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MOOCs and upskilling in Australia: A qualitative literature study

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Abstract: Access to digital technology has demonstrated the ability to change learning in the workplace with easily available resources and flexibility through often self-paced learning environments, offering employees the ability to take control of their learning experiences. The scarce existing body of research suggests that "specialised" MOOCs may be an effective means of upskilling the workforce. Whilst MOOCs offer a convenient, scalable and cost-effective means for businesses looking to increase or update skills within their workforce, much uncertainty still exists about both Australian employers' and employee perceptions and attitudes towards the use of MOOCs as a way of addressing the skills gaps. The aim of this study was to explore the potential for MOOCs in addressing the skills gaps in the Australian workforce through a systematic qualitative review of the literature. In total, 19 research and media articles were reviewed. Three major themes emerged: MOOCs and flexibility for learning, MOOCs for on-demand, lifelong learning in a rapidly changing workplace, and credentialing of MOOCs towards a formal qualification. This study aims to contribute to this growing area of research by exploring the extent to which MOOCs might help address skills shortages and upskill employees in an Australian context.

ABOUT THE AUTHORS

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PUBLIC INTEREST STATEMENT

This research provides a qualitative literature review on the use of Massive Online Open Courses (MOOCs) to bridge the skills gap, from an Australian context. The term "skills gap" refers to the divide in the skills employers seek and the skills attained by university graduates. Access to digital technology has demonstrated the ability to transform learning practices in the workplace but the uptake of this by Australian employers is currently unknown. MOOCs offer a way to provide training that is flexible, accessible, delivered on-demand and can be utilised by employers to address the skills gap. This literature review identified three emergent themes suggesting that MOOCs are able to offer flexible and lifelong learning in the rapidly changing workforce. However, in Australia, there is still work to be done as evidence indicates that managers and employers are not yet using MOOCs to upskill employees in the workforce or for hiring decisions.

1. Introduction

As technologies, services and markets are in constant evolution, levels of skills needed for new jobs and career development are incessantly changing (Confederation of British Industry (CBI) 2016, p.13). This trend to develop skills, according to the 2016 survey conducted by the Confederation of British Industry, is set to increase year on year (CBI 2016, p.13). In order to accommodate these changes, the survey suggests the "best avenue to employment and income security lies through gaining and applying skills" (p.13). The correlation between skills and increased prospects for employability is impacted through the opportunities by which to gain skills. Research on labour statistics in the U.S. shed light on this by indicating the clear connection between opportunities for skills-based education, employability, and career advancement (Bureau of Labour Statistics, 2015). Although such connections between gaining skills-based education and greater employability are evident in work environments, studies often suggest the opposite exists in practice. That is, a mismatch exists between attaining relevant skills or a persistence of skills shortages occurs which hinders employment (Shah, 2017; Hays, 2016, p.26), thus leading to a critical concern for businesses due to consequently affecting productivity and business growth.

Examples can be seen across the globe which indicate this correlation between "upskilling" and employment. In 2016 in the United Kingdom, for instance, 72% of large companies and 49% of Small and Medium Enterprises (SMEs) were experiencing technology skills gaps (Digital Skills for the UK Economy Report, 2016, p.4). A total of 93% of technology companies found that digital skills gaps affected their commercial operations, costing the UK economy an estimated £63 billion a year in Gross Domestic Product losses (Blackwood, 2016). On a similar note, the Confederation of British Industry survey indicated that the proportion of businesses that were not confident in their abilities to recruit high-skilled people had climbed to more than 69% in 2016 (Confederation of British Industry, 2016, p.14). This trend was again evident across other parts of the world as recently as 2018, through a survey by Manpower Group which indicated that employers in Japan (89%), Taiwan (78%), Hong Kong (76%) and Singapore (56%) could not hire the right talent (Manpower Group, 2018, p.5). In Canada, the Canadian Federation of Independent Business (CFIB) reported 407,000 unfilled jobs in the first quarter of 2018, particularly in sectors such as personal services (4.8%), construction (3.6%), hospitality (3.3%) and enterprise management (3.2%) (CFIB 2018). Similarly, according to the European Parliament's Committee on Employment and Social Affairs (Dlabajová & Nekov, 2017, p.7), 40% of European employers said they were unable to find people with the skills they required in order to grow and innovate. A total of 26% of EU adult employees lacked the skills they needed for their job (p.7) and by 2025, 49% of all job openings in the EU would require high-level qualifications (p.6). This phenomenon also impacted Australia as it was found that long-term unemployment, skills shortages, and talent mismatch were key pressures (Hays, 2016, p.26).

In relation to the mismatch between upskilling an employment, the inflexibility of tertiary institutions to quickly adapt to changes in the global economic environment and correlate industry needs is also a recurrent theme in the literature. The European Parliament's report on the New Skills Agenda for Europe focuses on the need for closer cooperation between the education sector and the labour market in addressing the existing skills mismatch (Becker et al., 2017 p.21). Kinash and Crane (2015) conducted research which indicated that "numerous employers expressed a belief that universities are confined by long-standing structures and systems and are not keeping up with the times to adequately prepare students for graduate employability" (p. 163). An earlier study by Jackson and Chapman (2012) highlighted this in an Australian context through its research on non-technical skill gaps for Australian business graduates, which concluded that

there was a pressing need to "review certain areas of business undergraduate curricula, pedagogical strategies in developing these skills and/or any institutional factors hindering current practice" (p.21). Focusing again on the Australian context, another study indicated that new graduate full-time employment outcomes were very poor, resulting in the proportion of recent graduates in full-time employment dropping from 89% to 67% between 2008–2014 with that level of mismatch increasing in subsequent years (Karmel & Carrol, 2016).

The inadequacy in the provision of skills leading to opportunities for employment recently led the Australian government to address their concerns for the skills gap to be bridged by the use of MOOCs. The Australian Government Trade and Investment Commission authored a National Strategy for International Education outlining the need for Australia to embrace the opportunities that technology offers for "borderless learning." The roadmap suggests that MOOCs will have an important role in collaborating with business to address the global skills gap and meet the increasing demand for online competency-based pathways (Australian Trade and Investment Commission, 2015).

With this notable shift towards MOOCs and given the dearth of information on employer perspectives of MOOCs in Australia, this paper seeks to shed light on the extent to which MOOCs might help address skills shortages and upskill employees in the Australian context.

1.1. Background

In examining the skills gap phenomenon, it appears that employers are playing a prominent role towards the need to address inadequate or lack of skills for employability, which they observe with recent graduates. In 2016, the UK government commissioned two major reviews on employability and skills of Sciences graduates: The Shadbolt Review (2016) and the Wakeham Review (2016). The Shadboldt Review focused on the employability of computer science graduates. The Wakeham Review considered the skill requirements of employers, as well as the relevance of Science, Technology, Engineering and Mathematics (STEM) knowledge and skills for industry. Key findings from these reviews (Blackwood, 2016 p.19, reproduced below) indicated that:

- "Employers are looking for "work-ready" graduates, who can apply their academic studies and abilities in a commercial or work context.
- The industry is changing at a rapid rate. This presents a dilemma for universities and colleges if they try to keep up with industry demands.
- Graduates need to upskill and adapt to a changing jobs market. Their degree will only get them in so far in a career that may span 50 years."

Confirming employers' awareness of graduate skills gaps, in 2015, accountancy firm Ernst & Young (EY) announced that it would drop degree classification as an entry criterion for its hiring programmes. Internal longitudinal research had revealed that success in higher education did not guarantee success in EY's graduate programmes (Havergal, 2015). In fact, a Pew Research Centre report argued that "within the next decade, education systems will not be up to the task of adapting to train or retrain people for the skills that will be most prized in the future" (Rainie & Anderson, 2017, p.7). The finding above indicates that employers are driving a demand for a future workforce that is responsive to change and for people with the ability to adapt. Due to this, on-demand learning and regular upskilling will become the new norm of the professionalised workforce. Additional facets of the skills gap phenomenon and requirements for adaptable on-demand learning options to attain upgraded skills, are considered through literature pertaining to "the skills gap"; "MOOCs and employers"; MOOCs and the workplace"; "benefits of MOOCs" and "MOOCs and hiring."

1.1.1. The skills gaps

A divide between the skills employers seek and the skills attained by graduates and the subsequent need of businesses to bridge this gap by investing in skills training for their employees, is

a growing phenomenon that has been highlighted in numerous studies and surveys (Harris, 2013; Kaka, Madgavkar, Manyika, Bughin, & Parameswaran, 2014; Mourshed, Patel, & Suder, 2014). Desirable skills include, but are not limited to, a combination of technical, cognitive, and non-cognitive skills such as inter- and intra-personal competencies (Hora, Benbow, Oleson, & Wang, 2015). Alony, Kaye, and Lambert (2015) described a successful approach to embed MOOCs in academic programs to address math skills at the University of Wollongong and in the community.

A report commissioned by DeakinCo (2017) honed in on a "soft skills gap" contributing to the difficulty many companies reported in filling both entry-level and leadership positions. The demand for transferrable skills in an increasingly globalised and digitised world is growing, particularly "transversal and transferable skills such as social skills, intercultural skills, digital skills, problem-solving, entrepreneurship and creative thinking" (Becker et al., 2017 p.8) are key for occupations like managers and professionals. This trend is not restricted to a specific business segment. Rather, the attainment of a diverse skill set is desired across many sectors and is in greatest demand when examining potential hires for their organisations. Nick Deligiannis of Hays, Australia, and New Zealand cautioned that in light of recent trends in the Australian labour market, "employers must not be complacent in the face of increasing skills shortages" (Hays, 2016, p. 26).

1.1.2. MOOCs and employers

Whilst Massive Open Online Courses (MOOCs) offers convenient and cost-effective means for businesses to increase or update skills within their workforce (DeZube, 2017; Ferriman, 2015), there are currently few research studies investigating employers' perceptions of MOOCs. This is important to understand the value of MOOCs and as to whether they positively impact upon hiring decisions (Svantesson, 2014). According to a study by Duke University and RTI International on 103 North Carolina employers' receptivity to the use and attitudes toward MOOCs (Radford et al., 2014), 59% were using, considered using, or could see their organisation using MOOCs in recruiting, and more than 83% reported positive views for using MOOCs as professional development tools. Shah (2017) noted a "decisive shift to focus on 'professional' learners who are taking these courses for career-related outcomes" (para.5) as "the market size for corporate learning is easily in the tens of billions of dollars annually" (para.12). Van Kleef Conley (2018), Senior Program Manager at Google explained how challenging finding qualified candidates for IT support roles was and how she decided to develop, internally, a short certifying professional training course for IT interns and full-timers, currently open to the public and offered on Coursera as the Google IT support Professional Certificate.

1.1.3. MOOCs and the workplace

MOOCs are also increasingly recognised in the workplace as a positive tool for the professional development of new and advanced staff. A study by Garrido et al. (2016) of MOOC usage for professional workforce development outcomes in Colombia, the Philippines, and South Africa indicated that employers had generally positive perceptions about MOOCs for advancing or starting careers. HarvardX and MITx data (Ho et al., 2014) suggested that participants used MOOCs to improve their professional or personal knowledge. Evidence of the increasing use of MOOCs by employers and employees demonstrates a trend towards recognition of the need for more affordable, updated and convenient professional development. A survey of 52,000 MOOC users by Zhenghao et al. (2015) has shown that an "overwhelming majority of people who complete MOOCs report career or educational benefits." Steve Halligan, Chief Operating Officer of N2grate, indicated that MOOCs were a "key piece" for his company as they offered "ongoing, flexible content to sharpen skill development" (DeZube, 2017, para.9). However, there remains anecdotal evidence that the adoption of MOOCs for upskilling has not been fully embraced by HR managers and is largely a "bottom up" movement (Friedl, Staubitz, & Jansen, 2018, p. 69).

1.1.4. Benefits of moocs

People with higher levels of education were most likely to benefit more from taking a MOOC to upskill whereas those in lower-skills jobs from lower socio-economic backgrounds were benefiting more from taking a MOOC to reskill and transition to a higher-skills job. A survey by Dillahunt, Ng, Fiesta, and

Wang (2016) showed that participants used MOOCs for employment for the following benefits: "easy to access resources; to improve their skills in their current lines of work; to enhance their credibility; and to better understand the operations of their existing workplace" (p. 242). As the cost of professional development programmes offered by universities continues to rise, so too does demand from employees for lower cost, flexible, self-paced online means of learning to improve their skillset. The results of the CBI Survey (Confederation of British Industry, 2016) showed that the great majority of businesses either valued academic and vocational qualifications without a particular preference between them (45%) of preferred recruits to hold a mix of both academic and vocational qualifications (27%). MOOCs could therefore "offer the needed skills and thus act as a bridge between an academic education delivered by secondary schools and universities and the needs of the labour market for all levels of training" (Manceli, Georgilas, & Petridis, 2015). Whilst Mumme and Cameron (2019) investigated how MOOCs could help Australian VET and higher education graduates prepare to work, Paton, Fluck, and Scanlan (2018) study indicated higher retention rates in MOOCs designed by the Vocational Education and Training (VET) sector in Australia.

In fact, according to a Kaggle report of full time employed data scientists, 32% had started learning data science through a MOOC (DeNisco, 2017). A white paper in Singapore (Choy & Tay, 2016) indicated that approximately 5% of the unemployed workforce were "joining Udemy MOOCs to upgrade their skillsets" (p.14). A Report for the Tertiary Education on micro-credentials as a model for engineering education (Mischewski, 2017) argued that MicroMasters were "well-suited to evidencing soft skills and enabling professionals to demonstrate the currency of their professional skills" (p.14). A European Round Table of Industrialists (ERTI 2017) report of 50 CEOs and Chairpersons of multinational companies indicated that 90% of Vodafone's in-company learning was done online (p.10), and in 2017, Nestlé offered its leadership course five times per year online to more than 400 people (p.11).

1.1.5. MOOCs and hiring

While employers recognise the potential for MOOCs to enable flexible learning in the workplace, there remains a reluctance when it comes to recruitment. A survey of 222 human resource, corporate learning, and talent development professionals found that 44% of respondents were interested in both creating internal MOOCs and curating external MOOCs (Meister, 2016, p.25). According to the survey however, only 3% were planning to use MOOCs for recruiting new hires (Meister, 2016, p. 26). In Europe, the potential of MOOCs to enhance employability skills and decrease unemployment rates have been acknowledged. Whitthaus et al. (2016) argued that some European MOOC platforms had been specifically designed to "increase learners' employability" (p. 22). For instance, "MOOCs for Web Talent Network" was launched in 2014 to discuss certification and recognition of MOOCs to increase the employability of the European workforce. In Spain, an initiative called "Google Actívate" launched a series of MOOCs to teach digital skills to young-unemployed people to help solve the unemployment problem in the country (p. 22). As the unemployment rate in Australia in 2019 sits at 5.2% (Australian Bureau of Statistics, May), a similar initiative could be established to upskill and reskill unemployed people into new areas of employment. In the U.S. and France, MOOCs are used as part of corporate training because, it is argued, they offer "higher quality standards than traditional e-learning, at lower cost" (p. 41). A survey in North Carolina of 103 employers, recognised that MOOCs could be used for recruitment, especially for staff with technical skills in high demand (p. 40) and 83% of employees considered using (or could see their organisation using) MOOCs for professional development (Radford et al., 2014). The question has also been raised as to whether MOOCs could be used as a database to recruit potential employees, since MOOC participants (such as Coursera' Career Service) could opt to have their contact information passed onto employers.

1.1.6. Summary

In Australia, employers are working at ensuring that their employees' skills remain relevant, up-to-date and are coming up with an alternative, cheaper, more flexible and at scale continuing professional development options. In an ever-changing employment landscape, MOOCs allow employees to brush up on technical skills and familiarize themselves with updated content, at a time of their

convenience. The literature so far has shown, however, that MOOC adoption by employers and employees in Australia has been rather isolated due to the lack of recognition and an important question remains as to whether MOOCs have the potential to address employees' skills gaps.

2. Methodology

Currently, a clear gap exists in the literature around utilising MOOCs as a way to upskill potential employees particularly in an Australian context. The standard definition of a systematic review is "a literature review that uses a specific methodology to produce a synthesis of available evidence in answer to a focused research question" (Bearman et al., 2012, p.5). A qualitative systematic review was performed to answer the research question and to provide impartial synthesis and interpretation of findings (Gough, Thomas, & Oliver, 2012). The review included relevant industry reports, articles and documents to minimise bias and provide a reliable and reproducible assessment.

2.1. Theoretical framework

The literature in this field consists of a number of relevant theoretical approaches. The authors adopted the *obsolescence of knowledge and skills* as the most appropriate framework to explain the upskilling phenomenon using MOOCs investigated in this study. Kaufman (1974) described skills obsolescence as "the degree to which professionals lack the up-to-date knowledge or skills necessary to maintain effective performance in their current or future work roles." (Kaufman, 1974, p. 23). It often relates to two kinds of obsolescence: job-specific (shifts in the type of skills needed by employers) and sector-specific due to shifts in the employment market.

2.2. Research question

Our research question for this study was: "How are Massive Open Online Courses currently being used as a means to reduce the skills gap in the Australian workforce?". Addressing this, a systematic qualitative review of the literature in Australia was performed (based on Campbell principles) to search for primary research papers in the period 2013–2017 using a combination of search strings including; MOOCs, skills, and Australia in scholarly databases. Inclusion/exclusion criteria were created for critical analysis of the sources and a workflow developed to determine which sources would be used in the review. Initially, 219 articles were screened, with only 19 used for the final review. The majority of sources used were primary research articles, government or university reports which had been peer-reviewed or critically analysed and met 4–5 of the inclusion criteria.

2.3. Search strategy

The authors modelled this systematic review on the Campbell principles, which are often used in educational, justice and social welfare research communities [The Campbell Collaboration, the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI- Centre)]. An overview of the search strategy is outlined in Figure 1. The study began with an extensive search of the literature using electronic resources for existing reviews in the field of "MOOCs and upskilling." General keyword searches were performed in bibliographic databases to estimate the size of the corpus and to identify specific keywords for the search string. Six scholarly electronic databases were used for the search; Scopus, Science Direct, JSTOR, MERLOT, Sage, and Google Scholar. Original research papers were targeted between the period 2013–2017 and limited to the English language. Specific search terms such as "MOOCs and skills," "MOOCs and skills in Australia", "MOOCs, skills, Australia", "MOOCs and skills in the Australian context," "Massive Open Online Courses and upskilling," "MOOCs and upskilling Australia", "Massive Open Online Courses and employment," and "Massive Open Online Courses for professional development" where first considered. Three were finally selected by the authors, as they were highly related to the research question: "MOOCs and skills in Australia", "MOOCs and skills in the Australian context," "MOOCs and upskilling Australia".

Figure 1. On overview of the systematic review process adopted by the authors to determine which articles were included in the final data set.
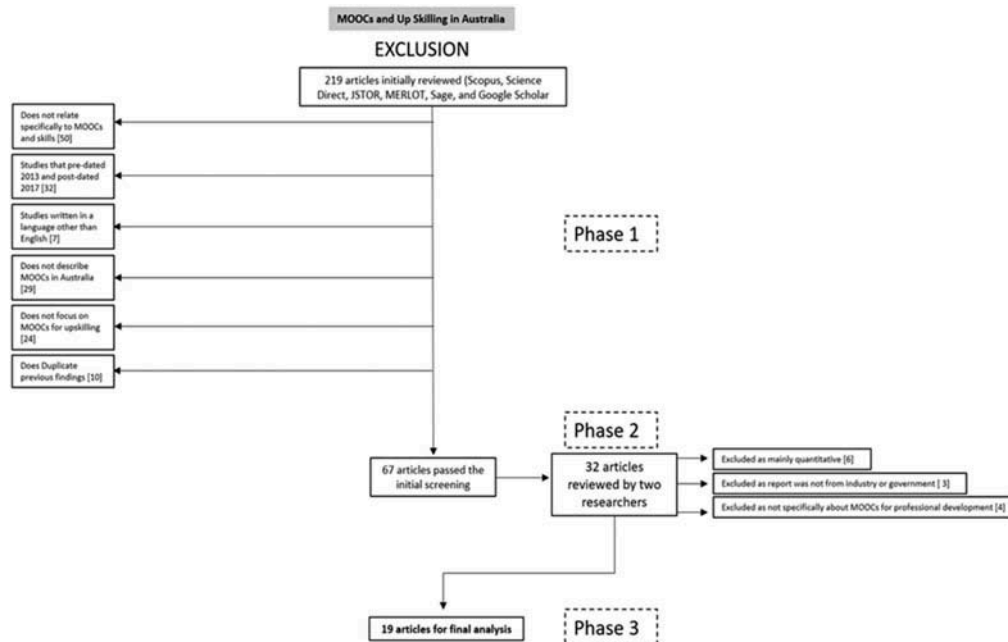
These search terms were chosen as they are commonly used to describe using MOOCs as a tool to upskill learners for employability. The authors also reviewed news media stories published in Higher Education websites such as The Conversation (Australia) or the education pages of The Australian, The Guardian, and Financial Review. The initial search resulted in 219 articles.

2.4. Inclusion/exclusion criteria

Each report, article and research paper was initially screened (title, abstract, introduction, and conclusion) to ensure that the review only included documents most relevant to the topic and to eliminate all ineligible publications. In total 219 articles were initially reviewed for relevant content. Each study needed to meet >1 of the inclusion criteria and not match any of the exclusion criteria to be included in this systematic review (Table 1). Reference lists of relevant articles were also searched to identify suitable and relevant articles. For the second phase of the review, full-text publications, reports, papers, newspaper articles, and websites were screened for information on MOOCs and higher education, workforce, employability, upskilling and industry (Table 1 and Figure 1). Those articles that did not meet these criteria, were removed from further review. Articles in disagreement about their inclusion were evaluated by at least two researchers to come to a final agreement about whether the article should be used in the study.

Table 1. Inclusion and exclusion criteria	
Inclusion	**Exclusion**
Article was original qualitative research	Does not relate specifically to MOOCs and skills
Article was peer-reviewed	Studies that pre-dated 2013 and post-dated 2017
Report was from industry or government	Studies written in a language other than English
Article was published in a HE website	Does not describe MOOCs in Australia
Use of MOOCs in higher education	Does not focus on MOOCs for upskilling
Use of MOOCs in industry	Does duplicate previous findings
Use of MOOCs in the workforce	
Use of MOOCs for professional development	

The initial review of 219 articles resulted in the removal of 152 articles from which 35 (of the remaining 67) did not meet the inclusion criteria. A total of 32 articles were reviewed again by 2 researchers with 19 articles included for the final analysis (Figure 1). Articles were excluded from the analysis based on relevance to the research question.

2.5. Screening and data extraction

Full-text documents that passed the first level of screening were classified based on the journal, date, and type (e.g., report, case study). A peer-review process was used to reduce the potential for random errors and bias; the researchers independently assessed documents for inclusion at each stage, compared and contrasted emergent themes and resolved differences through discussion at fort-nightly meetings. Independent researchers were not recruited during the screening process. Data extraction included: author, year of publication, source, themes, study design and analysis. Further indicators were used such as the use of digital technology, curriculum design and MOOCs for credentialing (Figure 1).

2.6. Analysis framework

Each article was qualitatively and iteratively analysed using open coding and axial coding and another reviewer performed a second analysis. The articles were then critically appraised and synthesized. Codes, which were similar or related, were merged. The inclusion/exclusion criteria met for each of the 19 sources is shown in Table 2.

2.6.1. Assessment of quality, rigor, and limitations of the evidence

The fact that there has been very little research in this area, particularly in the Australian context, is a major limitation of this study. Most of the reports in this paper originated from governmental agencies, universities or industry. These online sources were considered by the authors to be credible and valid, as surveys, reports, media articles and pilot studies are published and screened under ethical procedures, and examined for integrity. Currently a few studies in the published literature investigate the potential of MOOCs' for upskilling. Therefore, the conclusions to be drawn by this study cannot be compared with other similar studies. Further research should be carried out in order to establish comparisons and trends for analysis.

3. Results and findings

A total of 19 reports and documents published between 2013–2017 that address MOOCs and upskilling in the Australian context were identified and analysed: 7 research articles, 7 reviews/reports, 3 book chapters, and 2 media articles. Documents and their emergent themes are summarised chronologically in Table 3. A number of the sources chosen for the review met 4 or 5 of the inclusion criteria. For those sources that met 4 of the inclusion criteria (53%), the range of sources were reports from university or government agencies (4) primary research articles (4) or chapters from books (2). The information from these sources were considered by the authors to be reliable and credible having been peer-reviewed (research articles and book chapters) or critically analysed (reports). Three sources (15%) met 5 inclusion criteria being primary research articles (2) and a report from Australian School Management. The sources that met fewer inclusion criteria 2, (15%) were media articles or research with a pilot study and did not cover the topic areas in detail, often conveying a narrative or personal views.

4. Discussion

The purpose of this paper was to explore the potential for MOOCs in addressing skills gaps in the Australian workforce through a systematic qualitative review of the literature. Three key themes emerged and are reported on here:

  (i) MOOCs and flexibility for learning
 (ii) MOOCs for on-demand, lifelong learning in a rapidly changing workplace
(iii) Credentialing of MOOCs towards a formal qualification

Table 2. Inclusion/exclusion criteria for each of the 19 articles used in the systematic review		
Author	**Inclusion criteria**	**Theme**
Fraser and Ryan (2013)	3, 5, 6, 8	Flexibility, Workforce training
Australian Trade Commission (2013)	3, 5, 6, 7	Formal qualifications—credentials, "Rebundling", Affordability and cost reduction
Barnes (2013)	1, 2, 6, 7, 8	Scale, Librarian roles, Skills development
Fitzgibbons and Kelly (2013)	1, 2, 6, 7, 8	Continuing Professional Development (CPD), MOOCs as supplement
Freeman and Hancock (2013)	1, 2, 5, 8	Pathway into profession, Flexibility, Lifelong learning, Recognition of skills development
Vivian, Falkner, and Falkner (2014)	1, 2, 5, 8	CPD for teachers, Flexibility, Curriculum
McKay (2015)	1, 2, 5, 6	Flexibility, Professional skills development
Lambert and Alony (2015)	1, 5	Skills gaps, Self-paced resource, Scaffolding learning, Staff engagement, Customisability, Flexibility
Alony et al. (2015)	1, 2, 5, 8	CPD for academic staff, Workforce training, Capacity-building
Australian Computer Society (2016)	3, 7, 8	CPD (Information and Communications Technology/ICT)
Bliemel et al. (2016)	1, 2, 5, 6	Flexibility, Business Skills development
Davidson (2016)	3, 6, 7, 8	CPD, Flexibility, Formal qualifications—credentials, Workforce Training, Affordability
Hajkowicz et al. (2016)	3, 6, 7. 8	University's role/impact on Universities, Complement to University education, Flexibility, Affordability, MOOCSs for disadvantaged socioeconomic backgrounds
Ryan, Horton-Tognazzini, and Williams (2016)	3, 5, 6, 7, 8	CPD, Flexibility, Workforce training
Dodd (2017)	4, 5	Flexibility, Formal qualifications—credentials, On-demand learning, Fast-changing workplace, University's role/impact on Universities
Ng and McRae (2017)	1, 2, 5	Formal qualifications—credentials
Australian Government Productivity Commission (2017)	3, 7, 8	Flexibility, Affordability, Lifelong learning, Workforce training
Riley (2017)	1, 2, 5, 6	Flexibility, Formal qualifications—credentials, MOOCs' role in overcrowded markets, Supplemental training
Opray (2017)	4, 8	Lifelong learning, On-demand learning, Skills development, Workforce training post-graduation

4.1. MOOCs and flexibility for learning

The emerging need for flexibility in training and upskilling for both employers and employees was a recurring theme throughout the literature (Fitzgibbons & Kelly, 2013; Fraser & Ryan, 2013; Vivian et al., 2014). MOOCs are described as flexible, not only in time and location (travel-free), but for their ability to deliver professional development (Australian Computer Society, 2016) and upskilling in "chunks" (Lambert & Alony, 2015) and much quicker than traditional methods (Hajkowicz et al., 2016). Various professions including accounting, social work and education (Misra, 2018) use MOOCs to provide professional development for staff. Flexible delivery also allows employers to provide updated content to meet the needs of their industry (Australian Government Productivity Commission, 2017; Barnes, 2013; Davidson, 2016). A key positive reported in the literature is the responsive nature of MOOCs to be able to meet the upskilling demand without barriers such as geographical location and onerous time commitments (Australian Government Productivity Commission, 2017).

Table 3. MOOCs and upskilling: the Australian context sources for systematic review

Author (s)	Date of publication	Article Title	Source	Article type	Themes
Fraser and Ryan (2013)	2013	Could MOOCs answer the problems of teaching AQF required skills in Australian tertiary programmes?	The Australian Universities' Review	Review/Report	Flexibility Workforce training
Australian Trade Commission (2013)	2013	More than MOOCS: Opportunities arising from disruptive technologies in education	Australian Trade Commission	Report	Formal qualifications—credentials "Rebundling" Affordability and cost reduction
Barnes (2013)	2013	MOOCs: The Challenges for Academic Librarians	Australian Academic & research Libraries	Research article	Scale Librarian roles Skills development
Fitzgibbons and Kelly (2013)	2013	MOOCs as online professional development for law librarians	Australian Law Librarian	Research article	Continuing Professional Development (CPD) MOOCs as supplement
Freeman and Hancock (2013)	2013	Milking MOOCs: Towards the right blend in accounting education. (pp.86–100)	The Virtual University: Impact on Australian Accounting and Business Education, part B	Research article	Pathway into profession Flexibility Lifelong learning Recognition of skills development
Vivian et al. (2014)	2014	Addressing the challenges of a new digital technologies curriculum: MOOCs as a scalable solution for teacher professional development	Taylor & Francis Online	Research article	CPD for teachers Flexibility Curriculum
McKay (2015)	2015	Macro-Level Learning through Massive Open Online Courses (MOOCs): Strategies and Predictions for the Future	IGI Global	Book	Flexibility Professional skills development

(Continued)

Table 3. (Continued)

Author (s)	Date of publication	Article Title	Source	Article type	Themes
Lambert and Alony (2015)	2015	Embedding MOOCs in academic programs as a part of curriculum transformation: a pilot case study	University of Wollongong Research Online	Descriptive/ exploratory research with small-scale pilot	Skills gaps Self-paced resource Scaffolding learning Staff engagement Customisability Flexibility
Alony et al. (2015)	2015	MOOCs' contribution to staff development and capacity building: Australian University Case study	University of Wollongong Research Online	Exploratory research article	CPD for academic staff Workforce training Capacity-building
Australian Computer Society (2016)	2016	Australia's Digital Pulse Developing the digital workforce to drive growth in the future	Deloitte Access Economics (DAE) Report	Report	CPD (Information and Communications Technology/ICT)
Bliemel et al. (2016)	2016	The role and performance of accelerators in the Australian start up ecosystem	UNSW Business School	Research Paper	Flexibility Business Skills development
Davidson (2016)	2016	Future Tensions in Professional Associations (pp.79–83)	Relevance and Professional Associations in 2026. Chartered Accountants Australia and New Zealand	Report	CPD Flexibility Formal qualifications—credentials Workforce Training Affordability
Hajkowicz et al. (2016)	2016	Tomorrow's Digitally Enabled Workforce. Megatrends and scenarios for jobs and employment in Australia over the coming twenty years.	Australian Policy Online	Report	University's role/impact on Universities Complement to University education Flexibility Affordability MOOCSs for disadvantaged socioeconomic backgrounds

(Continued)

Table 3. (Continued)

Author (s)	Date of publication	Article Title	Source	Article type	Themes
Ryan et al. (2016)	2016	A Snapshot of MOOCs in Hospitality and Tourism	Australian School of Management	Report	CPD Flexibility Workforce training
Dodd (2017)	2017	Massive Online Open Courses are back and they're threatening universities	Financial Review, Business Education (online) pages	Media Article	Flexibility Formal qualifications—credentials On-demand learning Fast-changing workplace University's role/impact on Universities
Ng and McRae (2017)	2017	Chapter 5: MOOCs for credit. Making the idea work.	Taylor & Francis	Book Chapter	Formal qualifications—credentials
Australian Government Productivity Commission (2017)	2017	Chapter 3: Upskilling and Retraining, Shifting the Dial.	Productivity Commission Australian Government	Report	Flexibility Affordability Lifelong learning Workforce training
Riley (2017)	2017	Chapter 14: The Challenge of Massive Open Online Courses (MOOCs) to Traditional Legal Education: The Australian Experience.	Taylor & Francis	Book Chapter	Flexibility Formal qualifications—credentials MOOCs' role in overcrowded markets Supplemental training
Opray (2017)	2017	Seventeen jobs, five careers: learning in the age of automation	The Guardian	Media Article	Lifelong learning On-demand learning Skills development Workforce training post-graduation

Unsurprisingly, the ability to balance professional development with work commitments is described as a benefit of using MOOCs (Freeman & Hancock, 2013). The lower costs (Australian Trade Commission, 2013) and greater flexibility of these new approaches are identified as being particularly relevant for people who have existing job and family commitments (Dodd, 2017).

Another benefit for the users of MOOCs is the ability to gain greater access to contemporary views, up-to-date trends and practices, to enhance their professional development (Alony et al., 2015). It seems clear from their popularity that a major attraction for participants is flexible online access to "experts" in the field (Fraser & Ryan, 2013). For instance, Bogdan, Holotescu, Andone, and Grosseck (2017) report on Unicampus (http://unicampus.ro), an m-commerce MOOC, developed by a Romanian university in collaboration with three other institutions in Europe, which focuses on developing SMEs' staff m-commerce competencies.

Moreover, professional associations have identified the flexible delivery of MOOCs as a "new way for members to attain accreditation needed" (Davidson, 2016; Ng & McRae, 2017). There is an opportunity for professional associations to become more adaptable in professional education, for example, through offering and certifying unique learning experiences based on nano degrees from different education providers.

4.2. MOOCs for on-demand, lifelong learning in a rapidly changing workplace

A second theme that surfaced from our review is the ability for MOOCs to "allow people to learn what they need to know right now, which is far better suited for the twenty-first century's fast-changing workplace" (Dodd, 2017, para. 21). Owing to an accelerated pace of technological change, the labour market is undergoing significant disruption with many jobs being automated and employee skills sets quickly becoming out-of-date. In today's digital economy, workers are being challenged to continuously upskill themselves and become lifelong learners to remain competitive and employable (McKay, 2015; Riley, 2017).

A report on Australia's economic performance notes that "the online environment is well suited to the incremental acquisition of skills over a person's career, which is likely to be the key to ensuring job security as the nature of jobs and occupations evolve" (Australian Government Productivity Commission, 2017, p.97). Interviews with key experts identified MOOCs as an emerging trend that will influence the future of work, most likely as a complement to university education through the creation of better-skilled job seekers (Hajkowicz et al., 2016). In line with this, the demographic of MOOC participants seems to be shifting to the post-university workforce and individuals with traditional university degrees and significant professional experience take advantage of MOOCs to upskill, reskill, and assemble a diverse portfolio of microcredentials (Opray, 2017). Julia Stiglitz, Coursera's Vice-President argued that qualified candidates were sometimes difficult to find and that "these skill gaps often occur with 'new' skills like artificial intelligence or cloud computing" (DeZube, 2017, para.17), cybersecurity, blockchain, robotics and Big Data, which are often offered by MOOC platforms.

Relatedly, continuing professional development (CPD) is an important mechanism to ensure staff maintain their competencies and keep current with evolving standards (Australian Government Productivity Commission, 2017). MOOCs are being incorporated into CPD for various professions (Australian Computer Society, 2016; Fitzgibbons & Kelly, 2013; Vivian et al., 2014) and have the ability to impact industries where there are significant skills shortages, staff turnover, and limited opportunities to leave the workplace to undertake specialized training and development, e.g. hospitality and tourism (Ryan et al., 2016). In the context of capacity building for universities, the creation and delivery of a MOOC itself can be viewed as a professional development opportunity for academic staff, who gain new digital, technical, and pedagogical capabilities in the process (Alony et al., 2015). Moreover, MOOCs have been recognised as an emerging player in startup ecosystems where they provide essential just-in-time business skills development and valuable knowledge for aspiring entrepreneurs (Bliemel et al., 2016).

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4.3. Credentialing of MOOCs towards a formal qualification

MOOCs for credit were another theme arising from our research, defined as MOOCs that have gained recognition as credit for advanced standing into university degrees (Ng & McRae, 2017). Whilst career-applicable MOOC credentials are attractive, the transition of MOOCs as a recognised qualification has not been embraced by many universities because the complexities of a "quality" education have not been clearly identified and "success" rates of students requires further inquiry. MOOCs promote an education model that is cutting-edge, digitised, open, flipped and flexible, appealing to the twenty-first century student. MOOCs for credit entrepreneurialise higher education by making students pay for their credential but at a much lower cost than a university degree. MOOCs for credit may alter the traditional financial model of universities (Decker, 2014; Hajkowicz et al., 2016) and have potential for students and professionals to upskill without paying for a full degree (Craig, 2015). It has also been theorised that MOOCs have the potential to contribute to academia by making education more affordable and flexible (Yuan & Powell, 2013) because the qualification can be personalised with MOOCs providing the potential to "pick and mix" courses for a variety of educational outcomes (Lambert & Alony, 2015). An attractive modern CV now consists of microcredentials; "qualifications made up of several MOOCs which can be earned in a few months in online education" (Dodd, 2017, para.22). Freelance professionals favour microcredentials as they can keep up-to-date so they are well-positioned when new opportunities come along (Davidson, 2016). edX now offers 40 "MicroMasters" for US$1000–2000 giving students 25% credit towards a Master's degree at 10–20% of the cost (Dodd, 2017). Hamori (2018) argued however that only a fraction of employed participants (5%) received financial support from their employers to take a MOOC.

In Australia, MOOCs for credit are not yet formally accredited by any educational council, thus making acceptance and moderation difficult. The Australian Tertiary Education Quality and Standards Agency (TEQSA) has not approved MOOCs as complete degrees and this is the difference between American and Australian MOOCs for credit models; Accreditation would provide confidence that the MOOCs for credit are of a high standard and provide the same level of recognition as traditional face-to-face courses. In recognition of the increasing demand for micro-credentials and MOOCs, an Australian government appointed review panel has authored a position paper arguing for their inclusion within the Australian Qualifications Framework (Ross, 2019). This will address one of the main concerns regarding MOOCS for credit; how to credential informal and competency-based learning in a way that resonates with employer's expectations (Australian Trade Commission, 2013). Rosendale (2017) argued that hiring managers' perceptions towards MOOCs were mixed. According to his findings, managers in charge of hiring often preferred traditionally educated candidates with formal degrees. In 2016, the University of Queensland and the Australian National University participated in a global initiative with edX to pilot a global credit transfer system that allows students taking online courses to use them as advanced standing towards their degrees (Grove, 2016). This international collaboration could lead to an accreditation process driven by MOOC providers rather than national accreditation bodies.

5. Conclusions and implications

The aim of the present research was to review the literature related to the potential for MOOCs to address employees' skills gaps in the Australian context. Despite its exploratory nature, this study offers some insights into how MOOCs are currently or could be utilised by employees to upgrade their skills and competencies in a constantly changing environment and by professional associations to offer recognised CPD options to their members. The present study confirms previous findings in other contexts (Calonge & Shah, 2016) and contributes additional evidence that suggests MOOCs in Australia are starting to be used in various industries, as they offer flexibility, modularity, customisability, accessibility, and affordability. However, for all the benefits of MOOCs there is still little evidence in the literature that HR manager and employers are using MOOCs in either upskilling of the workforce or in hiring decisions. Quantitative research on the number of Australian's completing MOOCs could provide hiring staff with a better understanding of their

value. Confirmatory research on the positive impact on the career outcomes of MOOC users is another area for future research.

The second major finding was that the lack of formal credentials after completing a MOOC and of employer recognition was identified as a major obstacle to their propagation in workplaces in Australia. While the literature supports the view that MOOCs might help employees develop skills, there is little evidence to suggest that, as of now, MOOCs have been widely adopted by Australian employers. As noted in the literature, recognition, and confidence in MOOCs is unlikely to come without accreditation from The Australian Tertiary Education Quality and Standards Association. Equally, at present Australian employers are hesitant to move away from the preference for a bachelor degree in favour of a MOOC credential. Further qualitative research of Australian industry groups may help uncover current attitudes towards MOOC credentials.

6. Future directions

In addition to this exploratory investigation, the authors conducted preliminary qualitative data collection via an email survey of Australian human resource managers. Initial free-text comments received allows insight into the perception of the current effectiveness of MOOCs. On the question of quality, responses indicated that the lack of "accreditation" or "academic legitimacy" would be a barrier to making hiring or promotion decisions. On the question of recognition of a MOOC when making hiring or promotion decisions, the responses indicated that it would "very valuable", "viewed positively" and "favourably when the candidate presents it meaningfully". This suggests that the contextualising of the value of the MOOC is important. The responses of this small survey correspond with larger surveys of human resource managers and their reticence in using MOOCs as part of upskilling (Friedl et al., 2018; Hamori, 2019).

To understand if MOOCs will be able to deliver what employers want, there is a need for further research to evaluate their effectiveness to plug the skills gap. This qualitative research would involve surveys and interviews with human resource managers to establish a baseline understanding of the use of MOOCs in Australian organisations. It would also be useful to understand how this corresponds with corporate training expenditure. The relationship that MOOCs play in continuing professional development (CPD) and the perceived value when it comes to making hiring or promoting decisions should also be addressed by further research questions. Studies should also examine employees' perspective and use of MOOCs, as part of a "bottom up" mode of employee led upskilling (Friedl et al., 2018).

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