

5-15-2019

CROWDSOURCING FOR EDUCATION: LITERATURE REVIEW, CONCEPTUAL FRAMEWORK, AND RESEARCH AGENDA

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Recommended Citation

Prester, Julian; Schlagwein, Daniel; and Cecez-Kecmanovic, Dubravka, (2019). "CROWDSOURCING FOR EDUCATION: LITERATURE REVIEW, CONCEPTUAL FRAMEWORK, AND RESEARCH AGENDA". In Proceedings of the 27th European Conference on Information Systems (ECIS), Stockholm & Uppsala, Sweden, June 8-14, 2019. ISBN 978-1-7336325-0-8 Research Papers.

https://aisel.aisnet.org/ecis2019_rp/114

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CROWDSOURCING FOR EDUCATION: LITERATURE REVIEW, CONCEPTUAL FRAMEWORK, AND RESEARCH AGENDA

Research paper

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Abstract

Information technology (IT)-enabled, educational practices and open learning approaches are starting to transform traditional educational institutions. In particular, the use of digital platforms to engage both learners and educators in the process of knowledge co-creation and sharing is growing under the name of “crowdsourcing for education”. Although practitioners have started to develop an intuitive understanding of the particular use of crowdsourcing in and for education, we are lacking a coherent and comprehensive conceptualisation of the phenomenon. To address this void, we first provide a literature review of the emerging inter-disciplinary work on this topic based on which, we develop a theoretical conceptualisation of crowdsourcing for education. More specifically, we assess the fundamental philosophical views and assumptions that underlie the reviewed literature. After identifying and critically assessing three philosophical views (i.e., the entitative, process and practice views), we argue that a “strong” philosophical practice perspective provides the most promising theoretical foundation. Based on practice theory, we then define and conceptualise crowdsourcing for education in a coherent and comprehensive manner, re-analyse a well-documented case of crowdsourcing for education, and propose a research agenda for this new form of crowdsourcing.

Keywords: Crowdsourcing, Education, Crowdsourcing for Education, Practice Theory, Literature Review, Conceptual Framework, Research Agenda.

1 Introduction

Information technology (IT)-enabled, educational practices and open learning approaches have been changing traditional educational institutions by transforming students from mere passive content consumers to primary content creators and curators (Baggaley 2013; Whitaker et al. 2016). In particular, the use of digital platforms to engage both learners and educators in the process of knowledge co-creation and sharing is emerging under the name of “crowdsourcing for education” (Bradley et al. 2009; Chen and Luo 2014; Paulin and Haythornthwaite 2016). This new form of crowdsourcing appears as an IT-enabled educational approach in which educators involve large numbers of internal and external actors in teaching and learning (Anderson 2011; Llorente and Morant 2015).

Several compelling examples show how educators have used crowdsourcing to improve learning and teaching. For example, rather than asking his undergraduate students to write traditional one-off assignments, an Australian professor for comparative law invited his students to write and review Wikipedia articles on an issue in their field (Witzleb 2009). Wikipedia’s “Student assignments” website now provides guidelines and multiple examples where educators have used Wikipedia as a teaching and assessment tool (Wikipedia 2018). There are also compelling examples of how social media

crowds have been utilised to help with teaching and learning. For example, the social media platform BetterLesson, also known as the “Facebook for teachers”, supports more than 500,000 registered educators in the creation, management, and sharing of teaching materials and lesson plans among like-minded instructors (BetterLesson 2018; Tucker 2011). These fascinating examples illustrate a range of different platforms of crowdsourcing for education in practice.

Practitioners have started to develop an intuitive understanding of the particular use of crowdsourcing in and for education (Jiang et al. 2018). Further, empirical and design research has made initial efforts to develop promising crowdsourcing models (Barbosa et al. 2014; Mocozet and Tardy 2014), methods (de Alfaro and Shavlovsky 2014; Melville 2014), and design paradigms (Anderson 2011; Hall and Griffy-Brown 2016). However, these contributions are generally limited in terms of providing theoretical conceptualisations. While other forms of crowdsourcing such as crowdfunding, internal crowdsourcing, and crowdsourcing for research have been extensively discussed in the literature (Burtch et al. 2013; Love and Hirschheim 2017; Zuchowski et al. 2016), crowdsourcing for education has received comparatively little attention with regards to theoretical work (Jiang et al. 2018). This lack of a theory-informed conceptualisation is surprising since education is one of the core responsibilities of the academic profession (Kane and Fichman 2009).

Such a conceptualisation is important for the IS discipline, because of the uniqueness of this emerging phenomenon – that is, crowdsourcing for education (Porcello and Hsi 2013). In particular, it is the co-creation aspect that differentiates crowdsourcing from other IT-enabled educational practices (Hall and Williams 2016). Rather than making education a one-way communication, which is often the case in massive open online courses (MOOCs), or simply allowing student participation as in traditional classroom settings, crowdsourcing for education emphasises the co-creation of knowledge by students, educators, and external stakeholders (Dow et al. 2013; Heusler and Spann 2014).

The purpose of this literature review is to develop a first comprehensive conceptualisation of crowdsourcing for education to structure the discourse on how it may influence education, how the educational context requires a different crowdsourcing process, and how studying crowdsourcing for education might also inform the crowdsourcing literature in a broader sense. Based on a structured review approach (Rowe 2014; Schryen 2015; Webster and Watson 2002), we develop a theoretical conceptualisation of crowdsourcing for education. In particular, we assess the fundamental conceptual, theoretical, and philosophical views and assumptions that underlie the reviewed literature. After identifying and critically assessing three philosophical views (i.e., the entitative, process, and practice view), we argue that a “strong” philosophical practice perspective provides the most promising theoretical foundation (Gherardi 2015; Schatzki et al. 2001). Based on practice theory, we then conceptualise crowdsourcing for education in a coherent and comprehensive manner. We re-analyse one well-documented crowdsourcing for education case described in the literature through our practice-theoretical conceptualisation. Finally, building on this conceptualisation, we provide guidance for future research in the information systems (IS), but also related fields.

2 Definition and Related Concepts

In a broader, organisational context, crowdsourcing is typically referred to as “the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call” (Howe 2006). Crowdsourcing promotes strategic goals and enables competitive advantages for organisations in many forms through open innovation, open strategy, crowdfunding, and internal crowdsourcing initiatives (Brabham 2013).

For the purpose of grounding this paper in a more contextualised understanding of crowdsourcing for education, the following definition is taken from Jiang et al. (2018):

“... a type of online activity in which an educator, or an educational organization proposes to a group of individuals via a flexible open call to directly help learning or teaching” (p. 10).

This definition captures a number of characteristics that make crowdsourcing for education both distinct from other means of online collaborative education such as MOOCs as well as from other forms

of crowdsourcing: the online activity enabled by IT platforms, the educational context in various forms, the open call to the crowd, and the educational purpose of learning and teaching.

As such, crowdsourcing for education is different from MOOCs. Although both ideas share some common features, crowdsourcing for education displays a set of unique characteristics with regards to its IT structure, means of openness, and the nature of the crowd (Prpic et al. 2017). MOOCs are typically distinguished into those that focus on scalability (xMOOCs) and those that emphasise community and connections (cMOOCs) (Daniel 2012). xMOOCs are characterised by a traditional course structure with clear aims of completing the course. The educator is the expert provider and students are typically represented as consumers making education a one-way communication (Daniel 2012; Prpic et al. 2017). cMOOCs on the other hand emphasise a connectivist pedagogy trying to connect learners and build a community. The students participate in joint projects and help each other to answer questions (Daniel 2012; Prpic et al. 2017). Crowdsourcing for education, however, is different to both types of MOOCs. It is based on co-creation of knowledge rather than a one-way communication from the educator to the students (Battrawi and Muhtaseb 2014; Porcello and Hsi 2013). It also goes beyond a mere participation of students in educational activities to co-creation of meaning in practice with educators, students, and external stakeholders (Bryant 2015; Lewis et al. 2010). Altogether, while there appears to be salient overlaps between the concepts of crowdsourcing for education and other online collaborative learning approaches, a comprehensive discussion of the concept of crowdsourcing for education presents an opportunity to clarify some of the confusion around the two distinct fields.

Although the literature on crowdsourcing has at times employed a variety of terms and definitions (see Estellés-Arolas and González-Ladrón-de-Guevara (2012) for an extensive review), crowdsourcing in educational contexts appears as a new and in many ways unique form of the broader phenomenon. Jiang et al. (2018) have identified a few characteristics that differentiate crowdsourcing for education from crowdsourcing in organisational contexts such as the nature and variety of the crowd or the purpose and motivations to contribute in the crowdsourcing process. Following from the discussion above, we conclude that crowdsourcing in education is challenging our current understanding of the phenomenon and is a relevant form of crowdsourcing in need of comprehensive theoretical inquiry.

3 Literature Search and Review Method

To develop a conceptualisation of crowdsourcing for education, we started by conducting a structured review of the literature to date, in line with guidelines and best practices for IS literature reviews (Boell and Cecez-Kecmanovic 2014; Rowe 2014; Schryen 2015; Webster and Watson 2002).

We performed a broad literature search considering journal and conference papers in the IS and other relevant disciplines such as computer science and education. Our structured literature search included the three search strategies: a) keyword-based searches, b) backward/forward searches, and c) informal mechanisms such as getting recommendations from practicing colleagues and professional networks. Figure 1 depicts the literature search process and number of papers considered in each step in the form of a PRISMA diagram (Tricco et al. 2018). To identify relevant papers, we first queried a broad set of leading academic databases (i.e., AIS eLibrary, INFORMS, ACM Digital Library, ProQuest ABI/INFORM, EBSCOhost, ERIC, Scopus, and Web of Science) with predefined keywords (Kitchenham and Charters 2007). We identified keywords through an initial probing search allowing for all alternatives of the term “crowd” (e.g., “crowdsourcing”, “crowdfunding”, or “crowdlearning”) in combination with the term “education”. The initial search yielded a total of 4,708 hits across all databases. We then used backward and forward searches to identify additional papers that do not explicitly use our keywords (Webster and Watson 2002). Applying this second search strategy, we found a total of 2,534 additional articles (1965 papers from the backward search, and 569 papers from the forward search). Finally, we included a few more relevant papers based on the authors’ knowledge of the topic, as well as through suggestions from colleagues in the field. A total of 68 articles was considered as part of this third search strategy.

To filter the initial set of 7,310 papers, we applied a set of basic inclusion and exclusion criteria, removing duplicates, non-English, as well as non-peer-reviewed academic papers. These initial filtering

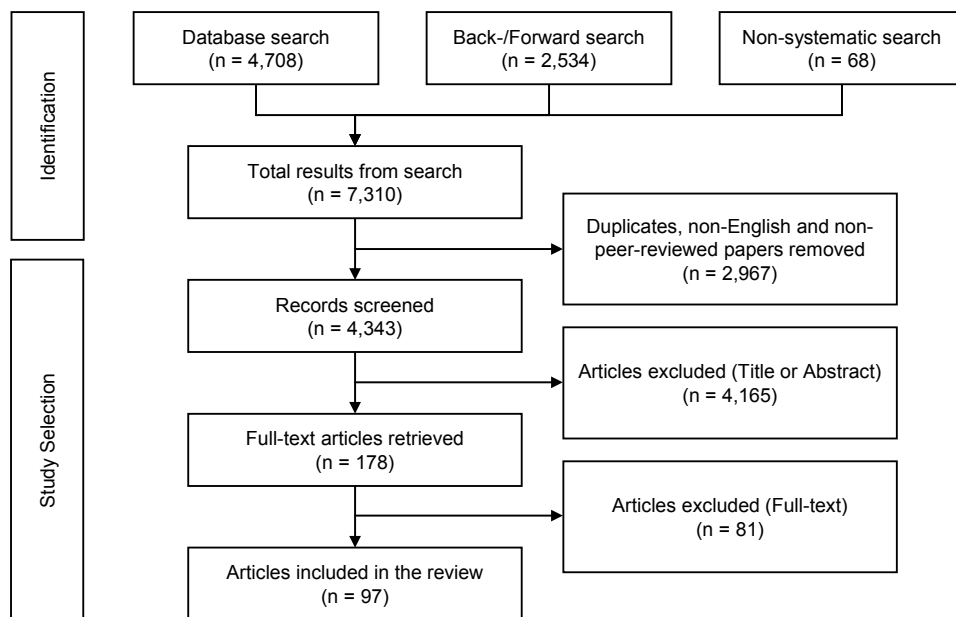


Figure 1. Literature Search Process and Numbers of Papers Included in the Review

criteria brought our set down to 4,343 papers. Further, we included only papers that studied the concept of crowdsourcing for education as per the definition provided in the previous section. This selection was a qualitative assessment we made on the basis of a staged process of skimming through titles, abstracts, and reading entire papers. In total, we considered 7,310 papers and from these, we identified 97 relevant papers on crowdsourcing for education published until 30th April 2018.

Using this set of 97 relevant papers, we employed a concept-centric approach toward analysing the literature drawing from inductive coding techniques (Webster and Watson 2002). The first author employed thematic analysis coding techniques to analyse the identified publications and generate a set of open codes. Since the purpose of the paper is to conceptualise this emerging form of crowdsourcing, we focused our coding on the themes, definitions, and concepts that characterise crowdsourcing for education rather than summarising empirical findings in a narrow sense. The author team then prepared extensive groupings of the definitions and concepts of crowdsourcing for education aggregating the initial open codes into analytical categories. The qualitative data analysis software NVivo helped us to organise the emerging codes, definitions, and concepts to make sense of the underlying conceptual, theoretical, and philosophical foundations (Bandara et al. 2015). Our coding is based on either explicit statements made by the authors in the text or our implicit understanding if no explicit statements were made. This was possible since theoretical and philosophical views are implied by the way in which authors talk and argue about a concept, what they focus on, as well as how they structure their analyses and present their findings (Deetz 1996). The final synthesis and critical assessment of the literature as presented in this paper was developed through multiple iterations of coding and discussions among the authors, which resulted in the proposed theoretical conceptualisation.

4 Philosophical Views on Crowdsourcing for Education

We classified the identified literature on crowdsourcing for education according to different conceptual, theoretical, and philosophical views including the core assumptions and role of IT (see Table 1). In line with the suggestions from Webster and Watson (2002) and Whetten (1989), our conceptualisation is based on a critical assessment of the philosophical views underlying the phenomenon. Since a field's conceptual and theoretical understanding is ultimately based on philosophical understanding, we focus our analysis on this "root cause" level (Lee 2004). A philosophical view concerns the ontological and epistemological assumptions underpinning a research study (Mingers and Willcocks 2004). Our analysis reveals that three philosophical views are underlying the crowdsourcing for education literature, namely what we refer to as "entitative view", "process view", and "practice view".

4.1 Entitative View on Crowdsourcing for Education

The entitative view assumes that entities, such as humans or IT artefacts, exist as independent things with their own characteristics, interacting with each other (Weber 1997). Researchers adopting an entitative view are concerned with the search for law-like relationships, which leads them to formulate basic cause-effect diagrams. Such studies then typically include “boxes and arrows” models that are broken down into testable hypotheses (Whetten 1989). As such, scholars focus on antecedent and consequent factors of the phenomenon under study and answer research questions concerned with the measurable effects that entities and their distinct characteristics have on each other (Weber 2012).

This view is the most prominent in the crowdsourcing for education literature, with about half of the identified publications being classified as exhibiting a primarily entitative view. Most of the reviewed papers evaluate a proposed crowdsourcing model and measure its performance with regards to learning goals using exam scores as the predominant dependent variable (Estelles-Miguel et al. 2015; Koschmider and Schaarschmidt 2017; Zualkernan et al. 2012). Some focus on particular factors, such as self and peer ratings (Avery 2014), perception toward peer-feedback (Demirbilek 2015), task difficulty and adequate effort (Koschmider and Schaarschmidt 2017). Some studies focus on more specific aspects of education, such as cheating behaviour in assessment tasks (Harris and Srinivasan 2012; Li et al. 2015) or the antecedents of crowdfunding in educational contexts (Althoff and Leskovec 2015). Researchers adopting the entitative view treat the inherent aspects of crowdsourcing as a “black box” and study learning and teaching as causal effects, with common research questions hypothesising, for example, that “our flashcard system would have an impact on overall student performance” (Bow et al. 2013, p. 768) or that “[crowdsourcing] supported reflective learning journeys via peer conversations” (Melville 2014).

The majority of crowdsourcing for education studies adopting an entitative view are design-oriented and therefore conceptualise the phenomenon as the design and development of an IT artefact to support education (Amrollahi et al. 2014; Bradley et al. 2009). For example, authors contend that “the design artefact is the crowd wisdom OLC [Online Learning Community] which integrates peer teaching and learning activities and ultimately helps improve academic performance” (Cheung et al. 2014, p. 7). These design science approaches do not focus purely on explaining the use of the crowdsourcing platform but deem practical utility and relevance as equally important. Clearly, these papers adopt an entitative view, since the artefact is typically regarded as an independent entity with which the learners interact. Examples of crowdsourcing for education artefacts developed by design science researchers include crowd validation of question-answer learning objects (Šimko et al. 2013), massive open online cheating detection (Li et al. 2015) or caption editors for educational videos (Deshpande et al. 2014).

4.2 Process View on Crowdsourcing for Education

The process view considers a phenomenon as a sequence of events that, over time, lead to a particular outcome. A process view features at its core a generative mechanism that, when compared to more focused cause-effect theories, often describes much broader sequences and global turning points (Cornelissen 2017). Quantitative researchers typically formulate a priori process theories, which address the dynamics of the phenomenon under study, and test them using coarse-grained longitudinal time series data. Qualitative researchers immerse themselves deeply in the processes, collecting rich qualitative data, attempting to extract theory from the ground up (Pentland 1999). The process view considers the dynamics of events over time but, in most cases, exhibits much of the same ontological assumptions as the entitative view. It explains the world as made of entities in which processes represent changes in their properties. However, process researchers recently began to question the entitative assumptions and linear temporal perspective, broadening the focus from outcomes to actual doings (Langley et al. 2013; Langley and Tsoukas 2010). This “strong” philosophical process view focuses on processes rather than entities as the primary ontological object. However, the process view we found dominating in the crowdsourcing for education literature, is typically referred to as the more traditional, “weak” process view, which theorises activities and stages along a linear timeline that lead to some form of outcome or change in entities.

View	Core assumptions	Role of the IT artefact	Critical assessment	Representative statements
<p>Entitative View (46 papers): Crowdsourcing for education as an entity with antecedent factors causing its adoption and consequent factors caused by it</p>	<p>Explain and predict relationships between antecedent factors such as a crowdsourcing platform and learning outcomes This approach answers questions, such as: “What factors have an impact on, or are impacted by, crowdsourcing for education?”</p>	<p>IT as a “black box”, a separable entity with objective properties The crowdsourcing platform as a mediator for learning whose impact on the learning outcome can be explained in the form of a cause-effect relationship</p>	<p>Strength: Formalise contingencies around an entity into basic cause-effect relationships Weakness: Lack of practical relevance due to its limited scope on certain factors while disregarding the broader context of a concept</p>	<p>“An empirical evaluation that we conducted at the end of the term supports our crowdsourcing-based learning approach and shows that students that participated were more likely to pass an exam than students denying participation.” (Koschmider and Schaarschmidt 2017, p. 100) “Using crowdsourcing techniques in the development of exams can help in increasing the quantity and the quality of exam questions [...]” (Alghamdi et al. 2015, p. 3) “An empirical analysis was conducted to ascertain the effectiveness of our crowd wisdom OLC on student learning.” (Cheung et al. 2014, p. 6)</p>
<p>Process View (36 papers): Crowdsourcing for education as a sequence of activities with preceding inputs and subsequent outputs</p>	<p>Understand and explain how events of a process play out over time and what sequence is effective This approach answers questions, such as “What constitutes an effective crowdsourcing for education process?”</p>	<p>IT as a facilitator of the events occurring within the process The crowdsourcing platform as a provider that enable the students to form a crowd, and which facilitates the continued learning process</p>	<p>Strength: Focus on processes and change, while being faithful to actual events unfolding over time. Weakness: Lack of practical relevance due to its focus on outcomes rather than rich details of what is being done</p>	<p>“The lifecycle of an assignment in CrowdGrader consists of three phases: a submission phase, a review phase, and a grading phase.” (de Alfaro and Shavlovsky 2014, p. 415) “Our goal is to design generic process models for crowdsourcing tools for distance learning purposes.” (Barbosa et al. 2014, p. 1121) “Students see the input side of preparing examinations and the output in two different forms: a study guide and individually LMS generated exam.” (Olson 2014, p. 123)</p>
<p>Practice View (15 papers): Crowdsourcing for education as the everyday activity of education in both its routine and improvised forms</p>	<p>Describe and understand what people do in practice and how education is actually being practiced This approach answers questions, such as “What are the actual practices happening on the crowdsourcing for education platform?”</p>	<p>IT either as a distinct entity, which is used in educational practice, or IT as part of socio-material relations between material entities and human bodies constantly producing and reproducing for education practices</p>	<p>Strength: Recognition of the intricate details of practical enactment Weakness: Often does not go beyond an understanding of practice in layman’s terms and limited to mere empirical descriptions of the actual doings in practice</p>	<p>“Communities of practice combine self-directed and collaborative learning to meet the challenges of today’s dynamic business environment. The increasing use of crowdsourcing via social media in management education will provide students and faculty access to the wider educational community of practice.” (Hall and Griffy-Brown 2016, p. 289) “Practices can be driven by the affordances (sometimes referred to as the ‘materiality’) of the objects at hand [...]. Practices develop around the use of technologies, such as the number and range of media used, the kinds of communication posted via different media, and the routines and shorthands that reduce the joint work of participants.” (Paulin and Haythornthwaite 2016, p. 136)</p>

Table 1. Three Underlying Philosophical Views on Crowdsourcing for Education

We coded more than one-third of the identified crowdsourcing for education literature as exhibiting a process view as the dominant philosophical perspective. Research from this perspective is focused on the crowdsourcing for education process. For example, “by way of analogy, we have four stages in our design framework: [Awareness, Acquisition, Action, Consequence]” (Yu et al. 2014, p. 984) or “the lifecycle of an assignment in CrowdGrader consists of three phases: a submission phase, a review phase, and a grading phase” (de Alfaro and Shavlovsky 2014, p. 415). Most studies focus on specific aspects of the crowdsourcing process and their outcomes: “This shifts the emphasis from a process measure (speaking during a case discussion) to an outcome measure (helping other students and yourself learn)” (Avery 2014, p. 11). However, few studies develop general process models for crowdsourcing for education on a macro-level (Barbosa et al. 2014; Kane and Fichman 2009). This limitation then leads to a common problem in process-based studies being too tied to the particulars of a specific setting (Cornelissen 2017), which is then often reflected in confined constructs and processes (Alghamdi et al. 2015). Processes and the underlying sequences of events are typically structured along the technical flow diagrams accompanying the developed crowdsourcing platforms. While such representations adequately reflect the proposed use case of the platform, the actual practices of how students are using the platform remain unclear in this view.

4.3 Practice View on Crowdsourcing for Education

In education, as elsewhere, the concept of “practice” is applied in different and sometimes incompatible ways. It is typically used in the layman’s sense of the term, for example, referring both to an activity undertaken to acquire certain skills (“teaching practice”) and to an activity which demonstrates that these skills have already been acquired (“best practice”). Understood this way, the concept of practice is interpreted as opposed to theory (Sandberg and Tsoukas 2015). While this focus on a phenomenon the way it is practiced rather than its abstract theoretical explanations can be helpful to describe novel phenomena, the a-theoretical inquiry of such an approach can be somewhat limited. Accordingly, the social science disciplines have recently experienced a shift toward a philosophical and theoretical understanding of practice, which is commonly referred to as the “practice turn” (Schatzki et al. 2001). This “strong” practice-theoretical approach focuses on the constitutive role of practices and how they produce reality as the primary ontological object (Feldman and Orlikowski 2011).

Even though a considerable body of literature in the education discipline has started to adopt a practice approach (Grootenboer et al. 2017), only 15 of the reviewed 97 papers on crowdsourcing for education took up this view. Most studies, however, follow the approach in a layman’s sense of the term “practice”, focusing on educational practice and “best practices” in education. For example, by expressing that “the issues surrounding the actual practice of crowdsourcing feedback within adaptive learning technologies are complex” (Heffernan et al. 2016, p. 620) or “a social platform, together with a collection of best practices related to running peer-based courses online” (Corneli and Mikroyannidis 2012). Yet, we could not identify a single paper that adopts a “strong” philosophical practice approach.

One practice-theoretical view, which is especially prevalent in the crowdsourcing for education literature, and even more so in education in general, is the concept of communities of practice (Giordano et al. 2015; Hall and Griffy-Brown 2016; Wheeler et al. 2008). Communities of practice are defined as groups of people who share an interest or a concern for something they do and learn how to do it better as they interact regularly in practice (Wenger 1998). In crowdsourcing for education, communities of practice are often developed around wikis, for example, “the wiki may become a focal point of interest for developing communities of practice, within which they can store their treasure house of knowledge about their specific interests and learning” (Wheeler et al. 2008, p. 990). Additionally, some studies also look at how an external crowd of mentors, professionals, or policymakers can be enrolled in the crowdsourcing practice (Althoff and Leskovec 2015; Dow et al. 2013). However, only a few of these studies acknowledge the importance of material objects such as IT within the learning communities where “practices can be driven by the affordances (sometimes referred to as the ‘materiality’) of the objects at hand” (Paulin and Haythornthwaite 2016, p. 136).

4.4 A Critical Assessment of the Literature

The three philosophical views on crowdsourcing for education have helped to produce promising initial findings to advance our understanding of this novel phenomenon. However, the body of knowledge is lacking in consistency and comprehensiveness as the views on crowdsourcing for education are inconsistent and, in some cases, appear to provide only a limited understanding. Table 1 summarises our synthesis of the literature, provides exemplary statements that illustrate the philosophical view, and points out arising inconsistencies and limitations that we elaborate on in more detail below.

The entitative view focuses on antecedent and consequent factors of education, for example “crowdsourcing participation” (Hu and Johnston 2012). The major advantage of the entitative view is its ability to formalise contingencies around an entity into basic cause-effect relationships that are readily testable. As such, the entitative view is capable of stating theoretical propositions to explain and predict relationships between constructs. The major weakness, for the purpose of our conceptualisation, is that it views actors as separate entities that interact and affect each other and in doing so disregards the dynamic and constitutive nature of the actual doings underlying educational phenomena. Further, the entitative view has been criticised for a lack of practical relevance due to its limited scope on certain factors while disregarding the broader context of a concept (Thompson 2011).

The process view sees educational outcomes as the result of a crowdsourcing implementation and its development over time (Heusler and Spann 2014). The major advantage of the process view over the entitative view is that the resulting theoretical understanding may correspond more faithfully to actual events unfolding over time. As such, the process view is capable of presenting an analytical focus on processes and change, although seldom explicitly conceptualised as such in the IS and organisation literature (Langley et al. 2013). The major weakness, in relation to our purpose of better understanding what constitutes crowdsourcing for education, is again the lack of a conceptualisation of the actual doings, the enactment of educational material, and the learning and teaching activities at the micro level. Further, it disregards the shared values and norms of students and teachers such as transparency, openness, and the recognition of students as enactors of their own learning (Amrollahi et al. 2014; Kane and Fichman 2009). To critically sum up, the process view explains the temporal events of crowdsourcing processes, however, in its traditional entitative form present in the literature it still focuses on outcomes rather than rich details of what is actually being done (Sandberg et al. 2015).

The practice view gives primacy to practices as being ubiquitous in everyday social life. The major advantage of the practice view is its recognition of the intricate details of practical enactment in the educational context. As such, a practice view deepens the meanings, descriptions, and reasonings offered in empirical studies focused on learning and teaching (Grootenboer et al. 2017). While this approach is commendable, it has often been interpreted as simply an invitation to pay more attention to what people do, which may not be enough. By a mere description and a-theoretical way of addressing practice, scholars falsely assume that practice is self-explanatory (Nicolini 2012). The major weakness, as identified in the crowdsourcing for education literature, is that often scholars applying a practice view do not go beyond an understanding of practice in layman’s terms and limit themselves to mere empirical descriptions of the actual doings in practice. While we do not disregard the usefulness of this empirical approach to practice in certain situations, we also think the practice view has more to offer to advance our understanding of crowdsourcing for education (Feldman and Orlikowski 2011).

According to our analysis, inconsistencies exist both between these three views, but also within these views on crowdsourcing for education. Many sources were vague about their philosophical view and often “flip-flopped” throughout the paper, taking the concept of crowdsourcing for education to be sufficiently self-explanatory. So, to use the words of Whetten (1989), the field is missing the “theoretical glue” that binds all the factors together to make it a clearly defined concept based on a strong underlying logic and rationale. In sum, while the reviewed literature has examined some of the factors fundamental to crowdsourcing for education, it is still fragmented, lacking conceptual clarity.

Hence, a well-articulated, coherent and sufficiently detailed conceptualisation of what constitutes crowdsourcing for education will be helpful and necessary to structure the discourse of future research in the field. The entitative and process views provide little consideration of the actual doings within

educational practice. The question of what is actually being done in crowdsourcing for education remains unanswered. However, a practice view in the layman's sense of the term "practice" as prevalent in the crowdsourcing for education literature has not seemed to advance our theoretical understanding of these actual doings. The focus on a purely empirical view of educational practices is restricting the researchers' ability to capture the richness of practical activities and weakens attempts of theory development. Nevertheless, we believe that a practice view has much to offer scholars in the field of crowdsourcing for education. Educational institutions today are becoming increasingly transformed through IT-enabled educational practices and open learning approaches, and, as such, we need conceptualisations that will help us understand these kinds of novel, dynamic, and emergent phenomena. We hence argue that a "strong" practice-theoretical conceptualisation, with its focus on actual doings, relations, and material enactment, is particularly helpful in sensitising us to these emerging questions in the field of crowdsourcing for education.

If we refer back to our definition of crowdsourcing for education presented earlier and if we were to dissect this definition into its components, a number of questions arise that a practice-theoretical conceptualisation could help us answer. For example, what is the role of "online" in educational activities and how do IT platforms on the Internet enact certain educational practices? Who are the educators, educational organisations, and groups of individuals that participate in crowdsourcing for education and how do they relate to each other? How does the flexible open call organise the crowdsourcing practice and help fulfil educational objectives? We believe that all of these questions could be better answered based on a practice-theoretical conceptualisation of the crowdsourcing for education phenomenon.

5 Conceptualisation of Crowdsourcing for Education as an Emerging Practice

Gherardi (2015) has argued for the value of considering "education as a social practice" rather than in the layman's sense of the term as "educational practice". Similarly, the conceptualisation of crowdsourcing for education that we are proposing here focuses on the emergent practices and the constituting roles of humans and IT rather than a mere empirical assessment of educational practices.

One theory that is widely considered the most fully elaborated account of practice theory is Theodore Schatzki's theory of social practices (Schatzki 1996; Schatzki 2002). Proposing a move to practice as the fundamental ontological and epistemic object of social inquiry, he argues for an attempt to escape dualisms of subject and object, structure and agency, and individual and society. This approach is deeply grounded in philosophical approaches of late Wittgenstein and Heidegger.

Schatzki (2012) defines practices as an organised "nexus of doings and sayings" existing in practice-arrangement bundles. Doings and sayings constitute the basic activities of a practice. As for organisation, he posits, these basic activities are organised by rules, teleoaffective structures, general and practical understandings. Lastly, Schatzki argues that practices are always entwined with material arrangements of human bodies and material entities continuously producing and reproducing practice-arrangement bundles.

Because education plays an important role in our society and crowdsourcing is emerging as a practice in this domain, the same account of social practices also applies to the phenomenon of crowdsourcing for education. Several scholars have advanced our understanding of specific domains by transforming existing subject matter into a practice theory question, such as strategy as practice, organisational knowledge as practice, and culture as practice (Nicolini et al. 2003; Swidler 2001; Whittington 2006). In a similar manner, we develop our conceptualisation of crowdsourcing for education as practice based on the three main concepts of Schatzki's theory of social practices – activities, organisation, and material arrangements – as shown in Figure 2. However, it is important to note that the distinction made between the three concepts in Figure 2 is only an analytical distinction to help make sense of the phenomenon. In fact, the two double-headed arrows are intended to indicate the entangled nature of the three concepts that appear only in relations to each other.

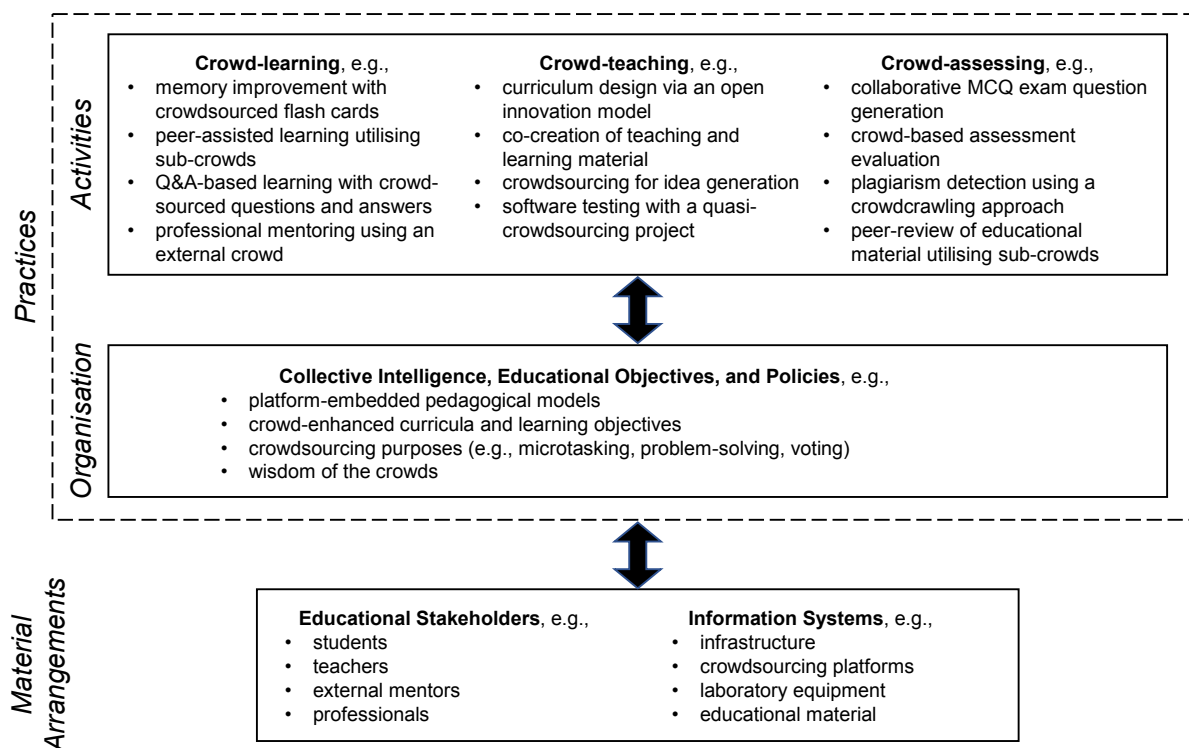


Figure 2. Conceptualisation of Crowdsourcing for Education as an Emerging Practice

5.1 Activities of Crowdsourcing for Education

A range of crowdsourcing for education activities has been identified in the literature. These activities are commonly characterised along the three major educational objectives – learning, teaching, and assessing. All three of these traditional educational activities have been influenced by crowdsourcing approaches as shown in the literature.

The literature on crowdsourcing for education provides several cases that adopt open, collective approaches to **learning**. What distinguishes crowdsourced learning from teaching activities is that in learning activities teachers typically appear as mere coordinators with little to no engagement in the actual learning activities (Cheung et al. 2014). The literature suggests that crowdsourced learning, especially for memorisation-heavy courses can improve student outcomes through Q&A-based learning platforms (Bow et al. 2013; Giordano et al. 2015; Šimko et al. 2013). Further, learning from a social media crowd (Knochel 2013) and external mentor platforms have been shown to be effective (Anderson 2011; Cheung et al. 2014).

There are also several **teaching**-related activities discussed in the crowdsourcing for education literature. While education budgets are increasingly being cut, educators are under constant pressure to produce new and compelling teaching materials. Crowdsourced idea generation presents an opportunity for teachers to either draw from colleagues (Porcello and Hsi 2013) or their own students (Heffernan et al. 2016; Tarasowa et al. 2013). Although the actual creation of educational materials has yet to pass the stage of prototypical implementations, the literature discusses multiple studies and use cases in practices where existing teaching materials are being improved (Deshpande et al. 2014; Scalise 2011).

Further, a large number of papers discusses crowdsourcing approaches toward **assessing** students' performance. Studies show how a student crowd offers a unique opportunity to create a large number of question items in a collaborative manner for the purpose of developing high-quality exams (Alghamdi et al. 2015; Luger and Bowles 2013; Olson 2014). In a follow-up activity, students are then asked to evaluate such crowdsourced questions using a crowd voting approach and assess other students answers based on a large-scale peer-review process (Koschmider and Schaarschmidt 2017; Schlagwein

2015). Further activities with regards to educational assessment include plagiarism detection (Butakov 2014; Harris and Srinivasan 2012) and peer-review of teaching materials such as lecture slides or course videos (Hall and Griffy-Brown 2016; McKinney and Niese 2017).

5.2 Organisation of Crowdsourcing for Education

The literature on crowdsourcing for education considers a range of organisational elements that provide structure to practices. However, while organisational elements shape the performance of activities, people's actions mutually reshape the organising elements. In line with Schatzki (2010) notion of organisational elements as “understandings, teleoaffective structures, and rules”, the crowdsourcing for education literature points to **collective intelligence, educational objectives, and policies**.

Organisation can be imposed by educational policies, inscribed by the designers of the crowdsourcing platform, and added on by students and teachers through previous interactions as part of the practice (Giordano et al. 2015; Kim 2015; Tarasowa and Auer 2016). Crowdsourcing is inducing a pedagogical transformation where the crowd enacts the curriculum rather than merely following its standards. For example, the literature discusses instances where students who use peer-learning platforms have developed a familiar pattern of interacting with other students on the platform – repeatedly enacting shared understandings that they now take for granted (Cheung et al. 2014; Schlagwein 2015).

However, even continuous enactment of these organising elements cannot guarantee stability. The studies we reviewed revealed various examples where, during a prototypical evaluation the actual practice of crowdsourcing for education differed substantially from the organisation of the practices, both with positive and negative outcomes on learning and education. For example, Scalise (2011, p. 10) reports how the option to modify educational material “challenged [the students] to come up with better answers than those offered, which was not actually the intent of the item designed but is an interesting idea”. Although the intended educational objective was for the students to only assess the provided material, the opportunity to actively construct knowledge has shown beneficial side effects resulting in the students to enact a different set of rules and understandings to guide their activities.

5.3 Material Arrangements of Crowdsourcing for Education

Material arrangements include human bodies and material entities in mutually constituting relations. In our conceptualisation of crowdsourcing for education, the material arrangements are represented by educational stakeholders and information systems respectively.

The literature considers a range of **educational stakeholders** inextricably related to crowdsourcing for education practices. Like traditional educational actors, these include internal stakeholders, such as students and teachers. However, the boundaries of the educational institution are defined much broader than in traditional education so that students and teachers can participate in the practice from everywhere where they can connect to the internet (Berenfeld et al. 2014). Additionally, with crowdsourcing, external stakeholders, outside of these institutional boundaries, can be drawn into the educational practices. While it has previously not been possible to introduce such external actors into the practice, with crowdsourcing for education, this group can include, for example, industry stakeholders, professional mentors, and policymakers (Amrollahi et al. 2014; Bandyopadhyay et al. 2016; Chen and Luo 2014). In such cases, external stakeholders serve as facilitators for learning and teaching rather than just disseminators of external knowledge (Hall and Griffy-Brown 2016).

The literature also points to a range of **information systems** that make up the material entities in crowdsourcing for education. Although crowdsourcing for education mainly discusses IT platforms as the essential information systems, some studies define information systems in the original broader sense and include any organised system for the collection, organisation, storage, and communication of information. As such, information systems in the crowdsourcing for education literature are composed of IT such as computers, infrastructure, smartphones, and crowdsourcing platforms (Butakov 2014; Koschmider and Schaarschmidt 2017), but also non-IT materials such as whiteboards, textbooks, and laboratory equipment (Edgcomb et al. 2015; Paulin and Haythornthwaite 2016).

6 Discussion and Implications for Future Research

Through our review of the literature and by building on earlier research on this phenomenon, we have developed a “strong” practice philosophical perspective as one conceptualisation that we find particularly suitable in explaining the crowdsourcing for education phenomenon. In the following, we use our practice-based conceptualisation as a theoretical tool to re-analyse one of the prominent cases of crowdsourcing for education discussed in the introduction of this paper. Re-analysing an exemplary case through our conceptual model both illustrates how the model can be applied in a particular context in practice and what implications a practice theoretical conceptualisation has for future research on crowdsourcing for education.

The case describes the use of Wikipedia as part of the assessment in a comparative law course at the University of Western Australia (Witzleb 2009). In 2007 Prof Normann Witzleb, lecturer of the course, designed an assignment, which consisted in students drafting a Wikipedia article on a topic of comparative law. In a second stage these draft articles were then reviewed by other students before being published on the Wikipedia platform. While Prof Witzleb was among the first educators to use Wikipedia in the context of tertiary education, Wikipedia today features a “School and University projects” website to encourage and facilitate such initiatives (Wikipedia 2018).

In re-analysing the crowdsourcing for education case, we identified occurrences of all three educational activities conceptualised in our practice-theoretical model. Although the case describes only limited use of the collaborative aspects of wikis, students working on the same topic and revising each other’s article can nevertheless be explained as a form of crowd learning. Since the written articles were later used as a replacement for missing traditional textbook content, the students also engaged in a form of crowd teaching, where the cohort co-created teaching and learning materials. Lastly, law professionals and the general public evaluating and revising the students’ assignments can be seen as a form of crowd assessment. A practice view could help us zoom in to these activities and answer questions of how educational practice is actually being performed in crowdsourcing for education.

Our re-analysis of the case suggests several organising elements that contributed to a successful educational practice. First, Prof Witzleb explained that the Wikipedia exercise was prompted by multiple educational objectives ranging from a lack of appropriate learning material to the aim of making highly specialised knowledge available to a wider audience. Further, the design of the comparative law assignment was not only guided by the assessment requirement of the educator, but also by Wikipedia’s guidelines and policies for writing new articles. Since the open nature of crowdsourcing for education demands handling multiple requirements and policies, a practice view can help understand educational practice as a whole rather than individual components.

In focusing on the material arrangements, the case revealed a variety of educational stakeholders and information systems included in the crowdsourcing for education practice, many of whom would not typically be involved in traditional educational settings. The law students and Prof Witzleb were the two most obvious stakeholders, who were immediately working on the assignment task and engaged in learning and teaching. However, during later stages of the assignment, external stakeholders such as law professionals and the general public started to get involved too. While the students were using traditional educational material to learn about the subject matter, their computers and the Wikipedia platform were the key information systems in the case. Wikipedia’s version history functionality, peer-review tools, and hypertext document structure enabled the co-creation of new Wikipedia articles. Indeed, a practice view can help to understand the sociomaterial arrangements of this plethora of internal and external stakeholders, and digital and non-digital technologies.

Although we developed our practice-theoretical conceptualisation based on the crowdsourcing phenomenon in the educational context, we believe that a “strong” practice philosophical perspective has implications for the crowdsourcing literature in general. While some earlier research on crowdsourcing has adopted practice views (Gleasure et al. 2017; Tavakoli et al. 2017; Von Krogh et al. 2012), we provide the first “strong” practice philosophical perspective based on Schatzki’s theory of social practices. Theoretically, we present how the identified practices and material arrangements enact bundles in different educational contexts. We believe that this focus on sociomaterial practices has a broader

relevance for crowdsourcing researchers in general, who try to understand seemingly heterogenous crowds and multi-faceted organisational goals.

Further our conceptualisation sets out to guide future research on this phenomenon. To outline avenues for future research we point out how a “strong” philosophical practice view can help explain aspects of crowdsourcing for education that a practice view in the layman’s sense of the term cannot.

First, although the empirical descriptions of practice studies have provided an initial understanding of the actual doings in crowdsourcing for education, they focus mostly on primary educational objectives. Research has examined how crowdsourcing for education can enhance learning, teaching, and assessing, but the effects on secondary educational activities such as crowdfunding educational programs (Bulger et al. 2016), open educational strategy (Amrollahi et al. 2014), and crowdsourcing for research (Love and Hirschheim 2017) have not yet been sufficiently addressed. Going forward, future research may explore how crowdsourcing can support educational practice as a whole rather than individual components. What are the different kinds of practice that are at play, often simultaneously (Fenwick 2012)? How do educational practices overlap and interact with each other (Gherardi 2012)? How do practices in crowdsourcing for education form the wholeness (Heidegger 1927), that is, educational practice? A practice view may help future research broaden the perspective on the “field of practices” to capture the complex nature of the phenomenon of crowdsourcing for education.

Second, although research has focused on the role of the IT artefact in crowdsourcing for education, future research may consider the relationships between IT and educational stakeholders in material arrangements and practices. In particular, the notion of sociomaterial practices may need to be further developed in regard to crowdsourcing for education (Fenwick 2010; Fenwick 2012). Our discussion highlights that IT is a constituent and central part of crowdsourcing for education which is what clearly differentiates it from the typical means of offline collaborative education (Brabham 2013). Crowdsourcing for education may hence provide a rich context for improving our understanding of the sociomaterial arrangements of IT and practices. Questions that may be explored in future research include: What is the role of materiality in crowdsourcing for education? How do IT and educational practices emerge through relations? How do changes in the configurations of IT trigger changes in the educational practices? A practice view with a focus on materiality and the role of IT in the educational practices will help to answer these questions.

This leads to the third point, that there is little consideration of the temporality of crowdsourcing for education, such as when and how it emerges and dissolves (Schatzki 2013). While some studies take a longitudinal perspective when observing the crowdsourcing process over time (Anderson 2011; Cheung et al. 2014), we lack an understanding of how educators move between traditional and crowdsourced approaches (Paulin and Haythornthwaite 2016). For example, how do new crowdsourcing for education practices emerge, persist, and dissolve (Schatzki 2013)? How do events in crowdsourcing for education unfold and how do the stakeholders interpret the events (Schatzki 2012)? To answer such questions, future research on crowdsourcing for education may need to draw from emerging process-theoretical concepts such as temporality, flow, and connectedness (Hernes 2014).

7 Conclusion

In this paper, we reviewed the emerging literature on crowdsourcing for education by assessing the fundamental conceptual, theoretical, and philosophical views underlying this research stream. This analysis is based on a rigorous literature review, using a structured yet iterative approach and using inductive coding techniques. As such, we provide three contributions to the field of crowdsourcing for education in particular and the IS discipline as a whole. First, we provide a comprehensive synthesis of the crowdsourcing for education literature. Second, based on the critical assessment of the fundamental philosophical approaches and assumptions that underlie the reviewed literature, we develop a new theory-informed conceptual model grounded in a “strong” philosophical practice view of the crowdsourcing for education phenomenon. Finally, we outline how the theoretical model can help us understand educational practice and how future research can utilise this practice perspective.

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