarios_for_support_of_different_target_groups.pdf

- EADTU (2016b). Output 12 SCORE2020: Business models for regional support centres. https://score2020.eadtu.eu/images/Results/Final_outputs/O12-Business_models_for_regional_support_centres.pdf
- EADTU (2017a). Output 13 SCORE2020: International collaboration of regional centres. https://score2020.eadtu.eu/images/Results/Final_outputs/O13-International_collaboration_of_regional_centres.pdf
- EADTU (2017b). Output 3 SCORE2020: Evaluation report based on regional events organised by each partner. http://score2020.eadtu.eu/images/Results/Final_outputs/O3-Evaluation_report_based_on_regional_events organised_by_each_partner.pdf
- EADTU (2017c). SCORE2020 Output 1: Needs analysis for support in Open Education and MOOCs. https://score2020.eadtu.eu/images/Results/Final_outputs/O1-Need_analysis_for_support_in_MOOCs_en_Open_Education.pdf
- EIT Health (2018). Health and Data Analytics MOOC: Online course equips online learners to maximise healthcare data. <https://www.eithealth.eu/-/health-and-data-analytics-mooc>
- ESCO (2017a). Connecting education and training with the labour market. European Skills/Competences, Qualifications and Occupations (ESCO). <https://ec.europa.eu/social/BlobServlet?docId=18489&langId=en>
- ESCO (2017b). Harnessing the power of big data analysis for a functional labour market. European Skills/Competences, Qualifications and Occupations (ESCO). <https://ec.europa.eu/social/BlobServlet?docId=18490&langId=en>
- ESCO (2017c). Improving career guidance services. European Skills/Competences, Qualifications and Occupations (ESCO). <https://ec.europa.eu/social/BlobServlet?docId=18492&langId=en>
- ESCO (2017d). Connecting people and jobs. European Skills/Competences, Qualifications and Occupations (ESCO). <https://ec.europa.eu/social/BlobServlet?docId=18491&langId=en>
- ESCO (2019). Our success stories. European Skills/Competences, Qualifications and Occupations (ESCO). <https://ec.europa.eu/esco/portal/document/en/47b25dc1-145c-4f88-aa7c-fea929e47cf5>
- Esfer S., Cagiltay K. (2018). Creating a MOOC Portal for Workplace Learning. In: Ifenthaler D. (eds) *Digital Workplace Learning*. Springer, Cham. https://doi.org/10.1007/978-3-319-46215-8_10
- ESLP (n.d.) European Short Learning Programmes (SLPs). <https://e-slp.eadtu.eu/>
- Europass (2019). Connect with Europass <https://europass.cedefop.europa.eu/>
- European Commission (2012). Towards a job-rich recovery <https://ec.europa.eu/social/BlobServlet?docId=7619&langId=en>
- European Commission (2016). Scoreboard of key employment and social indicators - summary <https://ec.europa.eu/social/BlobServlet?docId=16016&langId=en>

European Commission (2017a). A NEW SKILLS AGENDA FOR EUROPE: Working together to strengthen human capital, employability and competitiveness.

<https://ec.europa.eu/social/main.jsp?catId=1223#navItem-relatedDocuments>

European Commission (2017b). On a renewed EU agenda for higher education.

<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0247&from=EN>

European Commission (2017c). Proposal for a COUNCIL RECOMMENDATION on a European Framework for Quality and Effective Apprenticeships.

<https://ec.europa.eu/social/main.jsp?catId=1223#navItem-relatedDocuments>

European Commission (2017d). Strengthening European Identity through Education and Culture: The European Commission's contribution to the Leaders' meeting in Gothenburg, 17 November. https://ec.europa.eu/commission/sites/beta-political/files/communication-strengthening-european-identity-education-culture_en.pdf

European Commission (2018a). Employment and Social Developments in Europe: Quarterly Review (September 2018).

<https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8130&furtherPublications=yes>

European Commission (2018b). Key competences for lifelong learning.

https://ec.europa.eu/education/sites/education/files/document-library-docs/factsheet-key-competences-lifelong-learning_en.pdf

European Commission (2018c). Promoting online training opportunities for the workforce in Europe.

<https://publications.europa.eu/en/publication-detail/-/publication/812aeaf7-dccd-11e8-afb3-01aa75ed71a1>

European Commission (2018d). Proposal for a COUNCIL RECOMMENDATION on Key Competences for LifeLong Learning.

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018SC0014>

European Commission (2018e). Skills Agenda for Europe.

<https://ec.europa.eu/social/main.jsp?catId=1223#navItem-relatedDocuments>

European Commission (2018f). The European Qualifications Framework: supporting learning, work and cross-border mobility.

<http://www.cedefop.europa.eu/en/events-and-projects/projects/european-qualifications-framework-eqf>

European Commission (2019a). Council Recommendation on Upskilling Pathways: New Opportunities for Adults Taking stock of implementation measures.

https://ec.europa.eu/info/sites/info/files/file_import/implementation-report-upskilling-pathways_en.pdf

European Commission (2019b). European Vocational Skills Week.

https://ec.europa.eu/social/vocational-skills-week/node_en

European Commission (n.d.). Horizon 2020 INNOSUP.

<https://ec.europa.eu/easme/en/innosup>

- European Institute of Innovation & Technology (2019). EIT Strategy 2021-2027. <https://eit.europa.eu/who-we-are/eit-glance/eit-strategy-2021-2027>
- European Institute of Innovation & Technology (n.d.) Knowledge and Innovation Communities. <https://eit.europa.eu/activities/innovation-communities>
- European Union (2016). COUNCIL RECOMMENDATION of 19 December 2016 on Upskilling Pathways: New Opportunities for Adults (2016/C 484/01). [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016H1224\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016H1224(01)&from=EN)
- European Union (2018a). COUNCIL RECOMMENDATION of 22 May 2018 on key competences for lifelong learning (Text with EEA relevance) (2018/C 189/01). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2018.189.01.0001.01.ENG&toc=OJ:C:2018:189:TOC
- European Union (2018b). Education and training in the EU: where do we stand? <https://ec.europa.eu/education/sites/education/files/document-library-docs/eu-factsheet-2018-et-monitor.pdf>
- European Union (2018c). Education and Training Monitor 2018. Vol. 1. <https://ec.europa.eu/education/sites/education/files/document-library-docs/volume-1-2018-education-and-training-monitor-country-analysis.pdf>
- European Union (2018d). Education and Training Monitor 2018. Vol.2. Country Analysis. <https://ec.europa.eu/education/sites/education/files/document-library-docs/volume-2-2018-education-and-training-monitor-country-analysis.pdf>
- Eurostat (n.d.). Labour Market (including Labour Force Survey). <https://ec.europa.eu/eurostat/web/labour-market>
- Fano Méndez , S., Fueyo Gutiérrez, A., & Osuna Acedo, S. (2016), MOOC Development Policies: The ECO Project in the European and Spanish Context. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU. http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf
- Farrow, R., de los Arcos, B., Pitt, R. and Weller, M. (2015). Who are the Open Learners? A Comparative Study Profiling non-Formal Users of Open Educational Resources. *EURODL (European Journal of Open, Distance and E-Learning)*, 18(2) pp. 50–74. <http://oro.open.ac.uk/44962/>
- Fielt, E. (2013). Conceptualising Business Models: Definitions, Frameworks and Classifications. *Journal of Business Models* 1(1). pp.85-105. <https://journals.aau.dk/index.php/JOBM/article/view/706>
- FIPAS (2017). Pédagogie de l’alternance dans le réseau des CFALim: Une enquête sur la pratique de la pédagogie de l’alternance dans le réseau des CFALim à l’heure de la digitalization.

- Flynn, J. T. & Min, D. (2013). Moocs: Disruptive Innovation and the Future of Higher Education. *Christian Research Journal: Research on Educational Ministry* 10(1). pp.149-62. <https://doi.org/10.1177%2F073989131301000112>
- Forfás (2013). Addressing future demand for high-level ICT skills: Digital agenda for Europe: A Europe 2020 Initiative. <http://ec.europa.eu/digital-agenda/digitalagenda-europe>
- Fundación Telefónica (2015). Los MOOC en la educación del futuro: la digitalización de la formación. https://www.fundaciontelefonica.com/arte_cultura/publicaciones-listado/pagina-item-publicaciones/?itempubli=324
- FUNDAE (n.d.) Fundae: State Foundation for Training in Employment. <https://blog.fundae.es/tag/mooc/>
- Gamage, D., Perera, I., Fernando, S (2015). A framework to analyze effectiveness of eLearning in MOOC: learners perspective. In: *8th International Conference on Ubi-Media Computing (UMEDIA)*, pp. 236–241, 24–26 August 2015. <https://doi.org/10.1109/UMEDIA.2015.7297461>
- Garrido, M., Koepke, L., Andersen, S., Mena, A., Macapagal, M., Dalvit, L. (2016). An examination of MOOC usage for professional workforce development outcomes in Colombia, the Philippines, & South Africa. Seattle: Technology & Social Change Group, University of Washington Information School.
- Gilligan, J., Chen, W., & Darzentas, J. (2018). Using MOOCs to Promote Digital Accessibility and Universal Design, The MOOCAP Experience. In Craddock, G., Doran, C., McNutt, L., Rice, D. (eds). *Transforming our World Through Design, Diversity and Education: Proceedings of Universal Design and Higher Education in Transformation Congress 2018*. Studies in Health Technology and Informatics. IOS Press. <https://www.iospress.nl/book/transforming-our-world-through-design-diversity-and-education/>
- Gilliot, J.-M. & Bruillard, É. (2018). Recherches actuelles sur les MOOC. Sciences et Technologies de l'Information et de la Communication pour l'Éducation et la Formation, ATIEF, 2018. <https://hal-imt-atlantique.archives-ouvertes.fr/hal-01802224/document>
- GMV Conseil (2018). Enquête nationale sur les recrutements au sein du secteur alimentaire. Bilan 2017/ Perspectives 2018, https://www.observatoires-alimentaire.fr/sites/default/files/documents/elements-page/a-telecharger/fichier/rapport-enquete-recrutement-2018-observatoirssa_0.pdf
- Gruber, H. (2018). Proposals for a digital industrial policy for Europe. Telecommunications Policy. <https://doi.org/10.1016/j.telpol.2018.06.003>
- Hanlon, P. (2015). Education in a Technological Era: The EU Digital Agenda Policy - More Optimistic Than Realistic? *Level 3*: Vol. 12: Iss. 1, Article 4. <https://arrow.dit.ie/level3/vol12/iss1/4>
- Henderikx, P. & Jansen, D. (2018). The Changing Pedagogical Landscape: In search of patterns in policies and practices of new modes of teaching and learning. *EADTU*. <https://tinyurl.com/CPLreport2018>

- Hilton, J. III (2016). Open educational resources and college textbook choices: a review of research on efficacy and perceptions. *Educational Technology Research and Development* 64: 573. <https://doi.org/10.1007/s11423-016-9434-9>
- Hood, N. & Littlejohn, A. (2016). MOOC Quality: The Need for New Measures. *Journal of Learning for Development*, vol. 3, no. 3. <http://www.jl4d.org/index.php/ejl4d/article/view/165/155>
- Hyvönen, I. (2016). Need for national MOOC policy? In Jensen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU. http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf
- Jansen D., Rosewell J., Kear K. (2017). Quality Frameworks for MOOCs. In: Jemni M., Kinshuk, Khribi M. (eds) *Open Education: from OERs to MOOCs*. Lecture Notes in Educational Technology. Springer, Berlin, Heidelberg
- Jansen, D. & Konings, L. (2017). MOOC Strategies of European Institutions. Status report based on a mapping survey conducted in November 2016 – February 2017. EADTU. http://eadtu.eu/documents/Publications/OEenM/MOOC_Strategies_of_European_Institutions.pdf
- Jansen, D., Schuwer, R. (2015). Institutional MOOC strategies in Europe Status report based on a mapping survey conducted in October – December 2014. <https://www.surfspace.nl/media/bijlagen/artikel-1763-22974efd1d43f52aa98e0ba04f14c9f3.pdf>
- Jansen, D. & Teixeira, A. (2015). Position papers for European cooperation on MOOCs. Overview of position papers on the opportunities and characteristics for European cooperation as presented during the HOME conference in Porto November 2014. https://oerknowledgecloud.org/sites/oerknowledgecloud.org/files/Position_papers_for_European_cooperation_on_MOOCs_0.pdf
- Jensen, D. & Konings, L. (2016). European Policy response on MOOC opportunities. EADTU. http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf
- Jensen, D. & Schuwer, R. (2015). Institutional MOOC strategies in Europe. European Association of Distance Teaching Universities. <https://www.surfspace.nl/media/bijlagen/artikel-1763-22974efd1d43f52aa98e0ba04f14c9f3.pdf>
- Jobe, W. (2014, October). No university credit, no problem? Exploring recognition of non-formal learning. Paper presented at the IEEE Frontiers in Education Conference (FIE). doi: [10.1109/FIE.2014.7044389](https://doi.org/10.1109/FIE.2014.7044389)
- Joint Employment Report (2017). European Commission. <https://ec.europa.eu/social/BlobServlet?docId=17224&langId=en>

- Joint Employment Report (2018). European Commission.
<https://ec.europa.eu/social/BlobServlet?docId=18624&langId=en>
- Joint Employment Report (2019). European Commission.
<https://ec.europa.eu/social/BlobServlet?docId=20431&langId=en>
- Jones, C. (2015). Openness, technologies, business models and austerity. *Learning, Media and Technology*, 40:3, 328-349, DOI: 10.1080/17439884.2015.1051307
- Janger, J., Schubert, T., Andries, P., Rammer, C. & Hoskens, M. (2016). The EU 2020 Innovation Indicator: A Step Forward in Measuring Innovation Outputs and Outcomes? *Research Policy*, 46(1), 30-42. <https://doi.org/10.1016/j.respol.2016.10.001>
- Kaiser, F., Gwosc, C., Vossensteyn, H., File, J., Huisman, J., Kolster, R., Seeber, M., Muehleck, K. & Vukasovic, M. (2018). Promoting the relevance of higher education. Directorate-General for Education, Youth, Sport and Culture (European Commission) <https://publications.europa.eu/en/publication-detail/-/publication/9daa09fa-7ffd-11e8-ac6a-01aa75ed71a1/language-en>
- Kalman, Y. M. (2016). Cutting through the hype: evaluating the innovative potential of new educational technologies through business model analysis. *Open Learning: The Journal of Open, Distance and e-Learning*. Volume 31(1).
<https://www.tandfonline.com/doi/abs/10.1080/02680513.2016.1164592>
- Kalz, M., Kreijns, K., Niellissen, G., Castaño-Muñoz, J., Guasch, T., Espasa, A., Floratos, N., Tover, E. & Cabedo, R. (2015). MOOCknowledge: Establishing a large-scale data-collection about participants of European Open Online Courses.
http://home.eadtu.eu/images/Position_papers_for_European_cooperation_on_MOOCs.pdf
- Kapanen, A., Dressler, S., Edgar, D., Temple, B., Rachfall, T., & Förster-Trallo, D. (2016). Developing a MOOC for teaching employability skills to foreign students in Germany. In *EDULEARN16 Proceedings*. (pp. 551-561). The International Academy of Technology, Education and Development (IATED).
<http://dx.doi.org/10.21125/edulearn.2016.1104>
- Karnouskos, S. (2017). Massive open online courses (MOOCs) as an enabler for competent employees and innovation in industry. *Computers in Industry*, 91, 1–10.
<https://doi.org/10.1016/j.compind.2017.05.001>
- King, M., Pegrum, M., & Forsey, M. (2018). MOOCs and OER in the Global South: Problems and Potential. *The International Review of Research in Open and Distributed Learning*, 19(5). <http://www.irrodl.org/index.php/irrodl/article/view/3742>
- Koch, S. & Lanestedt, J. (2016). Norwegian national policy for open online education. In Jensen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU.
http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf
- Kordoni, V., Cholakov, K., Egg, M., Way, A. Birch, A., Kermanidis, K., Sosoni, V., Tsoumakos, D., Van den Bosch, A., Hendrickx, I., Papadopoulos, M.,

Georgakopoulou, P., Gialama, M., Van Zaanen, M., Buliga, I., Jermol, M. & Orlic, D. 2015. TraMOOC Project overview. Proceedings of the 18th Annual Conference of the European Association for Machine Translation (EAMT2015) May 2015, European Association for Machine Translation (EAMT) Antalya, Turkey, 217.

<https://aclweb.org/anthology/W/W15/W15-4900.pdf>

Lanvin, B. & Evans, P. (eds.) (2018). The Global Talent Competitiveness Index 2018: Diversity for Competitiveness. <https://adecco.es/wp-content/uploads/2018/09/GTCI-2018-web.r1-web.pdf>

Laudrillard, D. (2012). *Teaching as a Design Science*. Routledge.

Lehdonvirta, V., Margaryan, A. & Dabies, H. (2017). Skills formation and skills matching in online platform work: policies and practices for promoting crowdworkers' continuous learning (CrowdLearn). CEDEFOP

http://www.cedefop.europa.eu/files/crowdlearn_literature_review.pdf

Lehto, T. (2016). MOOC Strategies of Higher Education Institutions in Finland. In: Jansen, D. & Konings, L. (2016). European Policy response on MOOC opportunities. EADTU.

http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf

Les Observatoires de Secteur Alimentaire (n.d.). Prospective compétences numériques. <https://www.observatoires-alimentaire.fr/e-theque/prospective-competences-numeriques>

Lester, M. (2016), Policies of MOOC platform providers. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU.

http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf

Limone, P. (2017). Assicurazione della qualità, didattica universitaria e formazione dei docenti, in Paparella N., Martiniello L. (eds.), *Il management didattico nelle università. Una responsabilità da condividere* (pp. 249-264), Giapeto Editore, Napoli.

Littlejohn A and Hood N. (2018) *Reconceptualising Learning in the Digital Age: the (Un)democratising of Learning*. Singapore: Springer.

Liyanagunawardena, Tharindu Rekha, Lundqvist, Karsten, Micallef, L, & Williams, Shirley Ann. (2014). Teaching programming to beginners in a massive open online course. Paper presented at the OER14: building communities of open practice (28-29 April), Newcastle, UK.

López, E., Vázquez, E. & Román, P. (2015). Analysis and Implications of the Impact of MOOC Movement in the Scientific Community: JCR and Scopus (2010-13). *Communicate*, 44 , 73-80. <https://doi.org/10.3916/C44-2015-08>

Markowitsch, J., Messerer, K., & Prokopp, M. (2004). *Handbuch praxisorientierter Hochschulbildung* [Handbook for practice-oriented higher education]. Wien: WUV.

Martins Ferreira, J.M. (2016). MOOCs and other educational resources at the University of Porto. In: Jansen, D. & Konings, L. (eds). European Policy response on

MOOC opportunities. EADTU.

[http://eadtu.eu/images/publicaties/European Policy response on MOOC opportunities June 2016.pdf](http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf)

Mazoue, J. G. (2013). The MOOC Model: Challenging Traditional Education. *Educause Review*. <https://er.educause.edu/articles/2013/1/the-mooc-model-challenging-traditional-education>

Milovanovitch, M. (2018). Reforms in vocational education and training in ETF partner countries: A cross-country digest of reform implementation and risks. https://www.etf.europa.eu/sites/default/files/2018-09/VET%20reforms%20in%20ETF%20partner%20countries%20_report.pdf

Ministère de l'Agriculture (n.d.). Alim'agari Observatory. <https://agriculture.gouv.fr/mots-cles/observatoire>

MiriadaX (2018). MiriadaX 2018 LAB report [unpublished]

Miyazoe, T., & Anderson, T. (2013). Interaction Equivalency in an OER, MOOCs and Nonformal Learning Era. *Journal of Interactive Media in Education* 2013(2), 9. <http://dx.doi.org/10.5334/2013-09>

Moe, R. (2015). The brief & expansive history (and future) of the MOOC: Why two divergent models share the same name. *Current Issues in Emerging eLearning*: Vol. 2, Iss. 1 , Article 2. <https://scholarworks.umb.edu/ciee/vol2/iss1/2>

Mongenot, C. (2016). Shared MOOC services: regional, European or global level? FUN: The French initiative around MOOC. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU. [http://eadtu.eu/images/publicaties/European Policy response on MOOC opportunities June 2016.pdf](http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf)

MOOC Maker (n.d.). MOOC MAKER Construction of Management Capacities of MOOCs in Higher Education. http://www.mooc-maker.org/?page_id=869&lang=en

MOOCap (n.d.) MOOCap: A pan-European project on providing education on accessible design. <https://moocap.gpii.eu/>

moocs4all (n.d.). Erasmus+ LoCoMoTion Project: moocs4all. <https://moocs4all.eu/>

MOOCs4Inclusion (n.d.). MOOCs4Inclusion. <http://moocs4inclusion.org/index.php/>

Mol, C. (2016). edX reinventing education. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU. [http://eadtu.eu/images/publicaties/European Policy response on MOOC opportunities June 2016.pdf](http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf)

Mystakidis, S. & Berki, E. (2014). Participative Design of qMOOCs with Deep Learning and 3d Virtual Immersive Environments: the case of MOOCAGora. ECTEL 2014 Conference, Graz, Austria [https://www.researchgate.net/profile/Stylianos_Mystakidis/publication/265846818_Participative_Design_of_qMOOCs_with_Deep_Learning_and_3d_Virtual_Immersive_Environments_the_case_of_MOOCAGora](https://www.researchgate.net/profile/Stylianos_Mystakidis/publication/265846818_Participative_Design_of_qMOOCs_with_Deep_Learning_and_3d_Virtual_Immersive_Environments_the_case_of_MOOCAGora/links/55f686d508ae7a10cf8b9b97/Participative_Design_of_qMOOCs_with_Deep_Learning_and_3d_Virtual_Immersive_Environments_the_case_of_MOOCAGora)

[ve-Design-of-qMOOCs-with-Deep-Learning-and-3d-Virtual-Immersive-Environments-the-case-of-MOOCAgora.pdf](#)

Niederman, F., Butler, B. S., Gallupe, R. B., Tan, B. C. Y. & Urquhart, C. (2016). Electronic Pedagogy and Future University Business Models. *Communications of the Association for Information Systems*: Vol. 38 , Article 7.

<http://aisel.aisnet.org/cais/vol38/iss1/7>

Norvig, P. (2012) Helping the world to teach. Google Research.

<http://googleresearch.blogspot.com/2012/09/helpingworld-to-teach.html>

OECD (2014). Measuring Innovation in Education: A New Perspective. Educational Research and Innovation, OECD Publishing, Paris.

<https://doi.org/10.1787/9789264215696-en>.

OECD (2019). Education Hub. <http://www.oecd.org/education/>

Okada, A., Rabello, C. & Ferreira, G. (2014). Developing 21st century skills through colearning with OER and social networks. Paper presented at European Distance and E-Learning Network (27-28 October), Oxford, UK.

https://oro.open.ac.uk/41724/1/PE34_edem2014.pdf

Opcalim (2018). Les impacts du numérique sur les métiers du secteur alimentaire.

https://www.observatoires-alimentaire.fr/sites/default/files/documents/elements-page/a-telecharger/fichier/scope-transformation-numerique_2017_0.pdf

Organisation for Economic Co-operation and Development (2019). Measuring Innovation in Education 2019. <http://www.oecd.org/publications/measuring-innovation-in-education-2019-9789264311671-en.htm>

Orr, D., Weller, M., & Farrow, R. (2018). Models for online, open, flexible and technology-enhanced higher education across the globe – a comparative analysis. *International Council for Open and Distance Education (ICDE)*. Oslo, Norway. <https://oofat.oerhub.net/OOFAT/>

Ossiannilsson, E., Williams, K., Camilleri, A.F., & Brown, M.L. (2015). Quality models in online and open education around the globe: State of the art and recommendations. International Council for Distance Education.

<http://icde.org/admin/filestore/Resources/Reports/ICDEQualitymodels2.pdf>

Ossiannilsson, E., Altinay, F., & Altinay, Z. (2016). MOOCs as Change Agents to Boost Innovation in Higher Education Learning Arenas. *Education Sciences*, 6(4), 25. MDPI AG. Retrieved from <http://dx.doi.org/10.3390/educsci6030025>

Ostashewski, N. & Reid, D. 2012. Delivering a MOOC using a social networking site: The SMOOC design model, in Proceedings of the IADIS international conference on internet technologies and society (ITS 2012), Nov 28-30 2012, pp. 217-222. Perth, WA: IADIS.

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. New York, NY: Wiley.

Osuna Acedo, S. & Camarero Cano, L. (2016). The ECO European Project: A New MOOC Dimension Based on an Intercreativity Environment. *TOJET: The Turkish Online Journal of Educational Technology*, 15 (1), 117-125. http://e-spacio.uned.es/fez/eserv/bibliuned:425-Sosuna-0006/Osuna_Acedo_Sara_IntercreativityMOOC.pdf

Padilla Rodriguez, B.C., Armellini, A. & de la Garza Escamilla, S.L. (2018). Sustainability of Massive Open Online Courses (MOOCs): Beyond Business Models. In T. Bastiaens, J. Van Braak, M. Brown, L. Cantoni, M. Castro, R. Christensen, G. Davidson-Shivers, K. DePryck, M. Ebner, M. Fominykh, C. Fulford, S. Hatzipanagos, G. Knezek, K. Kreijns, G. Marks, E. Sointu, E. Korsgaard Sorensen, J. Viteli, J. Voogt, P. Weber, E. Weippl & O. Zawacki-Richter (Eds.), *Proceedings of EdMedia: World Conference on Educational Media and Technology* (pp. 1641-1647). Amsterdam, Netherlands: Association for the Advancement of Computing in Education (AACE). Retrieved February 21, 2019 from <https://www.learntechlib.org/primary/p/184391/>

Parkinson D. (2014) Implications of a new form of online education. *Nursing Times* 110: 15-17.

Perifanou, M. (2015). Language Massive Open Online Courses Research report on the current state of Language Learning MOOCs worldwide: Exploration, Classification and Evaluation. LangMOOC. Erasmus +. <https://www.langmooc.com/wp-content/uploads/2016/03/REPORT-LangMOOCs-02- V3.pdf>

Peters, G., & Seruga, J. (2016). A supply sided analysis of leading MOOC platforms and universities. *Knowledge Management & E-Learning*, 8(1), 158–181.

Petronzi, D. & Hadi, M. (2016). Exploring the factors associated with MOOC engagement, retention and the wider benefits for learners. *European Journal of Open, Distance and e-Learning* Vol. 19 / No. 2. <https://doi.org/10.1515/eurodl-2016-0011>

Patru, M., & Balaji, V. (2016). Making Sense of MOOCs. A guide for Policy-Makers. United Nations Educational, Scientific and Cultural Organization (UNESCO). <http://unesdoc.unesco.org/images/0024/002451/245122E.pdf>

Pitt, R., Friedl, C. Jansen, D. and Driha, O. (2017). The MOOC potential to address European challenges in CPD and continuous education. In: *Higher Education for the Future: Accelerating and Strengthening Innovation*. EADTU Conference Proceedings Ubachs, G. and Konings, L. (eds.), EADTU. pp. 369–380.

Poy, R. & Gonzalez-Aguilar, A. (2015). Boom-bust of MOOC platforms: crisis of an eLearning model? *International Journal of Education and Research* Vol. 3 No. 1. https://link.springer.com/chapter/10.1007/978-3-319-46215-8_10

Rampelt, F. & Suter, R. (2017). Recognition of prior learning–outcome-oriented approaches to the recognition and assessment of MOOC-based digital learning scenarios. *Proceedings of EDULEARN17 Conference 3rd-5th July 2017*, Barcelona, Spain. https://www.researchgate.net/profile/Florian_Rampelt/publication/318681668_Recognition_of_prior_learning_-_outcome-oriented_approaches_to_the_recognition_and_assessment_of_MOOC-

[based digital learning scenarios/links/5aa8fc3ba6fdcc1b59c6ccd0/Recognition-of-prior-learning-outcome-oriented-approaches-to-the-recognition-and-assessment-of-MOOC-based-digital-learning-scenarios.pdf](#)

Rapp, L. (2014). Les MOOCs, révolution ou désillusion ? Le savoir à l'heure du numérique. L'Institute Entreprise.

https://www.letudiant.fr/static/uploads/mediatheque/EDU_EDU/4/1/256141-les-mooc-revolution-ou-desillusion-rapport-de-lucien-rapp-institut-de-l-entreprise-septembre-2014-original.pdf

Reskill (2017a). Final Needs Assessment and Best Practices. <https://reskill-info.eu/intellectual-outputs>

Reskill (2017b). Gap identification of practical and forward-looking skills needed in the Agri-Food sector <https://reskill-info.eu/intellectual-outputs>

Rocha-Pereira, N., Lafferty, N., & Nathwani, D. (2015). Educating healthcare professionals in antimicrobial stewardship: can online-learning solutions help? *Journal of Antimicrobial Chemotherapy*, 70(12), 3175-3177.

Rodrigues, V., & Player, E. (2016). Does social learning increase engagement in online courses for healthcare professionals? Paper presented at the Association for the Study of Medical Education annual scientific meeting (6-8 July), Belfast, UK.

Rodriguez, C. O. (2012). MOOCs and the AI-Stanford like courses: Two successful and distinct course formats for massive open online courses. *European Journal of Open, Distance and E-Learning*, 1-13.

<http://www.eurodl.org/materials/contrib/2012/Rodriguez.pdf>

Rolfe, V. (2015) A systematic review of the socio-ethical aspects of Massive Online Open Courses. *The European Journal of Open, Distance and e-Learning*, 18(1), 53-72. <http://eprints.uwe.ac.uk/26803>

Rosewell, J. and Jansen, D. (2014). The OpenupEd quality label: benchmarks for MOOCs. *INNOQUAL: The International Journal for Innovation and Quality in Learning*, 2(3) pp. 88–100.

Rothe, H., Täuscher, K. & Basole, R. (2018). Competition between platform ecosystems: a longitudinal study of MOOC platforms. Twenty-Sixth European Conference on Information Systems (ECIS2018), Portsmouth, UK.

https://www.researchgate.net/profile/Rahul_Basole/publication/325896999_Competition_between_platform_ecosystems_A_longitudinal_study_of_MOOC_platforms/links/5b3a3b98a6fdcc8506e87d8f/Competition-between-platform-ecosystems-A-longitudinal-study-of-MOOC-platforms.pdf

Rutkauskiene D. and Gudoniene, D. (2016). Policy Paper: Lithuanian Case. In: Jansen, D. & Konings, L. (2016). European Policy response on MOOC opportunities. EADTU.

http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf

Santos, Cristina Mamédio da Costa, Pimenta, Cibele Andrucio de Mattos, & Nobre, Moacyr Roberto Cuce. (2007). The PICO strategy for the research question

construction and evidence search. *Revista Latino-Americana de Enfermagem*, 15(3), 508-511. <https://dx.doi.org/10.1590/S0104-11692007000300023>

Schardt, C., Adams, M. B., Owens, T., Keitz, K. & Fontelo, P. (2007). Utilization of the PICO framework to improve searching PubMed for clinical questions. *BMC Medical Informatics and Decision Making* 7(16). (2007) <https://bmcmmedinformdecismak.biomedcentral.com/articles/10.1186/1472-6947-7-16>

Schumann, F. (2016). Creating a Mezzo-Structure for MOOCs in Europe. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU. http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf

Schuwert, R., Gil Jaurena, I., Aydin, C. H., Costello, E., Dalsgaard, C., Brown, M., Jansen, D., & Teixeira, A. (2015). Opportunities and Threats of the MOOC Movement for Higher Education: The European Perspective. *The International Review of Research in Open and Distributed Learning*, 16(6). <https://doi.org/10.19173/irrodl.v16i6.2153>

Schuwert R. & de Vries F. (2016). MOOCs at Fontys University of Applied Sciences. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU. http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf

Schwerer, F. & Egloffstein, M. (2016). Participation and Achievement in Enterprise MOOCs for Professional Learning. 13th International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2016). <https://files.eric.ed.gov/fulltext/ED571404.pdf>

Sentance, S., & Humphreys, S. (2015). Online vs face-to-face engagement of computing teachers for their professional development needs. *Lecture Notes in Computer Science*, 9378, 69-81.

Shah, D. (2018). A product at every price: A review of MOOC stats and trends in 2017. Class Central. <https://www.class-central.com/report/moocs-stats-and-trends-2017/>

Silveira, I. F. (2016). OER and MOOC: The need for openness. *Issues in Informing Science and Information Technology*, 13, 209-223. <http://www.informingscience.org/Publications/3478>

Slavova, M. (2017). Lessons Learned from the Development and Implementation of MOOC in Digital and Social Media Marketing. *Bulgarian Journal of Business Research* (22), pp.56-63. <https://www.ceeol.com/search/article-detail?id=559144>

Smith, N., Caldwell, H., Richards, M., Bandara, A. K. (2018). A Comparison of MOOC development and delivery approaches. In Childs, M. & Soetano, R. (eds.) *Online Learning for STEM Subjects International Examples of Technologies and Pedagogies in Use*. Routledge.

- Stacey, P. (2015). Traditional Economics Don't Make Sense for Open Business Models. *Medium*. <https://medium.com/made-with-creative-commons/traditional-economics-don-t-make-sense-for-open-business-models-d277428535e0#.kl72wz9de>
- Stokes, C.W., Towers, A. C., Jinks, P. V. & Symington, A. (2015). Discover Dentistry: encouraging wider participation in dentistry using a massive open online course (MOOC). *British Dental Journal*, 219, 81- 85.
- Stracke, C. M. (2016a). MOOCs are dead! - Open Education and the Quality of Online Courses Towards a Common Quality Reference Framework. In A. Moreira Teixeira, A. Szűcs, & I. Ildikó Mázár (Eds.), *Proceedings EDEN 2016 Annual Conference* (pp. 215-221). Bucharest, Hungary: European Distance and E-Learning Network (EDEN). <http://hdl.handle.net/1820/7345>
- Stracke, C. M. (2016b). Openness for learning quality and change by Open Education in theory and practice - Overview, history, innovations and policies: How can Open Learning, OER and MOOCs achieve impact for earners, organizations and in society? In T. Amiel (Ed.), *Utopias and Dystopias in Education*. Sao Paulo: UNICAMP.
- Stracke, C. M. (2017a). Education Changes and e-Learning in Europe and worldwide: The Need for Open Education and Quality. Keynote at Symposium of the Korean National Open University, Seoul, Korea. <http://hdl.handle.net/1820/8626>
- Stracke, C.M. (2017b) Open Education and Learning Quality: The Need for Changing Strategies and Learning Experiences. In Proceedings of 2017 IEEE Global Engineering Education Conference (EDUCON). IEEE Xplore. pp. 1044-1048. DOI: 10.1109/EDUCON.2017.7942977
- Stracke, C.M., Kameas, A., Vassiliadis, B., Sgouropoulou, C., Texeira, A.M., Pinto, M., & Vidal, G. (2017). The Quality of Open Online Education: Towards a Reference Framework for MOOCs. In Proceedings of 2017 IEEE Global Engineering Education Conference (EDUCON) (pp. 1712-1715). IEEE Xplore. DOI: 10.1109/EDUCON.2017.7943080
- Stracke, C. M., & Tan, E. (2018). The Quality of Open Online Learning and Education: Towards a Quality Reference Framework for MOOCs. In J. Kay, & R. Luckin (Eds.), *Rethinking learning in the digital age. Making the Learning Sciences Count: The International Conference of the Learning Sciences (ICLS) 2018* (pp. 1029-1032). London: International Society of the Learning Sciences.
- Stracke, C. M., Kameas, A., Vassiliadis, B., Sgouropoulou, C., Texeira, A. M., Pinto, M., & Vidal, G. (2017). The Quality of Open Online Education: Towards a Reference Framework for MOOCs. In Proceedings of 2017 IEEE Global Engineering Education Conference (EDUCON) (pp. 1712-1715). IEEE Xplore. DOI: 10.1109/EDUCON.2017.7943080
- Stracke, C. M., Tan, E., Texeira, A. M., Pinto, M., Kameas, A., Vassiliadis, B., & Sgouropoulou, C. (2018a). Gap between MOOC designers' and MOOC learners' perspectives on interaction and experiences in MOOCs: Findings from the Global MOOC Quality Survey. In M. Chang, N.-S. Chen, R. Huang, Kinshuk, K. Moudgalya, S. Murthy, & D. G. Sampson (Eds.), *Proceedings 18th IEEE International Conference*

on *Advanced Learning Technologies (ICALT)* (pp. 1-5). IEEE: Computer Society. DOI 10.1109/ICALT.2018.0000

Stracke, C. M., Tan, E., Teixeira, A., Pinto, M., Vassiliadis, B., Kameas, A., Sgouropoulou, C., & Vidal, G. (2018b). Quality Reference Framework (QRF) for the Quality of Massive Open Online Courses (MOOCs). [http:// www.mooc-quality.eu/QRF](http://www.mooc-quality.eu/QRF)

Talmo, T. M., Voaidas, B., Stoica, A., Vacanti, F., Perifanou, M., Arnaudov, E., Teterewa A., Borniger, J. & May, A. (2016). Language Massive Open Online Courses: Report on LangMOOCs pilot courses. LangMOOC. <https://www.langmooc.com/wp-content/uploads/2016/11/Helegreia-knut-v8.pdf>

Täuscher, K. & Abdelkafi, N. (2017). Scalability and robustness of business models for sustainability: A simulation experiment. *Journal of Cleaner Production*. 170. 10.1016/j.jclepro.2017.09.023.

Teixeira, A. & Jensen, D. (2016). Europe embraces MOOCs - A prospective analysis on the way ahead. In Ubachs, G. & Konings, L. (eds.) (2016). *Enhancing European Higher Education: Opportunities and impact of new modes of teaching*. Overview of papers on enhancement of European Higher Education as presented during the Online, Open and Flexible Higher Education Conference in Rome, October 2016. European Association of Distance Teaching Universities (EADTU). <https://oerknowledgecloud.org/content/europe-embraces-moocs-prospective-analysis-way-ahead>

Teixeira de Sampayo, M., Sousa-Rodrigues, D., Jimenez-Romero, C. & Johnson, J. (2014). Peer assessment in architecture education. Paper presented at 14th International Conference on Technology, Policy and Innovation (9-12 September), Brno, Czech Republic

Tight, M. (2015). Theory development and application in higher education research: the case of academic drift. *Journal of educational administration and history*, Vol. 47, No 1, 2015.

Traeger, C. (ed.) (2015). Exploiting MOOCs for Access and Progression into Higher Education Institutions and Employment Market. <https://moonliteproject.eu/wp-content/uploads/2019/01/Moonlite-O3-report-final.pdf>

TraMOOC. (n.d.). Translation for Massive Open Online Courses. <http://tramooc.eu/>

Treadway, J., Ayala, C., & Dick, G.N. (2013). Harnessing "MOOCs" – can they be part of MBA courses? Proceedings. Paper 7. <http://aisel.aisnet.org/siged2013/7>

Tricco, A. C., Anthony, J., Zarin, W., Strifler, L., Ghassemi, M., Ivory, J., Perrier, L., Hutton, B., Moher, D. & Straus, S. E. (2015). A scoping review of rapid review methods. *BMC Medicine* 13(224). <https://doi.org/10.1186/s12916-015-0465-6>

Truyen, F. (2016). MOOC @ KU Leuven: an ICT perspective . In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU. http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf

- Ubachs, G. & Konings, L. (eds.) (2016). Enhancing European Higher Education “Opportunities and impact of new modes of teaching”. Overview of papers on enhancement of European Higher Education as presented during the Online, Open and Flexible Higher Education Conference in Rome, October 2016. European Association of Distance Teaching Universities (EADTU).
<https://repositorio.ipl.pt/bitstream/10400.21/7346/1/Daring%20to%20do%20differently%20innovative%20experiences%20in%20teaching%20&%20learning%20methods.pdf#page=963>
- Vacanti, F., Ciaperoni, S., Perifanou, F., Bekiaridis, G., Martinez, I., Gomez, P. Talmo, T. M., Mitchell, M. & Inayat, M. (2015). Language Massive Open Online Courses Research report on MOOCs Pedagogical framework. LangMOOC.
https://www.langmooc.com/wp-content/uploads/2016/12/Research_report_MOOCs_Pedagogical_framework.pdf
- Van Dijck, J. & Poell, T. (2015). Higher Education in a Networked World: European Responses to U.S. MOOCs. *International Journal of Communication* 9: 2674–2692.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2645629
- van Valkenburg, W. (2016). The Impact of DelftX MOOCs. In: Jansen, D. & Konings, L. (eds.). European Policy response on MOOC opportunities. EADTU.
http://eadtu.eu/images/publicaties/European_Policy_response_on_MOOC_opportunities_June_2016.pdf
- Volkman C., Goia (Agoston) S.I., Hadad S. (2018) Social Entrepreneurship Across the European Union: An Introduction. In: Dima A. (ed.) *Doing Business in Europe. Contributions to Management Science*. Springer, Cham. https://doi.org/10.1007/978-3-319-72239-9_10
- Vossensteyn, H. J. J., Huisman, J., Muehleck, K., Kolster, R., Seeber, M., Gwosc, C., Vukasovic, Ayalew, Y. (2018). Promoting the relevance of higher education: Annex 3: Country Fiches. European Union. <https://doi.org/10.2766/952691>
- Vrillon, E. (2017). Vers une démocratisation de l’éducation et de la formation par les MOOC? Étude des caractéristiques des utilisateurs de la plateforme. France Université Numérique. Recherches en éducation, Université de Nantes. pp.138-155.
- Vrillon, E. (2018) De l’égalité formelle aux usages réels: déterminants et effets du suivi des MOOC dans les trajectoires socioprofessionnelles. Phd Thesis. Université de Bourgogne. <https://nuxeo.u-bourgogne.fr/nuxeo/site/esupversions/94119bbe-c4e1-4698-b05d-da13806589df>
- Weller, M. (2011). A pedagogy of abundance. *Spanish Journal of Pedagogy*, 249 pp. 223–236
- Weller, M. (2015). MOOCs and the Silicon Valley Narrative. *Journal of Interactive Media in Education*, 2015(1), p.Art. 5. <http://doi.org/10.5334/jime.am>
- Wilson, K. E., Vyakarnam, S., Volkman, C., Mariotti, S. and Rabuzzi, D. (2009). Educating the Next Wave of Entrepreneurs: Unlocking Entrepreneurial Capabilities to Meet the Global Challenges of the 21st Century. World Economic Forum: A Report of the Global Education Initiative, April 2009.

SSRN: <https://ssrn.com/abstract=1396704> or <http://dx.doi.org/10.2139/ssrn.1396704>

Whitaker, J., Randolph New, R., & Ireland, R. D. (2016). MOOCs and the Online Delivery of Business Education What's new? What's not? What now? *Academy of Management Learning & Education* Vol. 15, No. 2.

<https://doi.org/10.5465/ame.2013.0021>

White, Su, Davis, Hugh C, Dickens, Kate, León Urrutia, Manuel, & Sánchez-Vera, Maria del Mar. (2015). MOOCs: what motivates the producers and participants? In S. Zvacek, M. T. Restivo, J. Uhomoihi & M. Helfert (Eds.), *Computer Supported Education: 6th International Conference, CSEDU 2014*, Barcelona, Spain, April 1-3, 2014, Revised Selected Papers (pp. 99- 114). Cham: Springer International Publishing.

Witthaus, G., Inamorato dos Santos. A., Childs, M., Tannhäuser, A., Conole, G., Nkuyubwatsi, B., Punie, Y. (2016) Validation of Non-formal MOOC-based Learning: An Analysis of Assessment and Recognition Practices in Europe (OpenCred). EUR 27660 EN; doi:10.2791/809371

Witthaus, G., Childs, M., Nkuyubwatsi, B., Conole, G., Santos, A.I. and Punie, Y. (2015) An assessment-recognition matrix for analysing institutional practices in the recognition of open learning. *eLearning Papers* 40, 32–42

Yousef, A. M. F., Chatti, M. A., Schroeder, U., Wosnitza, M., Jakobs, H. (2014). MOOCs - A Review of the State-of-the-Art. In Proc. CSEDU 2014 conference, Vol. 3, pp. 9-20. INSTICC, 2014. <https://oerknowledgecloud.org/content/moocs-review-state-art>

Yuan, L. & Powell, S. J. (2013). MOOCs and disruptive innovation: Implications for higher education. *eLearning Papers* 33. DOI: 10.13140/2.1.5072.8320

Yuan, L. & Powell, S. J. (2015). Partnership Model for Entrepreneurial Innovation in Open Online Learning. *E-learning Papers*, 41. <https://e-space.mmu.ac.uk/619528/>

Appendix: Reporting Tool

[GUIDANCE]

Your organisation has been assigned material to review

- *You should complete one record for each piece of evidence*
- *- If you find additional evidence which seems important, just create a new record. (You will have to add the citation for these because they won't be on the list)*
- *In some cases you might need to look up the evidence yourself*
- *Since citations are recorded in the metadata, you need provide only a page reference for each response where you extract data or a quote*
- *Remember that the purpose of the REA is to extract relevant data. You do not need to summarise evidence as a whole or write large amounts.*
- *However, you should extract all relevant data for the key interest areas of the project (or explain why this evidence is not relevant)*
- *The simplest way to do this is to cut and paste quotes and sections from the source materials (providing page references)*

Process:

- *Complete section 1 for all evidence*
- *Complete section 2 for research evidence*
- *Complete section 3 for all evidence - likely to either A, B or C depending on the evidence under consideration*
- *It's fine to complete multiple parts of section 3 if relevant*
- *Complete section 4 for all evidence*

In general you should use your own judgement with regards to relevant details, but it is better to include things if unsure. Where you see "(Cite or summarise)" you can either cut and paste material or write your own summary but please include a page reference either way.

[TOOL]

0. Reviewer Information

- Name / Initials
- Organisation

1. Metadata

- Citation
 - o Provide full citation
- Format [drop-down]
 - o Journal Paper
 - o Conference Paper
 - o Book
 - o Book Chapter
 - o Report
 - o Policy
 - o Website
 - o Other

- Sector (focus of evidence) [drop-down]
 - o Primary (Agriculture, Natural Resource Management)
 - o Secondary (Manufacturing, Engineering & Construction)
 - o Tertiary (Service Industries)
 - o Quaternary (Education & Research)
 - o Quinary (Government, Policy, Senior Leadership)
- Population
 - o Describe the population that is the focus of the evidence (e.g. a stakeholder group or groups)
- Scale [drop-down]
 - o Micro (Institutional / Regional)
 - o Meso (Federal / National)
 - o Macro (International / Continental)
- Glossary
 - o Please add any words you found in this evidence which you believe should be added to the project glossary

2. Research Evidence

- Research Design [drop-down]
 - o Meta-analysis of Randomized Controlled Studies
 - o Randomized Controlled Study
 - o Uncontrolled Study
 - o Survey
 - o Case Study
 - o Literature Review
 - o Theoretical Paper
 - o Other
- Sample
 - o Please provide a description of the sample used in this research
- Main Findings
 - o What were the key relevant research outcomes from this evidence?
- Context
 - o Please record additional relevant contextual factors here
- Important Quotes
 - o Please provide a few key quotations from the resources, providing full citations
- Limitations
 - o What are the limitations of the study?

3. Data Extraction

A. MOOC Innovations, Best Practice & Challenges

- The MOOC Offer
 - o For this evidence, what are the main ways in which MOOCs differ from other approaches to online teaching? [drop-down]
 - Accreditation
 - Adapting MOOCs for blended and/or local context

- Continuing Professional Development
 - Impact on learning and on learners
 - Learner behaviour, including retention and progression
 - Learning design
 - MOOC educators: understanding and developing their skills
 - Openness: benefits, constraints and approaches
 - Personalisation: implementation, AI and machine learning
 - Quality assurance and recognition of MOOCs and open learning
 - Social learning: discussion and interaction
 - Widening access and participation: diversity and inclusion
 - None of these / not relevant
 - Other
- MOOC innovation
 - Describe the innovations associated with MOOCs in this evidence
 - Challenges: Pedagogical
 - What were the main challenges from a pedagogical or teaching perspective? (Cite or summarise)
 - Challenges: Learners
 - What were the main challenges from the perspective of learners? (Cite or summarise)
 - Challenges: Institutional/Economic
 - What were the main challenges from an institutional perspective (Cite or summarise)
 - Challenges (Other)
 - Record any additional challenges identified here
 - Best Practice (Production)
 - What are the recommended practices for designing/building/curating content for MOOC? (Cite or summarise)
 - Best Practice (Delivery)
 - What are the recommended practices for delivering MOOC content or facilitating learning? (Cite or summarise)
 - Best Practice (Evaluation)
 - What are the recommended practices for evaluating MOOC effectiveness and learning? (Cite or summarise)
- B. Employability, innovation and entrepreneurship in European labour markets
- Drivers (Employability)
 - What are the key factors associated with improving employability prospects? (Cite or summarise)
 - Drivers (Innovation)
 - What are the key factors associated with improving innovation prospects? (Cite or summarise)
 - Drivers (Entrepreneurship)
 - What are the key factors associated with facilitating entrepreneurship? (Cite or summarise)
 - Barriers (Employability)

- What are the key factors associated with limiting employability prospects? (Cite or summarise)
- Barriers (Innovation)
 - What are the key factors associated with limited innovation prospects? (Cite or summarise)
- Barriers (Entrepreneurship)
 - What are the key factors associated with inhibiting entrepreneurship? (Cite or summarise)
- Barriers (Other)
 - Record any additional information about drivers/barriers here (Cite or summarise)

C. MOOCs supporting continuous education and continuing professional development in Europe

- Accreditation (Formal)
 - What forms of formal accreditation could be provided to MOOC learning? (Cite or summarise)
- Accreditation (Non-formal)
 - What forms of non-formal accreditation could be provided to MOOC learning? (Cite or summarise)
- Policy recommendations
 - What are the key policy recommendations made in this evidence? Please reproduce them here with citation(s).
- Educational Institutional Practice
 - What are the key recommendations made for how educational institutions should adapt their offer to support continuous education through MOOCs? (Cite or summarise) What recommendations are made about supporting continuous professional development through MOOCs? (Cite or summarise)
- CPD/CVT/CE
 - What recommendations are made about supporting training and skills development through MOOCs? (Cite or summarise)
- Training
 - What recommendations are made about supporting training and skills development through MOOCs? (Cite or summarise)
- Technology Impact
 - What is the anticipated effect of future technologies on MOOCs? (Cite or summarise)
- Services
 - What kinds of additional services are proposed to support MOOCs? (e.g. proctoring exams, tutoring, hosting, IT services, instructional design, analytics, etc.)
- Collaboration Models
 - What new forms of collaboration between stakeholders are indicated?
- Business Models

- Describe the business models that are indicated

4. Evaluation & Reflection

- How important is this evidence for the EMC-LM project? Please provide a score of 1-10 where 10 is most important
- You can record any additional thoughts on the evidence/recommendations made here