Translating actor-network theory: A methodology for the analysis of news stories on massive open online courses from the International New York Times 2012 – 2015

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Abstract

Translating actor-network theory: A methodology for the analysis of news stories on massive open online courses from the International New York Times 2012-2015

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Actor-network theory (ANT) principles are increasingly migrating into educational research, providing a unique entry point for the study of controversy(ies). While many educational scholars draw on ANT ideas, few have used it methodologically. ANT offers researchers a way to follow actors in unstable, quickly changing situations (Latour, 2005) when relationships that might otherwise be indiscernible become visible (Venturini, 2010a). This was the case from 2012 to 2015 when mainstream news coverage on the topic of massive open online courses (MOOCs) reached a peak. Educational scholars have recognized these years as a distinct episode in news reporting on MOOCs and, more broadly, in public debate on an educational technology. Because ANT is a set of principles and conceptual tools rather than a set methodology, the first objective was to translate ANT into a workable approach for the analysis of news stories. Drawing specifically on Latour's classic text, *Reassembling the Social* (2005), the research asked: How can an ANT approach be applied to the analysis of news stories? Once translated, the second objective was to demonstrate the translated methodology by following the MOOC controversy across a corpus of 31 news stories published by the *International New York Times* (INYT) from July 2012 to December 2015. The research asked: What does the translated ANT approach show us about how the controversy of MOOCs in higher education is expressed in the INYT corpus? What is the social that appears? Description and mapping, navigational

codes, strands and confluences emerge as a set of methods and instruments for making movements and shifts in meaning within a network of passage-actors explicit. In addition to providing insights specific to the MOOC controversy as expressed in the INYT, this ANT-inspired methodology is a contribution to the growing body of ANT texts in the field of education.

Keywords: Actor-Network Theory, Methodology, Research Design, Online Education, News Coverage, Sociology, Higher Education

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Chapter 1. Research Objectives

Actor-network theory (ANT) is the study of controversy. A controversy is any situation where actors *disagree* with one another (Venturini, 2010a, p. 261). Controversy in education began to unfold when Massive Open Online Courses (MOOCs), a type of online learning platform, were launched by some elite U.S. universities (i.e., Stanford, Harvard and MIT) in 2011-2012. This dissertation uses an ANT-inspired approach to study the news coverage of Massive Open Online Courses (MOOCs) from 2012 to 2015 as expressed in a corpus constituted by 31 news stories from the *International New York Times.* MOOC platform providers in combination with digital online technologies developed MOOC distribution platforms, enabling large numbers of students (i.e., millions) to enroll in prestigious university courses for little to no cost through the Internet.

MOOCs, with their seemingly accessible online learning platforms, gained the attention of the news media. The controversy of MOOCs was frequently mentioned in both the academic peer-reviewed literature and popular news media. Debates at times were polarized: some writers advocated for MOOCs as a way to make education more accessible (Lewin, 2012) or democratic (Coleman, 2013), while others cautioned that, without critical analysis, MOOCs had the potential to reify or worsen current disparities in education (Krupnick, 2014; Rivard, 2013). A preliminary review of academic and popular media accounts on the topic indicated a different set of relations: the positions articulated were often more nuanced, inconclusive, contradictory, fragmented and uncertain. The news coverage in the media also caught the interest of a handful of educational scholars who recognized 2012 to 2015 as a distinct episode in news reporting on educational

technological issues in the public domain (Brown, Costello, Donlon, & Giolla-Mhichil, 2016; Bulfin, Pangrazio & Selwyn, 2014; Kovanović, Joksimović, Gašević, Siemens & Hatala, 2015).

This dissertation has two parts, each with its own questions. The first part is a methodological exploration and translation of ANT; the second part, which is embedded in the first part, is an application of the translated methodology in the form of a demonstration on the MOOC controversy as expressed in the INYT. Because of this structure, with two related sets of research questions and explorations, and because the methodology being explored is at odds with many social science approaches, the organization of this dissertation necessarily departs slightly from a textbook social science model. This introduction situates these two aspects of the dissertation within their respective research objectives, problematics, rationales, and research questions. The theoretical framework (a set of propositions) is actor-network theory (ANT). The methodology and analytical tools are based on the translation of ANT that is undertaken in the first part. The analysis of the INYT corpus in the form of maps, descriptions and analyses is the enactment of the translated ANT methodology and analytical tools.

First Rationale

ANT is an ontologically oriented research approach that focuses on shifting relations (associations) and effects within continuously emergent networks. It works with uncertainty and includes the researcher within the actor-networks that it maps. ANT studies deal with controversy, situations, states of uncertainty and instability in which actors disagree with one another. In other words, it deals with the social with an important caveat—the social is not known in advance but will reveal itself to the researcher who suspends *a priori* assumptions and who maps and describes its appearance well. ANT provides a set of principles, steps and tools for the researcher to keep in mind while mapping and describing. As an assemblage of concepts, it

has inspired a small but growing number of educators to explore its potential to transform research in association with other methodologies and methods. Educational scholars Tara Fenwick, and Richard Edwards (2010) have provided much cited introductions to and overviews of the use of ANT in the field as well as publications that deploy ANT principles and concepts in research. The authors caution that there is a danger in defining ANT; in their view ANT is "a way of intervening in or interrupting education rather than simply a different way of representing education" (Fenwick & Edwards 2010, p. 5). The aim they suggest is to "expand phenomena" rather than using ANT as a set of devices that explain and therefore reduce phenomena (Fenwick & Edwards, p. 5).

Keeping this in mind, the first objective explores the possibility that ANT can be translated into a workable methodology for a particular problem without merging with/intervening in another approach. This research looks closely at actor-network theory as expressed in *Reassembling the Social: An Introduction to Actor-Network Theory* (2005) (RAS) by French philosopher, sociologist and theorist, Bruno Latour. In RAS, Latour presents us with an alternate sociology, setting out an approach that emphasizes hybridity and association over classical categorizations. It defines and deploys two distinct yet interconnected approaches: the first is metaphysical—it considers and gathers the full range of actors that constitute the social world in a controversy; and the second is ontological—it follows how the multiplicity gathered in the first step is put in order. The book is itself a demonstration: propositions about what ANT is and tools to enact it are continuously proffered and enacted. These tools can help the researcher to increase their sensitivity to the range of actors, their associations, and the networks of effects they constitute: in other words, to the social as a composition always in construction. The propositions and many tools, however, are not a methodology insofar as there are no precise

procedures. It is up to the researcher to determine how ANT will be deployed in any particular instance.

The instances to be studied, according to RAS, are moments of controversy, when states of instability and uncertainty exist (Latour, 2005, pp. 21-22). Controversy is where states of instability and uncertainty can be found almost anywhere. For the purposes of this dissertation, a controversy important to the field of education was sought out with the objective of enacting the translated ANT methodology.

Second Rationale and the Controversy on MOOCs

A controversy of interest emerged in higher education while I was a graduate student. In late 2011-2012 Massive Open Online Courses (MOOCs) were launched by a handful of elite U.S. universities; MOOC platform providers developed distribution platforms, enabling large numbers of students (in the millions) to enroll in these courses through the Internet. Initially the courses were free and available to anyone with an Internet connection (McAuley, Stewart, Cormier & Siemens, 2010, p. 10). They had no academic prerequisites and provided no formal accreditation, although for a fee, certification for course completion was sometimes available.

Almost immediately, claims and counterclaims about MOOCs began to be made in the media, often with scant empirical evidence. Scholars had barely begun to study the phenomenon when reports were issued by university administrators on the viability of MOOCs—reports that showed clearly the degree to which scholarship and popular media accounts relied upon one another for their information (e.g., Pursel et al., 2013). The controversy surrounding MOOCs was frequently mentioned in both popular news media and academic peer-reviewed literature, where issues were often described as a battle between polarized perspectives: proponents who were advocating for MOOCs as a way to make education more accessible (Lewin, 2012, Mar. 4)

through the use of a democratizing technology (Coleman, 2013, Oct. 15), and its detractors who were cautioning that MOOCs had the potential to reify current inequalities in education (Krupnick, 2014; Rivard, 2013).

An initial review of academic and popular media accounts of MOOCs indicated that positions articulated by actors in the controversy were often more nuanced, inconclusive, contradictory, fragmented and uncertain than first suggested; it also indicated that there were multiple matters of concerns being articulated and debated in a public (online) way. The proliferation of news stories on MOOCs caught the attention of scholars who came to recognize 2012 to 2015 as a distinct episode in news reporting on educational technological issues in the public domain (Brown, Costello, Donlon, & Giolla-Mhichil, 2016; Bulfin, Pangrazio & Selwyn, 2014; Kovanović, Joksimović, Gašević, Siemens & Hatala, 2015). The controversy of MOOCs as it was expressed in the media between 2012 and 2015 was chosen for the demonstration of the translation of ANT. Using Discourse Analysis (CDA), Bulfin, Pangrazio and Selwyn (2014) and Selwyn, Bulfin and Pangrazio (2015) extracted issues and meanings from 457 news articles on MOOCs. They concluded that "change, massification, marketization, and monetization" (2015, p. 189) were the most evident themes.

In their 2014 study, the authors called for more nuanced studies of media coverage of MOOCs. Between 2008 and 2014, Kovanović, Joksimović et al. (2015) gathered 3,958 articles from 591 English sources and traced the change in media topics over time. They showed that, in 2012 and 2013, MOOC providers, partnerships and course offering announcements were the most prevalent topics. In 2014, these topics diminished and new topics were introduced, for example, business and management, and government related issues; by the second quartile of 2014, media coverage of MOOCs had decreased by 50% (p. 511). ANT, with its attentive

gathering of the many actors in a controversy and patient mapping of their movements and associations, can provide this more nuanced analysis. Such an analysis, however, would require that the volume of data be much smaller than the volume of data used in the studies by Bulfin et al. (2014) and Kovanović, Gašević, Joksimović, Siemens, and Hatala (2015).

Research Questions

To narrow down the topic and limit the volume of data, the *New York Times* was selected as the news source; it was chosen because it is a popular news source with international reach that has a commitment to fact-checking. A further refinement focused on a still smaller, more manageable sample: 31 news stories and editorials from the *International Herald Tribune* and the *International New York Times* from 2012 to 2015. Note that the IHT was and the INYT is owned and operated by the New York Times. Given the similarity between the NYT and the INYT, the smaller group of news stories served as a more practical compilation for a first ANT-based approach that initially had no clear methodology. This led to the first research question: How can an ANT approach be applied to the analysis of news stories?

To answer the first research question, it was necessary to move beyond an abstract conceptualization of ANT as a methodology and engage it with the selected data. It was this engagement that led me to propose a translated ANT methodology, an approach that involved extracting certain principles, interpreting them and re-engaging with the INYT stories. In other words, the translated ANT methodology could only be fully formed through its demonstration with the INYT corpus. In a manner similar to an empirical study, the demonstration could make visible the methods (techniques) used to analyze the data as well as some newly developed tools that emerged in the deployment of ANT principles. On this basis two further research questions

were developed that are specifically addressed in the analysis and discussion of the demonstration as it pertains to the MOOC controversy in the INYT corpus:

- What does the translated ANT approach show us about how the controversy of MOOCs in higher education is expressed in the INYT corpus?
- What is the social that appears?

Summary of Chapters

This thesis consists of six chapters. The following summaries of the chapters elaborate on this process, the methodology and the demonstration. Chapter 1 introduces the structural parameters of the project. A brief description of the research objectives, rationale, problematic and research questions is provided. Not yet introduced are the outcomes—the findings—of the translated ANT methodology; this aspect of the project becomes evident in Chapter 5 where the translated ANT methodology is described and enacted. Chapter 2 presents a brief background to actor-network theory by situating it historically and theoretically. Some of the key contributors to ANT—Michel Callon, John Law and Bruno Latour—are discussed and the differences between them, albeit nuanced, are elucidated upon. I chose to work with one of these theorists, Bruno Latour, and to limit my exploration to one of his publications, *Reassembling the Social: An Introduction to Actor-Network-Theory* (RAS) (2005), a wide-ranging explanation of the approach.

Theories that influence Latour are introduced, and the concept of the social in ANT is distinguished from that in Durkheimian sociology. Latour claims that his *alternate* sociology, which he calls the *sociology of associations*, works for things that are moving and relies on following the actors by tracing connections (objects included), while traditional and critical sociology, which Latour calls the *sociology of the social*, work for things that change slowly and

relies upon invisible social forces as explanations for the social. For Latour, constructivism and fact-making go hand-in-hand. There is no question that things are being constructed, including facts; the question we should be asking, he states, is not whether a fact is real or artificially made, but whether it was made well in the first place. The chapter finishes with the question: what is ANT? The following chapters attempt to provide some insight into this.

Chapter 3 provides metrics to demonstrate the increase and spread of ANT in education. It investigates how and where actor-network theory might enter a research study. For example, Bisset, Potvin and Daniel (2013) use ANT in research that investigates interactions between health settings and professional practices in children's nutritional programs in order to allow for the emergence of unplanned events; their aim has been to use ANT as a way to expand the scope of research and methodological practice. In a first literature review on ANT and education, six studies are summarized, and commentary is provided. All of the studies to some degree integrate ANT ideas with other theoretical frameworks or methodological approaches: Jill P. Koyama (2017) integrates ANT with Critical Discourse Analysis in the area of educational policy and immigrant and refugee education; Mary Hamilton (2011), working in the area of educational policy reform and literacy studies, uses the descriptive/reflective story writing + analysis format of Moser and Law (1999) and Law (2006)[i] and purposefully integrates her own experience as an adult literacy practitioner. Two detailed analyses complete the selection: the first analysis, "The Heuristics of Adams and Thompson (2011)", compares phenomenology and ANT for their shared interest in human-object relations; the second analysis, "Composing Academic Practice with Decuypere and Simons (2011)", enacts ANT in the form of three sensibilities: heterogeneity, relationality and enactments.

Given the heterogeneity of these ANT-based studies—with different methodologies and research topics—the question of how to evaluate ANT-based research emerges. The chapter concludes with a consideration of the three criteria that Latour sets out for assessing the vitality of an ANT text: Does the research treat nonhumans as actors? Does it understand the social as an unstable associations of heterogeneous actors? And, is the aim of the study to reassemble the social (i.e., beyond mere deconstruction)?

These criteria are applied to the study by Decuypere and Simons (2011), not with the purpose to decide whether or not it is a good or not so good ANT study, but with the aim of elaborating on and perhaps elucidating ANT principles in education research. This chapter makes evident the extent of the commitment made by scholars in the area of education and ANT research. Chapter 4 provides an overview of ANT as expressed in RAS in terms of two broad approaches—the first, "Taking into Account" (Part I) and the second, "Putting in Order" (Part II) (Latour, 2005, p. 257). Taking into Account, which Latour calls the metaphysics, begins with five uncertainties about what constitutes the social and an array of principles.

This focus on uncertainty supports the researcher to let go of preconceived ideas and adopt an open, inclusive approach to the collective being formed. Rather than treating things (human and non-human) as intermediaries as is done in the *sociology of the social*, the *sociology of associations* (ANT) considers things as mediators which "transform, translate, distort, and modify the meaning or the elements they are supposed to carry" (Latour, 2005, p. 39). In working with news stories through a translated ANT approach, the "things" being traced are not the static words on the page, but the many actors that are assembled, and their effects in the network of meanings that is the corpus. Examples of this will be provided in Chapter 5 where the translated ANT approach is enacted.

The second approach, Putting in Order (part II), offers three movements with various conceptual tools (i.e., panoramas (p. 183), oligoptica (p. 187), the flattened landscape (p. 189) and structuring templates (p. 196)) that help keep the researcher on track and avoid falling back into the sociology of the social. Terminology is integrated throughout the chapter. In the flattened landscape, the sociology of the micro and the macro is collapsed, making way for the appearance of the sociology of associations in which the micro and the macro exist side-by-side on a single ontological plane. In the first movement Latour proposes that the global is always locally made; in the second movement he proposes that the local is redistributed. In the third movement, he discusses connecting sites. This chapter therefore introduces ANT principles in accordance with the five uncertainties and three movements.

A brief description on the role of the ANT researcher sets out some of the ways that ANT ideas might alter the researcher's mindset going forward. Chapter 5 includes the translation of the ANT principles set out in RAS and the enactment of the translated ANT methodology in the analysis of the controversy of MOOCs as expressed in the INYT. It is a demonstration of how the principles might be enacted in a research practice. The chapter is divided into three segments: Part I provides a background to current MOOC research; a literature review of eight studies that explore the news coverage of MOOCs from 2008 to 2014 is provided. Part II is the translation of ANT into a workable methodology for the analysis of news stories; three sequential actions are taken to translate ANT principles. Part III enacts the methodology generating findings in the form of newly developed tools identified as strands, substrands, confluences and ncodes, which are used to analyze the INYT corpus. *Strands* are repeating passages of text in the corpus. They retain a trace of an original idea but at each articulation, the meanings of the passages shift as new associations are made. Ten strands are identified but three are examined in detail. The

researcher explores their functions in association with other strands. Finally, contributions to the growing area of ANT and education are described. The demonstration as already stated is embedded within the exploration of an ANT approach. Chapter 6 revisits the research objectives of this two-part project. Discussed are some of the contributions made to the literature on the topic of news coverage of MOOCs, and more broadly to the field of educational research.

Chapter 2. History and Theory of Actor-Network Theory

Purpose of the Chapter

Actor-network theory (ANT) is best understood as a heterogeneous assembly of conversations, debates, critiques and case studies that began in the late 1970s that pertain to the fields of science, technology and society[ii]. Bruno Latour, Michel Callon and John Law are generally understood to be its immediate progenitors. The concepts and methods that each of them has introduced, while related, are also subtlety distinct, although they have tended to be used in conjunction with one another by scholars. In order to distinguish ANT as a constellation of ideas from the specific version of ANT expressed by Bruno Latour in his classic book *Reassembling the Social: An Introduction to Actor-Network Theory* (RAS) (2005), a brief overview of the key characteristics of the approaches introduced by Michel Callon, John Law and Bruno Latour is provided in this chapter.

Although ANT itself is regarded as a multiplicity (Fenwick & Edwards, 2010; Latour, 2005; Law, 1999; 2009), ANT is often described as if it is constituted by a unified and shared set of principles, which may include: an approach by the researcher that requires no *a priori*

assumptions about what constitutes the social; the concept of symmetry or generalized symmetry, which speaks to the idea of treating the human and nonhuman worlds equally and as having the capacity to effect; network effects or how things are constituted through actor-networks, pointing to relational effects[iii]; and, finally, the notion of translation – how one thing becomes something else -- which has to do with movement, transcription, and displacement, that is, transporting while transforming (Latour, 2015, Chapter 1).

To varying degrees and in different manners ANT approaches stress these key points. The argument I wish to make is: when we focus on the generalized concepts, we risk overlooking the nuances between the varied orientations of ANT. The methodology and conceptual devices of ANT as expressed in RAS by Latour (2005) have rarely been taken up in the scholarship. Further, I argue that the tools and concepts of ANT in RAS, have the potential to make the social visible as it is being constituted while revealing the implication of the researcher in that constitution of the social. In this chapter an overview of actor-network theory is provided, discussing its history, the different strains of three major approaches and finally a definition (sort of) of ANT is offered. To begin to grasp what is distinct about Latour's approach, I briefly present three trajectories of ANT: the four moments of translation described by Michel Callon (1986); ANT as a sensibility (Edwards & Fenwick, 2015; Fenwick, Edwards & Sawchuk, 2011; Law, 1999, 2004, 2009); and ANT as a method as expressed in RAS. Briefly, Latour's use of constructivism is contrasted with some tenets of social constructivism. Concluding the chapter, the question, what is Latour's definition of ANT, is posed.

Actor-Network Theory: Early Trajectories

ANT surfaced in the late 1970s and early 1980s at the Centre de sociologie de l'innovation (CSI) of the École superieure des mines de Paris, largely but not solely, through the

work of sociologists Bruno Latour, John Law and Michel Callon. It would be anti-ANT to suggest that these scholars were exclusively responsible for ANT. Critiques and responses to ANT by Donna Haraway (1988; 1991; 2004), Andrew Pickering (1993), Marilyn Strathern (1996), and contributions to ANT by Madeleine Akrich (1992), Annmarie Mol (1999), and Karin Knorr-Cetina (1981, 1999) are only a few of the resources that have played a role in the development of ANT. These early conversations, played out in the fields of science and technology studies (STS) and the sociology of scientific knowledge (SSK), claimed that science was a social endeavor (Bloor, 1976/1991); (Pickering, 1992; Shapin, 1995).

From the onset Callon, Law, and Latour have demonstrated an enduring commitment to the social study of science and sociotechnological projects. Actor-network theory or the "sociology of translation", as it is called by Callon (1986), offers a set of analytical tools and methods with which we can make sense of heterogeneity, including human and nonhuman actor-networks. The core ANT concept of *translation* was inspired by philosopher and mathematician Michel Serres whose work has creatively navigated passages between science and culture, between the "exact sciences" and the "sciences of man [*sic*] on the other" (Serres, 1982). The journey between science and culture, Harari and Bell (as cited in Serres, 1982) assert, is a major challenge because, from the beginning, we are taught to separate the humanities from the physical sciences. ANT offers a way for researchers to avoid the confinements of science and culture or nature and society through the inclusion of nonhuman entities in the social, the avoidance of *a priori* assumptions or pre-determined classifications about the social, and attention given to entities (actors) as intermediaries in networks of relations that are in constant flux.

Callon, Law, and Latour offer variations, translations and trajectories of ANT; in what follows, I present key aspects of their approaches. This will allow readers to grasp distinctions that will be made in the Literature Review and to better follow the discussion of Latour's approach as set out in RAS (2005). Ultimately, the aim is to shed light on how Latour's work can further enrich educational research through a media analysis of 31 news stories published on the topic of massive open online courses in the *International New York Times* during 2012 to 2015.

Michel Callon

Michel Callon is an engineer and sociologist and honorary member of Centre de Sociologie de l'innovation, a laboratory for research in the field of Science and Technology Studies. As a professor, he worked at l'École superieur des mines de Paris from 1982 to 1994, and was Chairman of the 4S (Society for Social Studies of Science) from 1998 to 1999. Callon's research has covered a number of areas of specialization, some of which include the economics of market economies, the socio-economics of innovation and science, and technology and democracy (csi.mines-paristech.fr). An early proponent of actor-network theory or the "sociology of translation", Callon is well-known in ANT education research for his publication, "Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay" (1986) in which three sociological principles—"agnosticism (impartiality between actors in a controversy), generalised symmetry (the commitment to explain the social and nature in the same terms) and free association (the abandonment of all a priori distinctions between the natural and the social)" (p. 186) -- are worked with four moments of translation -- problematisation, interressement, enrolment, and mobilisation -- in which the actors attempt to persuade or "impose" their understanding of the problem at hand onto others. This study follows how scientific knowledge and technology structures power in relationships. It does so by tracing

how fishermen and scientists (i.e., the social) and the scallops (i.e., the natural) work to resolve the problem: the diminishing scallop populations in St. Brieuc Bay, as defined in the terms by the negotiating actors.

The three principles and four moments introduced by Callon have provided an analytical framework that has been taken up by educational researchers. Mary Hamilton (2011), whose research interests lie in educational policy reform and literacy studies, adapts the "sociology of translation" as an analytical framework to analyze the stabilization of Skills for Life, a social project that is part of national educational reform in England. Citing Moser and Law (1999), Law (1999) and Callon (1986), Hamilton combines the four moments of translation and the three principles within the framework of presenting a 'story' followed by analysis -- a "typical device of ANT" (Hamilton, 2011, p. 56). Gray, Graham, Dewhurst, Kirkpatrick, MacDougall, Nicol and Nixon (2009) relate the four moments of translation as heuristic aids to the interpretation of textual and oral accounts concerning the development of a school research group. The four moments have also been applied to the study of computers in education (Tatnall, 2015), in management and organization studies (Smith, Rose & Hamilton, 2010); and to accounting in education (Verhoef & Samkin, 2017).

John Law

John Law is Co-Director of Centre for Research on Socio-Cultural Change (ESRC), Director of the Social Life of Method Theme within CRESC and a professor of sociology and science, technology and society studies at the Open University (UK). Law refers to himself as "interdisciplinary"; ANT allows him to work with the *materially heterogeneous* world, "a mix of the social, economic, human, 'natural', and technical" (http://www.open.ac.uk/people/jl6987). Law (2009) describes ANT as "a sensibility to the messy practices of relationality and materiality

of the world" (p. 142). For Law there is no "it" for actor-network theory; ANT is not a thing, nor something fixed, rather it is a diasporic in that it has become many other things, meeting up with other intellectual traditions (p. 142).

As a sensibility, Law explains, it requires a process of continuously letting go of *a priori* assumptions and staying with the "messy practices of relationality and materiality of the world" (Law, 2009, p. 142). Law and fellow sociologist Vicky Singleton describe ANT as a "worldly practice or craft", that "works slowly both on and in the world, as uncertain, as empirically sensitive, as situated, and as passionate because it stays with the trouble" (Law & Singleton, 2013, p. 489). Hesitant to use the word and not wanting to contribute to solidifying ANT, Law now prefers to call his approach 'material-semiotics'. ANT, he says, is a semiotics of materiality: It takes the semiotic insight, that of the relationality of entities, the notion that they are produced in relations, and applies this ruthlessly to all materials—and not simply to those that are linguistic (Law, 1999, p. 4).

For Law, ANT is not a theory, because it describes rather than explains (Law, 2009, p. 141). It is itself an actor-network, always changing and bringing into range a collection of philosophical, theoretical, and multi-disciplinary ideas and approaches. To solidify it would be to defeat the purpose of ANT, which is to make visible the messy heterogeneity in which we live. Material semiotics as a term, he claims, allows for greater "openness", "uncertainty", "revisability" and "diversity"; it's more amenable to humility, "one of [ANTs] intellectual leitmotifs" (Law, 1999, p.141).

As a semiotic approach, actor-network theory is performative: entities achieve "form as a consequence of the relations in which they are located […] [ANT] also tells us that they are *performed* in, by, and through those relations" (Law, 1999, p. 4). Performance maintains

relations, or, there are no relations without performance. ANT, Law writes, is, a "sociotechnical analysis that treats entities and materialities as enacted and relational effects, and explores the configuration and reconfiguration of those relations" (p. 158). "Ontological categories", Law continues, "(for instance 'technology' and 'society', or 'human' and 'non-human' are treated as effects or outcomes, rather than as explanatory resources".

Law with colleague Vickey Singleton (2014) credit feminist technoscience, including Donna Haraway's (1991) feminist material semiotics in her classic and ground-breaking "Cyborg Manifesto: science, technology and socialist feminism in the late twentieth century". Other influences include the numerous case studies and postcolonial analyses such as "Staying true to the laughter in Nigerian classrooms" (1999) by Australian historian and philosopher of science, Helen Verran. Work by British anthropologist Marilyn Strathern (1996) "Cutting the Network"[iv], Dutch anthropologist and philosopher, Annmarie Mol, *the body multiple: ontology in medical practice* (2002) and "Ontological politics. A word and some questions" (1999) and sociologist Vicky Singleton with whom Law has co-written several papers: "ANT, multiplicity and policy" (2014), "ANT and Politics: Working in and on the World" (2013), "Object lessons" (2005)[v] and "Performing technology's stories: on social constructivism, performance, and performativity" (2000).

Law's concerns have to do with "mess", "confusion" and "relative disorder" (Law, 2004, p. 2). Sometimes, he suggests, the act of description itself adds to the confusion of something. Methodological rules can get *naturalized*; methodological procedures can go unquestioned. The assumptions passed down, he argues tend to assume "a set of fairly specific, determinate, and more or less identifiable processes" (p. 5). In general terms, Law's larger project is to "broaden method" sometimes, "to subvert it" and also "to remake it" (2004, p. 9). To this end, material

semiotics allows for a certain flexibility. Law's approach is not singular but multiple, supporting a range of methods, anti-methods and new methods.

Educational scholars Tara Fenwick and Richard Edwards (2011) express the difficulty in defining ANT but in slightly different terms; they write that to define ANT, is to risk "distorting" and "domesticating" it (p. 2). ANT is described as "a virtual 'cloud', continually moving, shrinking and stretching, dissolving in any attempt to grasp it firmly". Less a singular theory or method, ANT, in their view, is "a sensibility, a way to sense and draw (nearer to) a phenomenon" (p. 1). They understand ANT as one of several approaches that support sociomaterial practices. Sociomaterial approaches are used by a number of ANT scholars working in education (see Aberton, 2012; Decuypère & Simons, 2014; Edwards & Fenwick, 2015; Fenwick & Edwards 2014; Mulcahy, 2013; Mulcahy, Cleveland & Aberton, 2015; Toohey & Dagenais, 2015).

Decuypere and Simons (2014) draw on three sensibilities of ANT -- heterogeneity, relationality, and enactments and three associated steps to describe and visualize academic practices of a university professor. Aberton's (2012) ethnographic or paxiographic research on everyday community learning applies ANT as a material semiotic methodology in which practices are foregrounded thereby questioning the often "formulaic responses" associated with "adult education literature, research and lifelong learning policy" (p. 131). ANT brings attention to the material that would otherwise go unnoticed. The women Aberton interviews speak of their past not by saying what they learned, but in sharing what they did.

Bruno Latour

Bruno Latour is a French philosopher, sociologist, and anthropologist. He taught at l'École des Mines de Paris at the Centre de Sociologie de l'innovation between 1982 to 2006, a highly regarded public institution that is oriented towards the education of engineers. Latour

conducted work in Africa and later moved to Roger Guillemin's[vi] neuroendocrinology lab in La Jolla California, where he and Steve Woolgar began a series of ethnographic studies in which they observed scientists working in the laboratory and used an *anthropology of science*[vii] approach to describe the movements, instruments, materials, notes, and conversations that they observed. Their work culminated in *Laboratory Life: The Social Construction of Scientific Facts* (1979) and its subsequent edition, *Laboratory Life: The Construction of Scientific Facts* (1986)[viii] identical to the first except for removing "*Social"* from the subtitle of the book and the addition of a postscript that explains the change among other things. Latour and Woolgar are interested in understanding how is it that a fact comes to be made, how it comes to stand on its own, separated from its history, and social affiliations. Rather than adding to literature emphasizing scientific discoveries and knowledge, they turned their focus toward the means through which scientific facts are produced.

In the case of a scientific culture in particular, there is a strong tendency for the objects of that culture (facts) to provide their own explanation. Rather than produce an account which explained scientists' activities in terms of the facts which they discovered, "our interest was to determine how a fact came to acquire its character in the first place" (Latour & Woolgar, 1986, p. 278).

This speaks to their early ethnographic approach which seeks distance, not through *exoticism*, but through *uncertainty*.

Latour and Callon collaborated in the early 1980s at the *Centre de Sociologie de l'Innovation*[ix.] Through a number of sociotechnological case studies (for Latour see, Aramis or the Love of Technology (1996)[x]; for Callon see "the state and technical innovation: a case study of the electrical vehicle in France" (1980)[xi], Latour and Callon developed some of the initial

theoretical principles on which ANT is based (Blok & Jensen, 2011). In *Mapping the Dynamics of Science and Technology*, Latour and Bastide (1986) examine how it is that scientists build enduring effects through their texts. They ask: how is it that scientists build their textual structures to endure long after the scientists themselves are no longer living? Using a socio-semiotic analysis, Latour and Bastide review the text (which has to do with mechanisms of urine concentration by the kidney) and slowly, sentence by sentence, build their analyses.

Within the first three paragraphs they demonstrate how the authors of the text have already expressed *a history of science* and an epistemology. Normally to go from one position to the other, they suggest, would require a lengthy discussion and many steps; in the article, however, these unspoken steps are "marked by erasures, interpolations and additions […]" (p. 52). Analyzing scientific texts in this close way using a socio-semiotic approach, yields effects that might not otherwise be evident. It also models possible approaches for an ANT-based analysis of texts. This approach is pertinent to my work on media reports on MOOCs as will later become clear.

In addition to *Laboratory Life* and the chapter text I have just mentioned, Latour has authored and co-authored many books, including: *Science in Action* (1987) which demonstrates methods that can be used to follow scientists; *The Pasteurization of France* (1988) which offers philosophical propositions on Latour's *principle of irreduction*[xii], the philosophy that *everything is absolutely concrete* (Harman, 2009); *We Have Never Been Modern* (1993)[xiii], and *Politics of Nature* (2004). This dissertation is based on *Reassembling the Social: An Introduction to Actor-Network Theory*, (2005) or RAS, a "how-to book" for ANT practitioners (p. 17). RAS offers us something very unique, something not easily expressed in the abstract that can only be achieved through the process of enacting ANT: RAS can help us to experience the world without the

burden of believing we already know it. Hence, Latour's description of RAS as a "travel guide" (p. 17).

Recognizing the time commitment required to do an ANT study and wanting to facilitate his students' research, Latour has since introduced a simplified version of ANT: the *Cartography of Controversies* (CC), or *controversy mapping* as it is sometimes called. CC focuses on digital online networks as the source of the information studied and relies on tools garnered from the World Wide Web (WWW), including, at times, a customized database/software called ANTA (Actor-Network Analyzer) to map controversies that appear (www.mappingcontroversies.net/). CC supports more immediate results than *RAS* and provides tools to translate data from the Internet into dynamic visuals. Other publications by Latour have to do with his ideas on the current political ecological landscape (see *An Inquiry into Modes of Existence* (2013); *Facing Gaia* (2017) and *Down to Earth: Politics in the New Climatic Regime* (2018).

Theoretical Foundations of ANT

Latour (2005) makes a compelling argument that, since the seventeenth century, and especially since the ascent of Durkheim's ideas over those of his mentor Tarde at the turn of the 20th century, the social sciences have progressively lost their way. Aligned as they were with the modernizing impulses of science, the definition of nation-states and projects of social engineering (Latour, 2005, p. 41), the social sciences have extended their reach to the point where it is no longer clear if something particular called 'society' actually exists; at the same time, they have restricted the possible participants in the social world to humans alone. Latour's alternative to this 'modern Constitution' is the 'non-modern' concept of the *collective*[xiv]: the *collectives*, or actor-networks, that Latour proposes are fluid and mutable – they collapse

distances and upset the local/global distinction; they are also materially heterogeneous, including both human and non-human actors.

In RAS, Latour traces the idea of the *collective* to two sources: The first, sociologist Gabriel Tarde, considered the social to be "not a special domain of reality but a principle of connections; that there was no reason to separate 'the social' from other associations like biological organisms or even atoms" (Latour, 2005, p. 13). Tarde also challenged the nature-human and micro-macro divides in sociology (Latour, 2002, p. 118), two projects that Latour takes up. The second, are the ideas of Harold Garfinkel: "sociology could be a science accounting for how society is held together, instead of using society to explain something else or to help solve one of the political questions of the time" (p. 13); and the practice of following subjects as they define what the social world consists of (Latour, 2005, p. 29n.22). Garfinkel and Sacks observed and described *society-members* as articulating their own sense of social order (as cited in Watson, 1992), an idea emphasized in ANT with the mantra "let the actors speak for themselves" or when the researcher follows the actors as they attempt to stabilize the "actor-networks" by putting things in order. By following the actors and letting the actors speak for themselves, ANT as expressed in RAS avoids the pitfall: the sociologist knows the subjects better than the subjects know themselves (Venturini, 2010a).

To refresh the project of sociology – which Latour defines as 'the science of living together' (Latour, 2005, p. 2) – he also adapts the linguistic semiotics of Algirdis Greimas, who coined the term 'actant' and explored how truth claims are built in scientific practice (Law, 2009, p. 144). Philosophically, Latour aligns himself with the poststructuralism[xv] of Michel Serres, Michel Foucault and Gilles Deleuze in their rejection of stable, underling structures and processes of reproduction, the process philosophy of Alfred North Whitehead, with its emphasis

on constant flux and its consideration of society as " bundles of composite entities that *endure* in space and time", constantly needing new associations to exist (Latour, 2005, p. 218), and finally, the pragmatic philosophies of John Dewey and William James.

Latour equates the traditional approach in sociology, which he calls "the sociology of the social", to 'pre-relativistic' science -- it works for things that change very slowly, but relies on invisible, underlying substances to explain them: "social forces" (p. 7) in the case of sociology, the "ether" in the case of physics (p. 12). He then equates ANT, which he calls the sociology of associations to 'fully "relativist"' science – it is needed when "things accelerate, innovations proliferate and entities are multiplied" (Latour, 2005, p. 12). In other words, he argues, it is needed today.

Epistemology, Ontology and Methodology

A principal requirement for practicing ANT is that the researcher overcome *a priori* assumptions about what the social world consists of so that they can observe how associations between actors are actually made. In this process, epistemological dualisms such as subject and object, Culture and Science, facts and values, Nature and Culture that have long informed and been propagated by Western theories and philosophical approaches dissolve (Blok & Jensen, 2011), leaving the researcher in an epistemologically indeterminate frame of mind. This has put ANT at odds with most social science research, which privileges epistemological findings -- knowledge or how we come to know based on what we observe (Lincoln, Lynham & Guba, 2011). Instead, ANT highlights the ontological and the metaphysical (Blok & Jensen, 201, p 12): ontological in that it is the study of being and the metaphysical in that it deals with existence and the nature of reality (Crotty, 1998).

Latour insists on a two-step method in ANT: the first step addresses the metaphysical question of what the social world consists of. The second addresses the ontological question of how the multiplicity found in the first step is put in order. In each step, the analyst "follows the actors" (Latour, 2005, pp. 12, 29, 61) and their choices and traces connections created between them. These steps, Latour insists, must be kept separate, or the analyst risks prematurely foreclosing on the collective, "the project of assembling new entities not yet gathered together and which […] clearly appear as not being made of social stuff" (Latour, 2005, p. 75). The process of following actors within concrete, changing relations is slow, and the recording of traces is abstract, detailed, and empirical: only this way can the analyst be sure that no entities are excluded from the future Collective without due process.

Constructivism and Social Constructivism

ANT is best aligned with constructivist principles. Crotty (1998) refers to constructionism, Latour (2000; 2005) to constructivism. Note that for the purposes of this dissertation, constructivism and constructionism are used interchangeably. A constructionist view holds that there is no objective truth waiting to be discovered from external reality. It contrasts with objectivism, which assumes that "truth and meaning reside in objects independently of any consciousness" (Crotty, 1998, p. 42). In constructionism, meaning is made in the mind as we engage with and observe the world we interpret. The interpretive strategies invoked to help us understand how we apprehend meaning vary. Whether we consider meaning to be 'a publicly available system of intelligibility' (Fish, 1990, p. 186 as cited in Crotty, 1998), or 'a system of significant symbols' (Geertz, 1973, p. 49 as cited in Crotty, 1998), it is generally assumed in constructionism that we enter a world that is, at once, already there (pp. 52-53). Constructivism is distinct from social constructivism.

In social constructionism, "All reality, as meaningful reality, is socially constructed.[7] There is no exception" (Crotty, 1998, p. 54). The 'social' in social constructionism concerns the mode of meaning generation (p. 55), not the meaning of the object to which our attention is directed; meaning is always social as it arises from interactions even if those interactions are physical or natural. Social constructionism is a contested field. Darin Weinberg (2009) argues that social constructionism's important contributions rely on its ability, through empirical study, to assess "what counts as genuine knowledge and why" (p. 282). In education we're likely to be familiar with Berger and Luckmann's (1966) *The Social Construction of Reality*, a seminal text on social constructionism in the social sciences and humanities. Their contribution worked against the reification of social and institutional identifications (Lynch, 2016). At the same time however, by limiting their investigations to humans and institutions, they reify a distinction that is part of traditional sociology: the Nature / Society dualism. This dualism is the target of ANT. In Latour's (2005) view, Nature and Society are collectors, Enlightenment concepts that are reified as distinct categories through use; rather than describe, they come to enact reality. In ANT, concepts exist, but they are no less constructed than the realities they purport to describe.

Rather than defining social constructionism, Weinberg (2009) suggests it is better to accept Ian Hacking's (1999) approach: "constructionist research has generally been concerned less with establishing the necessary and sufficient conditions needed to explain empirical events than raising people's consciousness in a more general sense" (p. 15). For Latour, the word "social" is too often used as a catchword, or adjective, for all the collectives and actions we haven't taken the time to observe. Instead, Latour practices constructivism; in his approach the researcher abandons a priori assumptions about the social, emphasizes empirical description over

explanation and follows the construction of actor-networks as assemblages in continuous formation (rather than contexts).

> Latour (2000) raises two possibilities of belief about reality: the first, deconstruction, which posits endless mediations; the second, fundamentalism which takes perceived reality at face value. He offers "constructivism" as a third option that refuses to see reality and construction as mutually exclusive terms. And while deconstruction leaves nothing to grasp in its wake, it is fundamentalism that is perceived by Latour as the real danger because it denies the very existence of the constructed. (https://constanzasilva.com/tag/social-constructionism/)

Constructivism, according to Latour, should not be conflated with deconstruction. ANT, Latour writes, "has been confused with a postmodern emphasis on the critique of the 'Great narratives' and 'Eurocentric' or 'hegemonic' standpoint". Instead, "dispersion, destruction, and deconstruction" are to be overcome not something enacted. ANT is about construction, composition, a way of making or contributing to a future common world (see Latour, 2005, p. 11). ANT as elaborated in RAS is best aligned with constructivism: actor-networks are always being formed and dissolving and the social, rather than being a "stuff" (Latour, 2005, p. 43) or an explanation is an *effect,* or a movement continuously being produced.

The Making of a Fact

> When we say that a fact is constructed, we simply mean that we account for the solid objective reality by mobilizing various entities whose assemblage could fail; 'social constructivism' means, on the other hand, that we replace what this reality is made of with some other stuff, the social in which it is 'really' built. (p. 91)

The question, for Latour, is not: Are scientific facts true? The question is: Are scientific facts made well? Scientific facts, in Latour's view, are constituted through chains of activities and instruments that are mobilized in the artificial setting of the laboratory. To make his point—that facts need to be well constructed if they are to stand and be reliable, Latour uses the analogy of architecture: the reason a building stands solidly and independently of the architect is because the work of the architect was done well. If a building has not been "designed, planned or built" well, it will be "shaky, unfinished, ugly, [un]inhabitable" (Latour, 2000, p. 8). As with architecture, science must be well built: "it is because they work and work well that facts are autonomous and stand independently of [the scientists'] action" (p. 9). In other words, science must always be tested. In this way, Latour posits that the debate between construction and autonomous reality is misguided; the issue, he argues is a choice between good and bad construction.

Latour points out that in some fields such as science and technology studies, construction has held a different meaning that if something was constructed, it was not true: "*either* something was real and not constructed, *or* it was constructed and artificial, contrived and invented, made up and false" (Latour, 2005, p. 90). In Latour and Woolgar's early observations of the laboratory, they realized that, "Facts were facts—meaning exact—*because* they were fabricated—meaning that they emerged out of artificial situations" (p. 90). Constructivism is for Latour and colleagues a way to increase realism, not fakeness. In the early nineties, some scholars drawing on aspects of constructivism argued that science, like other disciplines, was constructed and therefore its findings were not true. This strain of argumentation was not constructivist in the sense defined by Latour. The consequence of this misunderstanding was that some scientists and other scholars accused ANT of being anti-science and despairingly

relativistic and its practitioners of being ignorant of science. A period of intellectual upheaval in the early 1990s known as the "science wars", had pitted science against the humanities—exactly the division that Latour had been working to overcome (Latour, 2005, p. 116).

What is ANT?

In RAS, Bruno Latour writes that ANT *is* a theory—it is an "alternative social theory" as opposed to a "traditional" one (Latour, 2005). Latour's philosophical approach is negative: "ANT is first of all a negative argument. It does not say anything positive on any state of affairs" (p.141). "It's a theory […] about how to study things, or rather how *not* to study them—or rather, how to let the actors have some room to express themselves" (p. 142). Not only is it a theory, ANT is also "a method, and mostly a negative one at that" (p. 142). The most positive statement Latour makes about ANT is that it is "the name of a movement, a displacement, a transformation, a translation, an enrollment" (2005, pp. 64-65). Latour's main concern is that the "analyst"[1] not predetermine what the social consists of in order that the associations of actors that constitute it can appear in the ANT project. The goal is to support these associations—or actor-networks—as they are, rather than according to any *a priori* social assumptions about them. As the associations being followed in ANT are dynamic, the ANT researcher must remain attentive to change without predicting outcomes. Latour explains that the "social" in ANT "is not a place, a thing, a domain, or a kind of stuff but a provisional movement of new associations" (p. 238). In this view, ANT is an approach that thrives on heterogeneity and flux and requires that the researcher partake of the uncertainty.

[1] From here on, I will use the term researcher in place of this term.

Latour provides us with a method, not so it can be fixed in our minds as the way to do ANT research but as a way to experience the social from a place that no longer seeks to reify the "social" as has been translated to us since the Enlightenment.

Chapter Summary

ANT, Latour posits, is the name of a movement, a displacement, a transformation, a translation. To grasp the new sociology of associations, the researcher must attempt to shed their *a priori* assumptions about what constitutes the social as largely defined in Durkheimian terms. A first task was to differentiate Latour from his colleagues. To do so Latour, distinct from Callon and Law, offers researchers a two-step approach, one which allows for a reconsideration of sociology, and one that follows movement. ANT calls for a new way forward, filled with multiplicities that construct and build toward a future common world. Educational scholars have been taking up these ideas, inventing new ways to understand and describe relations. In the next chapter, a review of the literature examines ANT and some of its infiltrations into educational scholarship.

Chapter 3. ANT in Educational Research: A Review of the Literature

Purpose of the Chapter

Increasingly ANT is deployed in research and theorizing in education. Despite the growing interest in ANT and its integration with the educational academic literature, little has been explicitly written about its potential as a methodology, particularly as it is described in

Bruno Latour's *Reassembling the Social* (*RAS*). ANT scholars have for some time cautioned against using ANT in a way that "fixes" or solidifies it:

> ANT progenitors have worried above all that ANT can become reified as an immutable research strategy, a fixed and singular standpoint for thinking about the world complete with methodological baggage that would inevitably reduce the phenomena it confronts to conform to its own theoretical content (Fenwick & Edwards, 2010, p. 166).

Fenwick and Edwards state that researchers tend to avoid using ANT as a "rigid framework that tames theory, method and the life under observation" (p. 167), at times pursuing notions of "ambiguity, non-stability and transgression fixed to methodological approaches" (p. 166), at other times integrating the plethora of rich debates associated with qualitative research. Recognizing the heterogeneity of the academic material--ANT research crosses multiple topic and subject areas--this review takes an exploratory and expansive approach by asking: how *is* ANT expressed in the education scholarly literature?

Attempting to draw closer to methodology I asked the more specific question: how are ANT ideas, methods or sensibilities integrated with research design? In pursuit of these inquiries, this chapter exposes a purposefully selected series of studies and discussion papers that openly demonstrate and articulate in varied ways how ANT ideas or methods intersect in the research process. In the first part of the chapter, an overview of the scholarly literature of ANT in education is provided. This is followed by a review of some of the literature organized, thematically, taking into account how ANT intersects with methodology.

To assist in the analysis of ANT-based texts, I draw upon three criteria found in RAS. These criteria while broad in principle act as a set of guidelines with which to analyze the literature. While Latour himself admits there is "no clear litmus test for ANT membership"

(Latour, 2005, p. 10), he offers three criteria: 1. consideration of non-humans as actors; 2. understanding the social as an unstable association of heterogenous actors; 3. the research aims to reassemble the social—can offer a way to "test" the *vitality* of an ANT approach (Latour, 2005, p 10). The three criteria facilitate the analyses of ANT approaches in a field that is invariably constituted by distinct educational topic and subject areas and allows us to get a glimmer of the ways in which ANT is applied or enacted in the research. Finally, two distinct ANT-oriented research papers: Example I reviews the heuristics of Adams and Thompson (2011) and Example II reviews the sociomaterial approach enacted by Decuypere and Simons (2014). Both are summarized and analyzed. The three criteria approach by Latour is applied in a systematic way to the second detailed example by Decuypere and Simons (2014) whose research enacts ANT methodologically. This review of peer-reviewed research articles serves as a unique point of departure for the elaboration of applied research in education.

ANT in Education

Increasingly Actor-network theory (ANT) is deployed in research and theorizing in education. Despite the growing interest in ANT and its integration with the educational academic literature, little has been explicitly written about its potential as a methodology, particularly as it is described in RAS. There may be good reasons for this. For one thing RAS is not a quick read. As a text, it is interdisciplinary, drawing from Latour's erudition in multiple fields and disciplines: philosophy, sociology, science studies, fiction, semiotics, ethnomethodology and art as well as his involvement in the development of new ontologically oriented areas of study: *empirical philosophy* or *practical or experimental metaphysics*[xvi], and the *sociology of associations*. What distinguishes these new areas is their ontological rather than their epistemological orientation[xvii]. Another challenge for the researcher is that they are asked to

begin their inquiry without making *a priori* assumptions about what constitutes the social, which puts them in an unfamiliar, seemingly groundless situation. Furthermore, RAS is written in a performative style that requires the reader to continuously reflect on their own participation in the sense-making process. A review of the literature in education demonstrates the desired but sometimes uneasy relationships scholars have had with an approach that foregrounds matter and emergent relations over pre-determined knowledge based on historic sociological categorizations**.** Abandoning *a priori* assumptions about the social and embracing their own role in the creation of order is perhaps one of the major challenges for researchers long accustomed to the particular methods and methodologies of social science.

In the previous chapter, I presented three key contributors to actor-network theory as a way to distinguish some salient ideas that they share, despite differences in the formulations of these ideas and the terminology applied. In this chapter, I follow ANT as it is defined and applied in the literature, whether it emphasizes Callon's moments of translation (Hamilton, 2011), Latour's (2005) well-known advice, "follow the actors themselves" (p.12) (Adams & Thompson, 2011), or Law's emphasis on stories and narrative (Hamilton, 2011; Parker, 2017). It is not unusual in ANT research to draw on concepts from two or more of these varied ANT sources, and to emphasize their shared aspects. Researchers seem to draw on ANT in a way that the tools and theoretical concepts it offers are most applicable to their research. In other words, there is no set of distinct ANT tools for analysis, nor a set compilation of theoretical ideas. From an ANT perspective then, this kind of mixing is not heretical, in part because it fits with the idea that readings of ANT are neither singular nor are they to be solidified as the method or the methodology or even the sensibility of ANT.

An important contribution comes from educational scholars Tara Fenwick and Richard Edwards whose philosophical and theoretical undertakings have oriented the field through their emphasis on ANT as one of a number of sociomaterial[xviii] approaches and practices. Their view of ANT, which aligns with John Law's material semiotic approach, emphasizes ANT as a sensibility; they propose that when ANT sensibilities are enacted, researchers can come to see relations with a new clarity. It is important to point out that while ANT as expressed in RAS can be understood as a sensibility as described by Fenwick and Edwards (2010), the word "sensibility" is not used in RAS; Latour speaks of sensitivity, intuitions and modes of existence—language not used by Fenwick and Edwards. In other words, ANT sources may have and invoke their unique terminology. Fenwick and Edwards (2010) use the metaphor of "cloud" to capture the idea that ANT consists of a "moving, shrinking and stretching" (p. ix) set of relations that cannot be *grasped* in any definite way. For them, ANT is an umbrella term that includes a range of shared ideas about ANT. This approach, which emphasizes sociomateriality and sensibility better reflect the way that ANT is expressed in the education literature. This review adheres to approaches used in the literature.

In this review, I begin by presenting some basic metrics to support the idea that ANT-identified approaches are increasing within scholarly literature in the field of education. This is followed by a brief introduction to "considerations for the vitality of ANT texts", more or less a set of broad principles with which to consider ANT-identified texts and which serve as guidelines for the exploration of the ways that ANT is expressed within the literature, looking at some of the unique expressions of ANT that scholars have chosen to consider in the orientation of the research. Finally, I review and discuss two exemplary ANT-inspired peer-reviewed research articles that propose an heuristic and a sociomaterial methodological approach.

The two articles have little in common aside from a substantive interest in the ideas of ANT. In the first, scholars Adams and Thompson (2011) offer eight heuristics--a hybrid of phenomenological and actor-network principles--to educational researchers working in the areas of philosophy, theory and/or information and communication technologies (ICTs). In the second, scholars Décuypère and Simons (2014) enact three sensibilities and devise three associated steps to describe and visualize the academic practices of a university professor in a single day at a time when digitization is increasing.

As a methodology ANT relies on clear, good description and avoids explanation. As an ontological approach, it is not generally concerned with what things mean but, rather, with what things do ANT puts into focus the how, not necessarily the why (Fenwick & Edwards, 2010, p. 8). Within this sociology of associations mapped without *a priori* assumptions, the connections and translations are multiple, fluid, specific and detailed. The research questions then arise: Can ANT-based methodological approaches be evaluated? If so, how?

Drawing directly from RAS, I apply three considerations to the research offered in RAS as a way to "test" the *vitality* of an ANT approach: considering non-humans as actors; understanding the social as an unstable association of heterogeneous actors; and whether the research is aiming to reassemble the social. I summarize and consider the study by Decuypere and Simons (2014) as an examplar keeping in mind these ANT measures. I apply these three criteria merely as guidelines for analysis of the articles. They help maintain some consistency (order) within fields of heterogeneous texts. The aim of this exercise is to elaborate on the ideas about ANT and methodology rather than judge the quality of research[xix]. I argue that ANT in education produces effects that cannot be obtained with other methodologies, such as bringing awareness to the multiple ontologies of our world(s), and our enrollment in processes we might

not have previously recognized. The two research papers—the first by Thompson and Adams (2011), the second by Decuypere and Simons serve as examples for the elaboration of ANT ideas; the latter for the consideration of evaluation and elaboration of ANT research on ANT terms.

ANT developed in the early 1980s in Science, Technology and Society studies, largely at the hands of scholars Michel Callon (1979; 1986), Bruno Latour (1986; 1988) and John Law (1986). However, it wasn't until the late 1990s[xx] that research from within the field of education began to draw on ideas associated with actor-network theory. Early ANT research includes *Space, Time and Curriculum in Undergraduate Physics and Management*, a book by Jan Nespor (1994) published as part of the Knowledge, Identity and School Life Series. Drawing on fieldwork gathered at a public university from June 1986 to July 1987, Nespor explores interaction as something that occurs at a distance--across time and space--and within immediate settings (time-space compression) (Harvey, 1989 in Nespor, 1994). Nespor explores networks[xxi] as a means for understanding how undergraduate students are socially organized in space and time through various curriculum activities and representations that become a part of enduring *networks of power* around the academic disciplines of physics and management. Looking at knowledge and learning, Nespor writes that ANT "requires us to look closely at how distant activity is transported into and made manifest in particular settings and at how activities in those settings are connected to activities and spaces elsewhere" (Nespor, 1994, p. 3). Large or small, dispersed or nearby, actor-networks are in continuous formation or dissolution in this account. Communities for example are not simply "situated" in space and time, they are "producing and organizing space and time" (p. 3).

An important contribution to the review of ANT literature in education is provided by educational scholars Fenwick and Edwards in *Actor-Network Theory in Education*; this comprehensive review includes: an appraisal of some of the key debates and academic shifts that occurred in early ANT; an analysis of educational research in which ANT plays a key role; the proposition that ANT as a sociomaterial orientation has the capacity to interrupt or intervene in the mundane; and the proposition that ANT is best understood as a 'sensibility'. ANT in their view (partially) is "an interruption or intervention" that allows educational researchers to make sense of some of the difficulties associated with studying complex phenomena. A subsequent publication, *Emerging Approaches to Educational Research: Tracing the Sociomaterial* by Fenwick, Edwards and Sawchuk (2011) presents ANT as one of a number of emerging sociomaterial research approaches in education, an orientation that assumes the worlds we occupy are never neat and tidy but, rather, they are "messy, slippery and indeterminate". They argue that ANT, like other sociomaterial approaches decentres the human and activates our *interwoven* relations with things; ANT contradicts binaries—"subject/object", "doing/reflecting", "informal and formal learning", "human/non-human"—and disrupts the unexamined dualities we often take for granted (2011, p. vii).

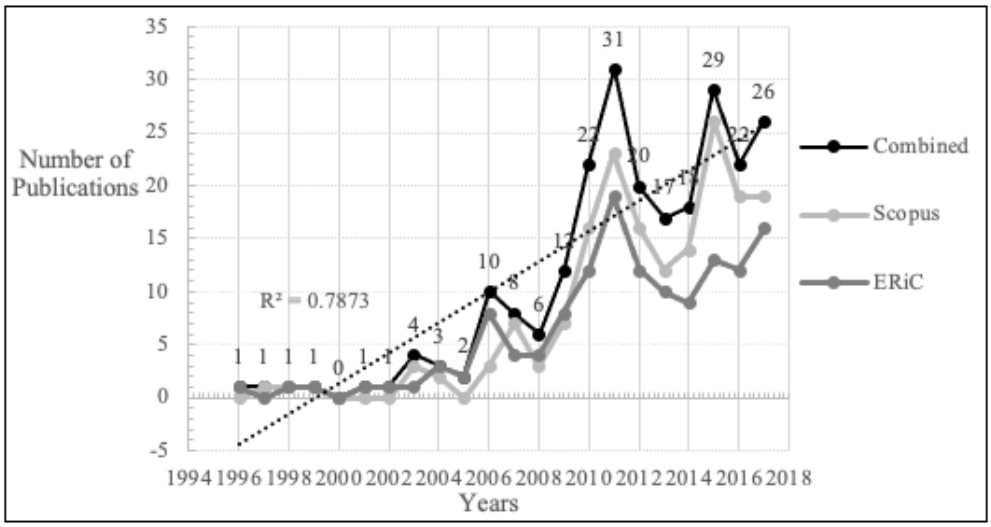
Reviewing ANT as a methodology or as a sensibility in education poses several challenges for the researcher. The first is that it requires that the researcher work with research, at least in part, outside of their own specialization. The second is that terminology used to express ANT concepts varies. Third, the application of these concepts also varies. ANT studies are not generally comparable—unlike the methods of experimental research in which statistical outcomes (effect sizes, significance of results, and power analysis) can be compared across studies--as ANT takes expression in various forms, often narrative or ethnographic.

Qualitative research too eludes ANT even though various methodologies—discourse analysis, content analysis, narrative approaches, ethnography—are integrated with ANT in education, sometimes forming a hybrid form of research and analysis; however, ANT's emphasis on withholding *a priori* assumptions about what constitutes the social and its refusal to settle for deconstruction can put it at odds with some qualitative methodologies. As Fenwick and Edwards (2010) assert, qualitative research with its emphasis on written accounts can "collapse multiplicity into one particular totality" (p. 161)[xxii] in its attempt to explain the social. Feminist discourses in qualitative research have tended to find alignment with ANT in part through the *new material feminisms*[xxiii] that have been instrumental along with material approaches such as ANT in bringing new ideas to educational research, albeit "selectively, eclectically and with wide variation" (Fenwick, Edwards & Sawchuk, 2011, p. 111).

In education, ANT-based, inspired or identified research continues to rise. Two keyword searches were conducted in order to determine the extent of the predominantly anglophone literature in the field. In Scopus, a database centered on the life, social, physical and health sciences, a search using the keywords "actor network theory" and "education" in abstracts from 1996 to 2017 returned 176 results. In ERIC, an education database, a keyword search for "actor-network theory" in abstracts from 1996 to 2017 returned 138 results. Both searches were limited to peer-reviewed articles. Other published formats--books, conferences, and editorials--were excluded. After eliminating repetitions, Scopus and Eric returned 236 results from 1996 to 2017, evident in Appendix A. The number of journal articles published peaked in 2011 with a combined result of 31 in 2011 and with a combined result of 29 in 2015. Appendix A provides a break-down of the number of peer-reviewed articles by Scopus, ERIC and the two sources combined. Despite some fluctuation, ANT-inspired research is increasing (Figure 3.1).

Figure 3.1

Number of Peer Reviewed Articles Published in Scopus and ERIC, 1996 to 2017



Note. While publications remain specialized and are relatively small in numbers, the long-term trend shows an increase in the number of peer-reviewed publications in which ANT ideas play a major role.

Results also show that ANT scholarship is international and includes researchers affiliated with universities from 29 diverse countries (see Figure 3.2). Despite the wide international scope, both Scopus and ERIC produce results that predominantly reflect English language research. With the exception of Portuguese, German and Lithuanian, research from non-English sources in Scopus and ERIC is limited. A search through *Fundacíon Dialnet*—a database managed through Universidad de la Rioja (Spain)[xxiv]—using keywords *La Teoría del Actor-Red* returned an additional 189[xxv] full-text results (articles only) from 2008 to 2017. Documents from *Dialnet* are available in Spanish, Portuguese and English and span a range of disciplines. Many of the journal articles returned include *hispano* and *portugués* journals not normally found through Scopus or ERIC. The results obtained from *Dialnet* demonstrate that the

topic of ANT is also being taken up within Latin American and Hispano-European research settings.

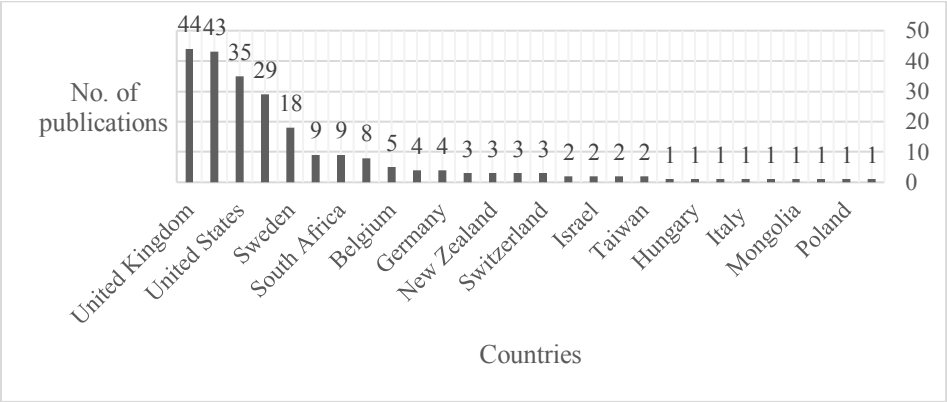
Based on the combined results from Scopus and ERIC, the largest number of articles were published in the United Kingdom (44) followed by Australia (43), the United States (35) and Canada (29). In Canada, ANT research has been conducted in Québec, at Université de Montréal and Université Laval, in Western Canada, at the University of British Columbia, Simon Fraser University, the University of Regina, the University of Alberta and Athabasca University (Alberta) in Ontario, at York University, the Toronto Institute of Pharmaceutical Technology, Athabasca University, the University of Ottawa and the University of Western University, and in the Maritimes, at Saint Mary's University.

During this period ANT migrated into specialized areas of education, some of which include educational technology (Bigum, 1997, 1998; Habib, Johannesen, & Øgrim, 2014; Johannesen, 2013; Lee, 2008, 2011; Perrotta, Czerniewicz, & Beetham, 2015; Tatnall & Manning (2011), Thumlert, de Castell, & Jenson, 2015), educational technology and mathematics (Hillman, 2011; Stoilescu, 2009); literacy studies (adults) (Zhang & Heydon, 2016) or early education literacy (Edwards, Ivanič, & Mannion, 2009; Hamilton, 2011; Heydon & O'Neill, 2014; Heydon, Crocker & Zhang, 2014; Lafton, 2015); numeracy (Adam & Tatnall, 2010); scientific literacies (Peirce, 2013; Mueller, 2015); adult education and educational media (Bhatt, 2012); performance ontologies in adult education or lifelong learning (Fenwick & Edwards, 2013) critical literacies (El Khouri Buzato & Sachs, 2015); digital and new literacies (Clarke, 2002; Gourlay, 2015; Toohey & Dagenais, 2015); production literacies in videomaking (Smythe, Toohey & Dagenais, 2016); informal learning (Aberton, 2012); policy studies (Fenwick, 2010; Fenwick & Edwards, 2011; Gorur & Koyama, 2014, 2011; Lögdlund, 2010);

curriculum studies (Edwards, 2011; Heydon, Moffatt & Iannacci, 2015); educational philosophy and theory (Adams & Thompson, 2011; Edwards, 2011; Edwards & Fenwick, 2015; Fenwick, 2011; Gorur, 2011; Hamilton, 2011; Mulcahy, 2011; Nespor, 2011), higher education studies (Decuypere & Simons, 2014; Habib, Johannesen, & Øgrim, 2014; Tatnall & Manning, 2011) and professional education (Ackland & Swinney, 2015).

Figure 3.2

Number of Peer-Reviewed Publications by Country from 1996 to 2017



Note. Scopus and ERIC sources are combined.

The journals that have tended to publish ANT-identified research, vary according to educational topic; some journals include: *Pedagogy, Culture and Society* (11), *Educational Philosophy and Theory* (9), *Studies in Continuing Education* (8), *Journal of Curriculum Studies* (7), *Journal of Educational Policy* (7), *Cultural Studies of Science Education* (5)*, E Learning and Digital Media* (4)*, Discourse* (3)*, Globalisation, Societies and Education* (3), *IFIP Advances in Information* (3)*, Studies in Higher Education* (3), *Environmental Education Research* (2)*, British Journal of Sociology of Education* (2)*, Education Policy Analysis Archives* (2)*, and Journal of Education for Teaching* (2).

The Varied Expressions of ANT

ANT is understood and applied in variegated ways: some scholars draw on ANT principles or concepts to help formulate questions and guide empirical research, while others apply ANT concepts in the analyses of data gathered through methodologies other than ANT. Some have developed hybrid approaches that use ANT as a methodology in combination with other theoretical frameworks or concepts. In some cases, ANT is limited to providing specific theoretical ideas that ultimately reside within another theoretical framework. Upon closer inspection of the initial 236 peer-reviewed research articles gathered from Scopus and Eric, a heterogeneous collection was revealed. Attempting to isolate ANT as a methodology seemed an onerous task. Unlike the usual approach to social science research, I was not investigating a specific social problem to which scholars apply shared qualitative methodologies or implement comparable research designs using inferential statistical methods and models. Furthermore, scholars use ANT concepts and terminology differently, in ways that often do not align. In some studies, ANT was addressed, but its application to the research was not substantive. The initial plan—to gather data about the types of ANT applied in the research—began to make little sense as the level of diversity became obviously less possible to reduce.

Peer-reviewed articles were selected for this review and include those in which actor network theory (ANT) plays a substantive role in the research design or makes a substantive contribution through the elaboration of ANT ideas. This small selection doesn't distinguish necessarily between empirical studies and theoretical papers. As we will see, particularly in the case of Adams and Thompson (2014), ANT-based research takes a number of forms, all of which contribute to the elaboration of ANT ideas. A research design in education tends to follow, more or less, the social science method, which, according to Crotty (1998), can be identified by four

general areas: philosophy or epistemology (i.e., the knowledges and assumptions we hold about the world that are integral to the theoretical perspective such as objectivism, or constructivism), theoretical framework (i.e., the philosophical approach—symbolic interactionism or feminist-, queer- or race-based critical theories—inform the logic of the methodology), methodology (i.e., the strategies informing the methods deployed, such as randomized field experiments, grounded theory or ethnography) and finally methods (i.e., the techniques applied--inferential statistics, open coding, focus groups or interviews in which data is collected)(pp. 2-6).

Lincoln, Lynham and Guba (2017/1994) have identified what they refer to as the axiomatic nature of five paradigms: positivism, postpositivism, critical theory, constructivism, and participatory/cooperative[xxvi] juxtaposed with a number of relevant concerns including: ontology, epistemology, methodology, the nature of knowledge, knowledge accumulation, goodness of quality criteria, values, ethics, and others. In more recent literature they point to the influence of one paradigm on another, or the emergence of new tools. The boundaries of qualitative research are continually in flux: paradigms are not necessarily enacted singularly (Lincoln, Lynham and Guba, 2017/1994). A researcher may evoke several paradigms at once emphasizing the fluidity of research design. ANT studies are aligned with the full spectrum of research approaches including design that follows quantitative or survey methods. In this review the two "models" proposed, the first by Crotty (1998) and the second by Lincoln, Lynham and Guba (2017/ 1994) are important references in navigating this heterogenous field[xxvii]. I draw on these formulations of methodology to help distinguish how ANT is being used within the research design whether as theory, philosophy, techniques, or concepts and analyses, and for the interpretation of study results. There has been a propensity for ANT research in education to be aligned with qualitative approaches, including ethnography, narrative, and case study. Even so,

ANT is often used in restricted ways and only more recently are scholars attempting to use ANT as a full enactment of methodology while refraining from solidifying it as a singular approach (e.g., Decuypere and Simons, 2014).

By looking at methodology in the research I aim to show what it is the researcher is doing with ANT rather than looking at what they are saying about ANT. The orientation for this review was broadly conceived: how is ANT expressed in the education scholarly literature? After an initial review, a more refined focus was developed: How are ANT ideas, methods, or sensibilities integrated with the research design? What strategies do scholars invoke in their advancement of ANT*?*

After a preliminary review of the research texts extracted from the two databases – Scopus and ERIC – a small number were purposefully selected; they demonstrate a range of methodological possibility but are neither generalizable nor exhaustive. They do however provide some insight as to how scholars navigate ANT philosophical principles and application to enactment of those principles. I acknowledge that some topic areas are not within my realm of expertise. In these cases, it has been important to closely follow the words of the author(s).

Considerations for the Vitality of ANT Texts

To assist in the analysis of ANT-based texts, I draw upon three criteria found in *Reassembling the Social* (*RAS*). These criteria while broad in principle act as a set of guidelines with which to consider the broad range of literature. While Latour himself admits there is "no clear litmus test for ANT membership*"* (p. 10)*,* a good text, Latour explains, is one in which an actor or network is being traced. Whether or not that happens "depends entirely on the precise ways in which [the text] is written—and every single new topic requires a new way to be handled by a text. Most texts are just plain dead. Nothing happens in them" (p. 149). A good text,

according to Latour's fictional professor, is both productive and uncertain. In another section of *RAS*, three tests for ensuring the vitality of a study are offered:

1. Whether non-humans are granted the role of actors;
2. Whether the social is understood as an unstable association of heterogeneous actors;
3. "[W]hether a study aims at reassembling the social or still insists on dispersion and deconstruction" (p. 11).

I invoke these criteria as a lens, not to judge whether a study is or is not ANT, but as a way to elaborate on ANT ideas in the particular ways they are expressed in the scholarly literature.

1. *Consideration of non-humans as actors.*

   The social in ANT is relational where nonhuman elements (as well as human ones) connect or mediate other entities. Most studies which are ANT-identified tend to accept this basic premise.

2. *Understanding the social as an unstable association of heterogenous actors.*

   This is perhaps the most challenging consideration for researchers given the importance of conducting research using stable methodologies and methods. Latour writes, "If the social remains stable and is used to explain a state of affairs, it's not ANT" (p. 10). ANT is not social science as we know it. It doesn't explain the social, nor does it use pre-determined "social" categories as a lens to see the social. If we follow the actors, describe well, it may be possible to get a small inkling of the social unhindered by the burden of pre-determined social classifications.

3. *The research aims to reassemble the social.*

   In other words, the aim of ANT is not to deconstruct *metanarratives* or *Eurocentric* and *hegemonic* viewpoints; it's aim is to create or compose "new institutions, procedures, and

concepts able to collect and to reconnect the social" (Callon et al., 2001; Latour 2004b in Latour, 2005, p. 10).

These three criteria serve as a point of departure to discuss the contributions of the research in general terms; they will, however, be closely applied to the study by Decuypere and Simons (2014) and addressed towards the end of this chapter. In what follows, I identify some of the ways that ANT is expressed in Education providing salient examples from the literature as it pertains to methodology.

Deployments of ANT in Educational Research

ANT as Methodology

Some scholars consider ANT a method that is ontological (e.g., Decuypere & Simons, 2011; Edwards, 2011; Steyaert, 2011) rather than epistemological, and follow core ANT principles, such as no *a priori* assumptions, to shape a research design that emphasizes description over social explanation. Research by Decuypere, Simons and Masschelein (2011) from the University of Leuven (Belgium), falls within this characterization. Decuypere et al. (2011) apply ANT principles to describe an early and well-cited experimental study in the field of mobile learning by Chen, Kao, and Sheu (2003). A key finding of the study by Chen et al. (2003), which looked at students' mobile technology use for birdwatching, suggests that mobile learning environments are "particularly suited for giving learner support in the form of scaffolding" (p. 10). Learning gains for the students in the PDA[xxviii] group confirmed the finding. This study has come to be most widely cited in the area of mobile technologies.

After a detailed review of the study in which they draw on the four moments of translation developed by Michel Callon (1986)[xxix], the notion of inscription[xxx], irreversibility[xxxi] and black boxing[xxxii], Décuypère et al. (2011) review the parts of the study and identify more

actors than those originally mentioned by Chen et al. (2003). Based on an ANT lens, Decuypere and colleagues find additional actors-- mobile devices, the mobile learning scientific community, in addition to the student participants in the study and the three researchers. Their point: "actors never stand alone", they are always "interwoven in mutual relationships" (p. 16). Their analysis of the Chen et al., (2003) [xxxiii] study responds to the question: How has it been possible that three researchers (Chen et al., 2003) could come to represent an entire scientific community?

In this research the researchers demonstrate how ANT can be used to gather actors, and how it can help to extend inquiry into the relations between actors. By relying on concrete description and the suspension of *a priori* assumptions, Decuypere and colleagues show that mobile devices are not just technologies that offer affordances but are devices capable of constructing a reality through *inscription*, that is, "the transformation of a certain reality into written, pictorial, graph-like, etc. accounts" (p. 14). These *inscriptions*, they note, are not neutral devices; rather, they make visible the decisions made by researchers: "they determine what can be read and what cannot, what can be compared and what cannot, what contributes to new knowledge and what does not" (p. 14). Inscriptions, they demonstrate, can generate (powerful) effects; in other words, inscriptions do things (Decuypere & Simons, 2014).

This study enacts ANT concepts through description and analysis of an experimental study on the topic of mobile learning. As an ANT text, it follows the stages and parts of the experimental study, at times explicating on the way in which ANT would detour the study to include more actors, place emphasis on relations, break down distinctions between the technical and the social, and focus reconfiguring and including particular stakeholders who are not visible but play a key role in shaping the relations. For these reasons it may make sense to consider it as an intervention in the field of mobile technologies and learning.

In a later study, Decuypere and Simons (2014) identify and follow three sensibilities—heterogeneity, relationality and enactments—as they trace the interactions of a university professor during a single day. Results of their research are provided in the form of written descriptions and mapped visualizations, an approach that is derivative of *thick* description—"highly attentive to details" and the "following, or tracing, of every-one and every-thing in their course of action" (p. 92)—yet devoid of contextual information; the visualizations that result are "more flat, taking concrete actors and actions (in their relationality) as a point of departure" (Geertz, 1973; Pole & Morrison, 2003 as cited in Decuypere & Simons, 2014, p. 92). The authors question research that treats *digitization* as a set of inputs and outputs, predetermined social categories or forces that enter and exit a "university"; for example, the idea that professors are affected by increasing workplace digitization which in turn is expressed by the type of output they produce. By observing and mapping the interactions of a professor with humans and non-humans during the period of a day they reveal a digital infrastructure and the formation of a *humandigital* hybrid. This study reviewed in greater detail later in the chapter offers an example in which the ANT principles themselves are used as the methodological logic for the study.

ANT as Theoretical Framework

Often, ANT is used in conjunction with other methods or theories. Researchers use ANT concepts to inform the theoretical framework for a study which also affects the research question(s) posed. For example, scholars Sherri Bisset and Louise Potvin from l'Université de Montréal and Mark Daniel from the University of South Australia, use ANT as a theoretical framework in an *instrumental* case study that investigates interactions between health settings and professional practices in children's nutritional programs. Health settings are assessed, not as context, but as parts of a network that allows for "unplanned" or "emerging practice-based

realities for program implementation" to become part of the data set (Bisset, Potvin & Daniel, 2013).

Not only is the theoretical approach ANT-inspired, so too is the research question: How do nutritionists, acting as intervention translators, create connections aiming to interest school actors to see the nutrition program as responding to their own personal and/or educational goals? Coding of the data was not based solely on program effectiveness; it built upon and incorporated emergent practices established by the nutritionists *in situ*. The authors foreground two findings: the first, "nutritionists' practices varied according to their past experience, perceptions of schools' social setting, structural conditions and atmosphere in the classroom", and second, "nutritionists' practices were strategic, in that they aimed to build relationships by considering how intervention goals could respond to the needs of the school actors" (p. 16).

From an ANT perspective, nutritionists are conceived as agents or mediators[xxxiv] in that they translate and re-orient their practices not in terms of a pre-determined program model, as has been suggested in some research, but as actors implicated and engaged (mediating program implementation) with their own experiences, personal preferences and particular alliances with student interests or school conditions. Program implementation therefore can differ from one school to another.

ANT as the theoretical framework allows the researchers to *see* and document data that might otherwise be overlooked through current methodological practices in the field. In this sense the scholars have used ANT to widen the scope of research and methodological practice within this specialized area (Bisset & Potvin, 2007; Bisset, Daniel & Potvin, 2009).

ANT for Interpretive Data Analysis

In research by Laurence Habib and Monica Johannesen (2014) from Akershus University College of Applied Sciences (Oslo), ANT informs the theory as well as the analysis of data in a study they conducted to determine the extent to which faculty perceive and are involved in the implementation of educational technologies in higher education. Following the ANT principle of *generalized symmetry*[xxxv], the authors treat humans and nonhumans equally. The research methodology is a multi-site case study in which a mix of qualitative and quantitative data collection methods is applied; using quantitative methods in an ANT approach is rare, the authors note, as most ANT studies are ethnographic and narrative and often based on textual material[xxxvi]. To explore policy and engagement across "organizational boundaries" data collection was based on a survey and a series of semi-structured interviews. Of the academic staff members surveyed, slightly more than half (51.5%) (N=740) felt that institutional ICT policies were important or very important. Fewer (41.5%) felt that the institution's requirement of improving efficiency was a motivating factor. The survey showed that participants lacked knowledge about university policies; this was similarly noted during the semi-structured interviews. Only a small percentage of participants (27%) felt they were involved in technological projects initiated by their university, and less (24.5%) felt considered when decisions about technologies were made; this idea was concurrently expressed in the interviews.

Habib and Johanessen interpret descriptions of technological projects by participants as weak actor networks based on interviews that suggest some confusion for the participants, for example, claims that the technology seems to "just happen", "decision-making processes are […] vague and abstract" (p. 493), and the network is "complex and confusing" (p. 492). Educational technologies are emphasized as innovative and indicative of progress but their development and

implementation seems to be mired "in a labyrinth of administrative procedures and indistinct lines of authorization and clearance" (p. 492). Habib and Johannesen suggest that there is a gap between teaching practice and institutional rhetoric on the topic of policy and governance as well as a need for *more* collaboration between managers and academic staff.

In this study ANT concepts are used to analytically interpret the data. The researchers propose a rupture between the rhetoric of policy and actions between managers and academic staff, and integrate core concepts of ANT, such as *negotiation*—when actors/actants want different things but try to convince others to modify their goals and become aligned (p. 486)—into their analysis. They show that sometimes this negotiation is subtle, as when employees decide to accept a particular technological tool, even though it is not well adapted to their needs, simply because the "financial or social cost of switching to a new tool would be too high" (p. 486). *Enrolment* (an ANT concept associated with Callon's four moments of translation) is used to describe how groups of actors are enlisted to join other groups. Habib and Johannesen propose that the participants in their study have "a lack of negotiating power" (p. 492) due to several factors: little opportunity for democratic involvement; little or no consultation concerning faculty needs; and a general lack of information about the process. ANT, as expressed in this research, foregrounds a political epistemology not typically associated with quantitative and some qualitative research approaches. (Habib, Johannesen and Øgrim, 2014; Habib and Wittek, 2007; Johannesen, 2013; Johannesen, Erstad and Habib, 2012; Johannesen and Habib, 2010).

ANT as Reassembling the Social

Arthur Tatnall from the University of Victoria (Melbourne) is a major contributor to information systems, knowledge management and innovation technologies in Education and

Education Management. He has been editor-in-chief for the *International Journal of Actor-Network Theory and Technological Innovation* (*IJANTTI*), a journal focused on socio-technical research that emphasizes human and nonhuman interactions. Tatnall (2014), both from the University of Victoria (Melbourne) conducted a case study dealing with "Learning Disabilities" in which the Education Department policies of two Special Schools were investigated and the impact of Information and Communication Technologies (ICTs) and their potential benefits for students explored. In a first step ANT approach, Tatnall identified the actors needed to help Special Needs students adopt a particular computer technology. Tatnall draws on work by Callon (1986, 1991), Latour (1991, 1996), Law (1992), and Law and Callon (1992) to enable (as referred to previously in this review) the four 'moments' of innovation translation (Callon, 1986): *problematisation*, *interessement*, *enrolment* and *mobilisation*. The challenge for the actors Tatnall suggests, is "to form a common understanding of problematisation (Callon, 1986b, p. 8). Implicit in this approach is the need to first see the different understandings of a problem before agreeing on its resolution. Tatnall disagrees with skeptics who argue that ANT does no more than shed light on how a given approach to technology is adopted. He writes,

> We believe that if a researcher understands how the factors involved in the adoption of a new technology interact in one situation then it is possible to affect the outcome of a similar situation by assisting favourable interactions and doing one's best to reduce unfavourable interactions (p.8).

Also implicit is the idea that an *informed* actor can make *informed* decisions to build what is deemed appropriate. Tatnall writes, no action "is purely social nor purely technical" (Tatnall, 2014, p. p556). This study shows that actors' beliefs are embedded into curriculum and that ICTs can benefit the students pedagogically when the software is also fully embedded by

supporting students' unique communication skills and engagement.

In the enactment of Callon's 'moments', how each student is part of a different network, each with its own resources network and distinct set of problems, becomes visible, allowing for ICTs to be better adapted. (Adam and Tatnall, 2017, 2010; Tatnall, 2015, 2014; Tatnall & Manning, 2011).

In an earlier study on the same topic, Adam and Tatnall (2010) use an integrated ANT research design to investigate information and communication technologies (ICTs) implementation into two Special Schools to benefit students acquiring literacy and numeracy skills. ANT principles, referred to as the *ANT research process,* are integrated with participant observation, interviews and other data collection techniques. The *ANT research process* is a non-linear, iterative approach that continues to seek out more actors long after initial interviews and other data collecting methods have been deployed. Methods and techniques for data gathering are supported with the seemingly simple but rather complex activity of "follow[ing] the actors" (Latour, 1996 as cited in Adam & Tatnall, 2010). Without the usual constraints between the social and the natural, the researcher is able to better describe the "situatedness of innovation and technology" (p. 7). Moreover, ANT they argue is *anti-essentialist* and *non-deterministic* allowing for a more inclusive gathering of heterogenous actors. The researchers too must seek out the various ways in which the technology comes to be translated by the actors as the technology is being developed.

Reassembling involves analysis of relations between actors throughout the research process producing results in which the technology is integrated into the needs of the students. In this study Adam and Tatnall (2010) have integrated some of the principle ideas of ANT, most of which cite Michel Callon: that neither humans nor technologies are privileged during the process

of data collection; that the agenda or stakes involved by all the actors are accounted for and forming a shared problematization is an aim, albeit challenging; the actor "is an abstraction which enables the analysis of situations where heterogeneous entities are encountered" (para. 23) and referring to actor as an abstraction removes the need to simplify into "political, social or technological categories" (Section 3). One interesting aspect of these studies is the inclusion of money.

Hybrid Associations: ANT and Critical Discourse Analysis

Jill P. Koyama from the University of Arizona has produced research utilizing ANT in the areas of educational policy studies and the politics of immigrant and refugee education. In a recent research project Koyama (2017) brings critical discourse analysis (CDA) and actor-network theory (ANT) together to form a discursive lens through which to explore the ways Latino youth in a civic education program in three high schools develop their identities in online contexts. Koyama contrasts the discourse of formal civic engagement with the enactment of civic engagement (pp. 3-4). Drawing on survey questions (N=857), interviews, field observations of youth involved in public activities, and online and offline documents, Koyama follows the ways Latino youth navigate authoritative discourses of citizenship. CDA and ANT are brought together "[…] to offer a reasoned discourse analysis" (p. 7); she "utilize[s] the CDA terminology throughout the paper and use[s] ANT as a supportive approach" (p. 7).

ANT is defined not as a singular theory but as a set of *material-semiotic frameworks in* which the connections between elements of the social, including discourse, are variable. Citing Law (1999) who claims that "elements retain their spatial integrity by virtue of their position in a set of links or relations", Koyama asserts that there is nothing inherent in any singular element. In CDA, discursive events are "part of an *intertextual* chain or network of texts and events"

(Fairclough, Pardoe & Szerszynski, 2006, p. 106 as cited in Koyama, 2017, p. 7); in ANT, texts are "actants" -- "any independent entity that, at any time, can acquire the ability to make things happen with the actor-network" (Cerulo, 2009, p. 534 in Koyama, 2017, p. 8). Koyama states this clearly,

> Actants, including language materials, can, according to Latour (1994) be of two types—"intermediaries" that transport meaning as they circulate in a network and "mediators" which "transform, translate, distort, and modify the meaning of the elements they are supposed to carry" (p. 39).

It is likely that most researchers utilizing CDA can agree that texts and other language materials are intermediaries, and also that they can mediate information and knowledge for human actors. Yet, scholars employing CDA do not directly position texts as actors (p. 8).

Here Koyama points out a key difference between ANT and CDA: CDA doesn't treat the text itself as an actant (or as a mediator) as ANT does; however, CDA does consider texts as having causal effects in that they have the ability to bring about change in how we come to know, affecting "our beliefs, our attitudes, values and so forth […] In sum, texts have causal effects upon, and contribute to changes in, people (beliefs, attitudes, etc.), actions, social relations, and the material world" (Fairclough, 2003, p. 8 in Koyama, 2017, p. 8). There are some key differences between a CDA understanding of effects and Latour's: Latour argues that many effects are happening at the same time: there is never a single source to any action. Any source or "actor is *always* made to act by *many others*" (Latour, 2005, p. 46 my emphasis). Latour's approach is aimed at avoiding easy social explanations which can carry invisible variables eluding necessary checks (p. 50). While ANT extends its networks to include all matter as having the potential to mediate, CDA remains human-focused.

Koyama asks: How do high school students, especially Latinos, assemble networks of civic and political engagement around issues of immigration and citizenship? This is an ANT-influenced inquiry as the focus is on the specific ways in which the students associate to enact their civic concerns through varied activities occurring both online and offline. Offline environments, relationships and documents are as important as online ones for understanding how Latino youth develop their civic identities.

In this study, ANT ideas propel the research question, the analysis and the approach to the project, which treats the nonhuman (recent policy such as the American Civics Act) among the elements that can generate effects. Other studies by Koyama and colleagues include Gorur and Koyama (2013), Koyama, (2007, 2011, 2013, 2015, 2017), Koyama and Kania (2016), Koyama and Menken (2013).

ANT as Stories and Analyses

Description over sociological explanation is a repeated orientation for many scholars doing ANT research. Rather than beginning with political or sociological assumptions, ANT proposes that, by tracing actions and through the practice of good descriptive writing, the political will emerge. There are many applications of "description". Story is one of them. Mary Hamilton (2011) from Lancaster University (England) sees ANT as a way to analyze the stabilization of *Skills for Life*, a social project that is part of national educational reform in England. Hamilton's work in educational policy reform and literacy studies draws on ANT for its ability to track the messy -- the "typically, sinuous, layered, conflicted and time-bound" (p. 56) aspects of policy reform. Previous policy studies assume a "well-defined task-oriented organization" (p. 57), a state of existence that Hamilton argues simply cannot apply to adult literacy education situations where sites of gatherings unfold across varying settings, each with a

distinct purpose, membership and politic.

Drawing on the descriptive/reflective story writing + analysis format of Moser and Law (1999) and Law (2003), Hamilton provides three ANT stories—the International Adult Literacy Survey (IALS), the Get On! Media campaign, and the use of Individual Learning Plans (ILPs)--each followed with analysis. These stories are "theoretically motivated choices" (p. 59), where summaries by the author are interpretive and based on oral histories and documentary data (see Hamilton & Hillier, 2006; 2007); they are also informed by Hamilton's experience as an adult literacy practitioner, researcher and educator. Hamilton combines this approach with Michel Callon's (1986) moments of translation[xxxvii] so that the analysis for each story relates to one or more of the four moments of translation.

For Hamilton, stories demonstrate how power is enacted. In the first story it is learned that two researchers who are attempting to access the International Adult Literacy Survey (IALS)[xxxviii] from the Office of National Statistics are unable to photocopy the IALS or any of its tables as its distribution is regulated. They read: "Photocopying is not allowed as the materials are restricted and the power of the test would be lost if they were circulated to unauthorized people", a "tenet of the psychological testing industry" to which the IALS subscribes. The researchers continue to put together examples of the tests from other varied sources with the aim of developing a critique intended to help improve policy.

The story continues to say that details of the tests[xxxix] remain undisclosed to the public, "so that it can play its part as an undisputed rationale for action." The story finishes with: "Later the researchers will shake their heads as they read the banner headline in the tabloid newspaper which declares: '7 million people cannot read a medicine bottle label'" (pp. 55-56). At this point, the "behind-the-scenes" description ends and Hamilton analyzes it in relation to

problematisation, Callon's first 'moment'. She explains that the deployment of a network by government is rationalized, and the expression of "7 million people" referred to in the first story becomes "a powerful actant[xl]", in the national *Skills for Life* program where local or national policies are established in relation to international survey measures. Hamilton argues that universal strategies that establish certain levels of attainment "runs counter to many years of adult learning theory and practice" (p. 65). The IALS is a measure, Hamilton writes, that becomes an *obligatory passage point* (OPP) -- an ANT tool that helps us understand how a particular conception of the problem gains acceptance or "where the flows of action and resources come together and through which debates and discourses are squeezed" (p. 61). The connections within OPP are dense and show "mechanisms of power and network elaboration" (p. 59) to which all must agree.

The second story (the Get On! media campaign) revolves around the Gremlins marketing strategy, a mass media campaign sponsored by the government that targeted adults in an effort to entice them to enroll in adult education programs designed to support literacy. A survey showed that while the targeted people supported the campaigns and thought them to be beneficial for those who need them, they did not see themselves as needing those programs. Hamilton writes, people had to "be persuaded of the role the government has imagined for them—they must, literally be 'enrolled'" (p. 66).

Hamilton uses ANT to explore the tensions and inconsistencies that occur when standards are imposed (p. 68). In the first story, "7 million adults" is a powerful actant in the policy process. Large target numbers inevitably suggest escapes. By escapes Hamilton is referring to those adults not accounted for in the figure of 7 million adults. Young adults already enrolled in institutions may more easily take advantage of adult programs while other adults

who, for a range of reasons, cannot enroll or do not have access. She adds, lifelong learning escapes too, and even Adult Literacy escapes its own specialization, as their objectives are increasingly translated into forms that meet national qualifications: “key skills”, vocational training, all “subsumed by the functional skills of English” (p. 69).

Of note is Hamilton’s position on text: she suggests that the four moments and the OPP, which I have only been briefly touched upon in this review, can be mapped onto discourse through the use of “metaphor, argument, positioning of social actors, framing, and elision of agency”. Here Hamilton invokes Fairclough (2001; 2003) and Wodak (2001), two scholars specializing in critical discourse theory. “Metaphor”, she writes, is not just aesthetics but a rhetorical device that enacts a powerful move in a story—rhetorical devices are "designed to organize public knowledge”. Metaphors, she argues, have come to be normalized and unnoticed in such venues as UNESCO and literacy campaigns where they influence the way we come to understand or view those to whom literacy programs are directed.

In the example of *Skills for Life,* metaphors have been mobilized to “problematize and establish a crisis view of literacy as a deficit inherent in individuals” (p. 62). Hamilton also introduces, ‘stable mobiles’—"representations of aspects of the world” that “can be accumulated and combined in new ways at a distance, and used to co-ordinate action from within centres of power” (p.62), and ‘boundary objects’, which make the framing and stabilization of actions possible, while “providing an opening onto other worlds, thus constituting leakage points were overflowing can occur” (Callon, 1999, p. 188; Law, 1994, p. 24; Latour, 1987 as cited in Hamilton, 2011). These descriptions relating to earlier ANT writings also conjure concepts found in RAS: collecting statements, panoramas, oligoptica, and centres of calculation, conceptual tools that are explored in the next chapter.

Hamilton demonstrates that stories are powerful tools that can provide information that we might otherwise not have. Stories have the capacity to convey complicated relations. In Hamilton's first story, we receive some insights to the "behind-the-scenes" rules at the Office of National Statistics and how those rules restrict access and make use of powerful metaphors (or figurations in Latour's (2005) terminology). The power of the story in part is that it tells something of the experience of the literacy researchers who are in the process of conducting the research, thus making visible their role and their matters of concern. The stories conveyed by Hamilton are critical -- they say something about the power of institutions, and the means by which ideas are stabilized through language. This research, like Koyama (2017), provides a methodological and theoretical relation between ANT and critical discourse analysis.

Detailed Analysis of Two Research Texts

One: The Heuristics of Adams and Thompson (2011)

Scholars Catherine A. Adams from the University of Alberta and Terry Lynn Thompson (2011) from the Centre for Distance Education, Athabasca University pulled together phenomenological and post-phenomenological propositions with actor-network theory to produce a set of eight heuristics that can be applied when "interviewing" *technologies-in-use*. They argue that *technologies-in-use* are hybrid actors that participate in mutually shaping the "existential and hermeneutic conditions of our lifeworld" (p. 733) and, as such, should be considered as key qualitative research participants. Responding to the National Rifle Association (NRA) claim that 'guns don't kill, people do', Adams and Thompson paraphrase the hybrid resolution offered by Latour (1999):

> it is neither the person nor the gun that kills, but the 'citizen-gun' or 'gun-citizen', a complex human-technology hybrid that, when assembled, necessarily engages new intentions, associations, and actions (2011, p. 733).

In this view, objects in their relations with humans are ascribed an "agential" role. Human-technology relations are multidimensional: just as objects urge us to engage in the world in prearranged ways, so too do we shape them to serve our needs. Given this human-object co-shaping, Adams and Thompson ask: *How might a qualitative researcher 'interview' a technology in an effort to disclose its material agency in co-constituting teaching–learning worlds?* (p. 734).

Adams and Thompson present two aims: the first, to explore *technologies-in-use* as vital participants in the study of digital environments; and the second, to sketch a set of heuristics as possible directions when qualitative researchers try 'interviewing' objects. Appendix B presents an overview of some of the eight heuristics proposed by the authors.

According to Adams and Thompson, not all of the heuristics are applicable to any one study. This is because they emerge from two distinct philosophical and theoretical orientations: phenomenology and actor-network theory. Phenomenology "is oriented to the life world as we immediately experience it—pre-reflectively, pre-verbally, pre-theoretically" (p. 736); in the case of teachers acquainting themselves with the affordances of technologies such as ICTs, the technologies are already "re/de/informing their perceptions and actions in the world" (p. 736). Actor-network theory places objects and humans on "an equal analytic level" (p. 737) and proposes that actor-networks are relational and because of the connections that hold them together. In other words, "ANT is interested in how alliances come to be and how actants end up juxtaposed with others" (p. 737). Hybrid, quasi-objects or quasi-subjects do away with subject and object dichotomies making room for arrangements that are mutually co-constitutive.

The authors argue that both ANT and phenomenology dissolve subject-object dichotomies and recognize human-technology relations as co-constitutive. In ANT (Latour, 1993), there is no separation between subject and object, there are only continuous, fluctuating relations of hybrid or quasi-objects and quasi-subjects. Phenomenology maintains concepts of subject and object but foregrounds the "mutual engagements that constitute subject and object" (Kaplan 2009, as cited in Adams & Thompson, 2011, p.737). In addition, ANT and phenomenology both veer from accepting the object as something solid; they also invoke reciprocity or 'a system of things in reciprocal connection' (Harman, 2009 as cited in Adams & Thompson, 2011, p. 737). They share the privileging of *description over explanation* and theory and reject the all-purpose "methodology" category (Latour, 2005, pp. 96-126), preferring instead a heuristic approach. In a reference to Heidegger, the authors suggest that both phenomenology and ANT allow "things of the world [to] speak for themselves" (1962 in Adams & Thompson, 2011, p. 738).

The eight heuristics emerge from the qualitative research explorations of each scholar. Adams demonstrates how a PowerPoint presentation can limit and extend students' and teachers' experiences of digital technologies in the classroom (2012). PowerPoint comes to be understood as a complex technology, not necessarily functioning seamlessly and increasing support but as a possible limit to or effect on a teachers' pedagogical moments (Adams, 2011). Thompson examines work-learning in informal online communities. ANT plays a key role in the ways that learning emerges as an effect of the flow of networks in which they are enfolded (Edwards & Usher, 2008 as cited in Thompson, 2012, p. 252).

Commentary

This work draws on ANT and hermeneutic phenomenology plus literature on techno-science, media ecology, and the philosophy of technology to develop a hybrid set of heuristics for the activity of "interviewing" objects that co-exist, co-relate and are co-constitutive with humans. At the core is an interest in human-object (technology) relations and experience. Adams and Thompson (2011) integrate a number of ANT concepts to their list of heuristics: "following the actors"; "listening to the invitational quality of things", "looking for breakdowns or accidents", "untangling tensions" and "constructing co(a)gents". In doing so they produce a set of heuristics, bringing together a range of thinking modalities: the post-phenomenology of Don Ihde (2004), ANT ideas by Latour (1999, 2005), the laws of media proposed by Marshall and Eric McLuhan, the phenomenology of van Manen (2008) and others. ANT and phenomenology do not combine easily. Despite their unique orientations, the authors make a strong case for their similarities and dissimilarities.

Of the eight heuristics, the following are specifically related to ANT: following the actors; studying breakdowns and accidents; and untangling tensions. Although 'listening' to the invitational quality of things seems to refer predominantly to phenomenology, there is a place for this with ANT too, particularly in developing sensitivity to actors' matters of concern. Clearly the authors understand objects as complicated and relational mediators capable of transforming or modifying "the elements they are supposed to carry" (Latour, 2005, p. 129). In one description the *structures* of headings and bullet points in *PowerPoint* are described as presenting particular knowledge to the teacher. As the teacher looks to their screen after launching *PowerPoint* they may find themselves enrolled by the technology as they respond to instructive commands "• Click to add title", " • Click to add text".

The teacher becomes enrolled into--but not necessarily determined by--the programmed language of the technology; the humans in this situation are not taken in by the technology but are engaged with it. The moment "objects" "things" or "quasi-objects" are rendered as mediators, the social becomes visible in the form of an actor-network, although the authors don't use this terminology.

The heuristics provide a way to see distinct theoretical orientations; when each of the philosophical approaches to technological analyses are itemized side-by-side the differences among them become evident. The researcher's approach has the potential to make apparent any or all decisions made by the researcher as they proceed to use one or more heuristics. According to the fictional professor in *Reassembling the Social* (*RAS*) (pp. 141-156), ANT is not something to be applied to a situation; rather it is what "allows you to produce some *effect* that you would not have obtained by some other social theory" (Latour, 2005, p. 143). So, while we may think of applying the heuristics, it is the experience of moving through them, reflecting with them, that, surprisingly, resembles ANT. The heuristics themselves are inviting and function as a type of pedagogical tool; they highlight the current and salient theoretical/philosophical concepts on human-technology scholarship, enabling researchers, scholars, or students some facility in developing a path to the study of *technology-in-use* in a territory of varied vocabularies and modalities.

The strategy of offering eight heuristics allows the researchers to keep the commitment to hold ANT and the phenomenological approaches open, refraining from solidifying any singular approach. Still, questions remain: how might these philosophies, as set out by the researchers, come together empirically in the conduction of a research project? An empirical study might pose an interesting case for this set of two or more heuristics. By following ANT and post-

phenomenological approaches we may deepen our understanding of technology-human associations, not in the form of a series of perspectives given on a single topic but instead on an incoherent (see Law & Singleton, 2014, pp 380-81) ontological set of *multiplicities*[xli]: in ANT, reality is not singular but many (Mol, 2002).

Two: Composing Academic Practice with Decuypere and Simons (2014)

As already mentioned, there are core principles that are shared among ANT approaches; the ANT literature in education expresses a range of ANT concepts, analyses, and theoretical interpretations that cannot be easily summarized. With its emphasis on uncertainty (heterogeneity), relationality and hybridity, an ANT approach cannot be defined in any stable or simple way as this review of research articles has demonstrated. Despite its challenges, scholars continue to explore ANT, keeping it alive and vital. Scholars working with feminist and sociomaterialist orientations (Edwards & Fenwick, 2015) for example, have inspired, influenced, expanded, borrowed, and reconsidered ANT principlesxlii. This begs the question, how then can any of this ANT-based research be understood or evaluated? And on what terms? I return now to Latour's three ways to assess the vitality of an ANT study:

- Does the research treat nonhumans as actors?
- Does it understand the social as an unstable association of heterogeneous actors?
- Is the aim of the study to reassemble the social (over mere deconstruction)?

With these three considerations in mind, I review the research article by Decuypere and Simons (2014) introduced earlier. In this article, the authors enact three sensibilities and devise three associated steps to describe and visualize the academic practices and interactions of a professor within the university workplace over the course of one day. Their research integrates a series of maps that become a part of the analyses of data. This review takes a close look at a

study that enacts ANT ideas substantively: theory, methodology, and techniques enacted are explicitly ANT. It is not my intention to make judgments on the quality of the research, but rather to use these three criteria to foreground the ways in which ANT is integrated into the research and elaborate on ANT ideas in the practice of research.

Scholars Decuypere and Simons (2014) from the Laboratory for Education and Society, University of Leuven (Belgium) adopt actor-network theory (ANT) as a sociomaterial approach to provide descriptive and visual accounts of the academic practice of a professor for the period of a day during a time in which digital technologies and devices are increasingly altering professional practices in universities. The authors claim that most academic research that investigates the impact of digitization on academic life tends to attribute the effects to social forces— "marketisation, privatisation, [and] globalisation" (p. 89), and that this approach reifies the "black box" by treating academic work as predictable 'inputs' and 'outputs' and leaving little space for understanding the daily life of the academic in relation to their actual practice with digital technologies. The central aim of the research by Decuypere and Simons (2014) is to find ways to understand and describe how varied agencies are distributed within webs of relations (Callon & Muniesa, 2005 as cited in Decuypere & Simons, 2014).

The scholars engage three guiding theoretical principles described as sensibilities of ANT: (1) heterogeneity; (2) relationality; and, (3) enactments. A *heterogeneous* sensibility assembles actors and activities performed that make up a professor's academic practice without relying on *a priori* assumptions. All actors are gathered on one analytical plane. A relational sensibility assumes that agency is "distributed and located within webs of relations: all things are what they are in relation to other things" (Law, 2009; Gad & Jensen, 2010 as cited in Decuypere & Simons, 2014). A *relational* sensibility assumes that networked actors are continuously being

transformed by their relations with other actors (Callon, 1986; Latour, 2005, p. 91). Finally, a sensibility that attends to *enactments* is concerned with tracing practices as they are "emerging or in the making" in the moment. The professor is understood in terms of what they are doing and with what or with whom they are interacting.

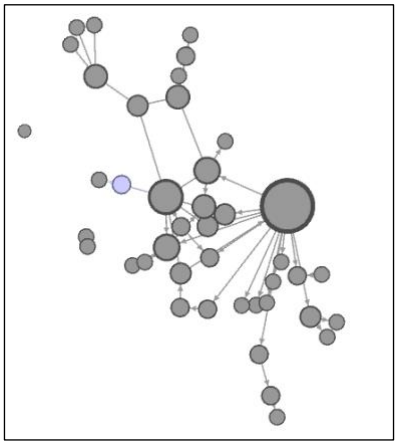
Methodological and Analytical Approach. Decuypere and Simons (2014) consider ANT to be well aligned with ethnographic research with its emphasis on thick description and attention to detail. A key difference, they point out, is that ANT descriptions are "flat", emphasizing relationality but avoiding explanation and context. Direct observation is aligned with the ANT approach to follow the actors, however, Decuypere and Simons note that direct observation for this project was not always possible. To mitigate, they adopt an interview technique--Interview to the Double (ITTD)--which asks interviewees to imagine they are speaking to a double of themselves who will be replacing them on the job. The task of the interviewee is to provide such detailed instructions about what they do (in the workplace) that their double would be able to carry out the tasks without their cloned identity being revealed[xliii]. Those interviewed were asked to describe their previous day by responding to the question, what would they have to do to have a normal functioning day? Decuypere and Simons employ this indirect observation approach to partially resolve the problem of discontinuous direct observation. The researchers treat the interview notes as observation notes. In this study descriptive and visual accounts for only one professor (Mary, a bioethicist) is described in full. Each time an action occurs between two or more actors, it is counted as an interaction. For the professor in the study, a total of 84 actors and 200 interactions are counted and mapped in the form of a visualization. Decuypere and Simons see the visualization of the data (a network

composed of nodes and edges using Gephi software) not as a representation but as a working document contributing to the analyses of the data.

Decuypere and Simons invoke three steps for visual observation and descriptive analysis: 1. visualizing the constitution of the actor-network; 2. observing agency distribution as constituted in practice; and 3. noting associations between described regions. A research question is combined with each step.

In the first step, all the actors are gathered on one plane and denoted by nodes. Gephi[xliv], an open source visualization software that can depict networks through nodes and edges (Figure 3.3), is used to visualize relations and track connections (interactions) between those relations. The size of the nodes (representing actors) is determined by the number of interactions each node has with other nodes (actors). The greater the number of interactions, the larger the node. In this way, interactions between actors (human and non-human) are mapped.

Figure 3.3 A Representation of Nodes and Edges

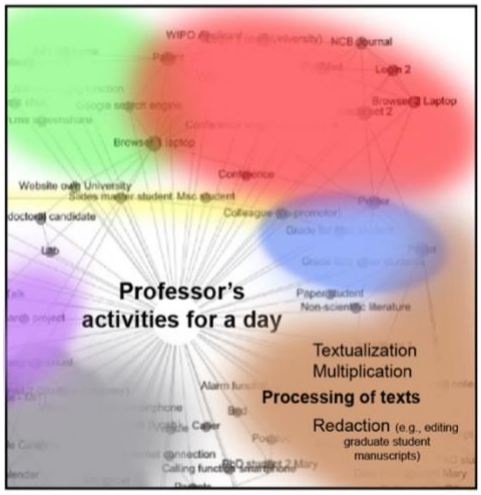


Note. An example of a small network visualization produced with Gephi, an Open Graph Viz Platform. The larger circles have more connections. The circles are referred to as nodes and the lines are referred to as edges. By C. Silva (2018).

The second step considers how the practice of the professor is distributed in (and mediated by) larger wholes; it asks the question: *how is academic work distributed in larger wholes, that is, what are the regions and their operations that make up academic practice?* Interactions and objects are organized into three areas: First, *operations* tell us what is being practiced by the actors within a general area (e.g., a student practices their presentation and it is treated by the professor as a module that can be inserted into another overarching presentation. The operations are described as "analogisation" and "modularisation" (p. 100). Second, *regions* tell us something about the activity that is being done in those areas (e.g., preparing is used to describe students who are preparing for a defense). Third, *operational effects* tell us what effects are being generated in those areas (e.g., designing a future or organizing present activities are going on at the same time as preparing). Effects are not treated as singular or causal or defined by inputs and outputs; rather, they are seen as mediators that effect other actors as they themselves are affected.

In their mapping and describing, Decuypere and Simons make visible seven *regions* showing clusters of actors that interact more intensely with one another. Figure 3.4 is a detailed closeup of the regions.

Figure 3.4 A Gephi Visualization of Academic Practice from Decuypere and Simons (2014)



Note. A partial Gephi visualization of academic practice. Three of seven regions (coloured areas) with accompanying associations (operations and operational effects). Adapted from "On the Composition of Academic Work in Digital Times", by M. Decuypere and M. Simons, 2014, *European Educational Research Journal*, 13 (1), p. 97. http://dx.doi.org/10.2304/eerj.2014.13.1.89

These regions identified on the map by different colors show associations between them and other regions. The brown region is described as *text processing*. Its operations includes: *textualization* (processing of texts), *multiplication* (making more than one), and *redaction* (of manuscripts). The effects produced by the operations within the regions (i.e., operational effects) include: *creating authorship* and *mandating manuscripts*. Given the impossibility of identifying all generated operational effects, Decuypere and Simons establish limits on the project by focusing only on those effects generated by the "central operations in each region" (p. 98).

The third step involves the describing of associations between regions. In this step the researchers analyze, in precise terms, whether or not different regionalisations are related (pp. 95-101). These descriptions consist of a number of findings.

Findings. From the beginning Decuypere and Simons focused on the ways in which academic activities are enacted in practice being careful not to engage explanations about social

forces. Actors do what they do because of their interactions, they assert. Through visualization, the researchers demonstrate that some clusters of actors tended to interact more with another; these clusters of activities and interactions as previously described were designated as regions (see Figure 3.4). The number of regions depends on the activities of the academic for the day. Had there been fewer activities there would have been fewer regions.

Through the process of building a visual network, Decuypere and Simons find that actors situated between, or at the edge of, two or more regions made it possible for regions to interact with one another. These objects are referred to as *boundary actors*; they include "a printer, paper, a patent, a browser, a search engine, a mail function, a Google account and [the professor's] colleague" (p. 100); an actor such as *a patent* is both the topic of discussion and an object of retrieval through the Web. The authors suggest that boundary objects have a particular authority due to their capacity to facilitate the occurrence of interaction to and from different regions.

Through a series of other visualizations (not included in this summary) the authors demonstrate how digital actors span the network to form a swarm or cloud (p.102) forming an infrastructure. Six digital boundary actors (one from each region) form a hexagon in the network that functions as a digital interface between the different regions. Boundary actors are continuously present in academic work, also making evident their importance in academic activities. Academic activities and objects trigger one another and emerge simultaneously. For these reasons, Decuypere and Simons use the term *humandigital* to describe the nature of these continual relations and forward a series of questions for future research: Do different academic practices produce different humandigitals? What other forms might humandigital interfaces take? How does the fact that an academic herself does not need to move in order to switch between different regions impact the composition of academic work? And, which forms are typical of

academic or university practices as they are enacted today? Are there modes of being and interaction that are typical of different academic practices (p.103)? The findings reveal a series of questions.

Commentary

Decuypere and Simons draw on varied scholarship, including actor network theory (Callon, 1986; Callon & Muniesa, 2005; Czarniawska, 2007; Latour, 1987; 2005; Latour, Jensen, Venturini et al., 2012; Law, 1992; 2009; Marres, 2012; Mol, 2002; 1994; Strathern, 1996; Venturini, 2010a, 2010b, 2012), actor network theory in education (Fenwick & Edwards, 2010; Sørensen, 2009), ethnography (Geertz, 1973; Pole & Morrison, 2003); higher education studies (Barnett, 2011; Calhoun, 2006; Herbert & Tienari, 2013); and academic practices (Fanghanel, 2011).

Decuypere and Simons (2014) further the research and discussion of actor-network theory (ANT) by developing a unique methodological approach that is based solely on ANT principles. At the point of this research, no other studies in education have attempted to do this; other ANT research combines ANT principles with social science methodologies as exemplified in the review of literature. In their study, Decuypere and Simons invoke three sensibilities--heterogeneity, relationality and enactments--each is tied to a core principle associated with actor-network theory. Each sensibility is connected to a research step: 1. visualizing the constitution of the actor-network; 2. observing agency distribution as constituted in practice; and 3. noting associations between described regions. For each step a research question is formed and visualizations using Gephi visualization software are produced. The visualizations assist the researchers in developing an analysis from which they derive regions, operations and operational effects (see summary). Findings are descriptive and textual. A key objective for this research is:

how to understand academic practice in the universities where digitization is increasing without reifying a subject-context construction and without proposing social forces—"marketisation , privatisation, globalisation" (p. 89)—as causal.

The following analysis is organized according to Latour's three criteria with which to assess the vitality of an ANT study.

Nonhuman and Human. This study with its emphasis on relational effects (Fenwick & Edwards, 2010, p. 17) stands out as an intervention in higher education studies. It rejects "epochal" changes in the world caused by social forces as explanations for changes to academic practice. It looks closely at activities and interactions within a sociomaterial framework (ANT) to demonstrate that boundary objects are boundary actors capable of doing academic work. In the relational infrastructure the researchers create an integrated view of academic practices; it is no longer possible to distinguish the work as something constituted by humans or digital objects because humans and digital objects activate each other. They suggest the term humandigital for this hybrid assemblage.

The Social as an Unstable Association of Heterogeneous Actors. The researchers use an interview technique (ITTD) to obtain an account of the tasks the interviewee (the professor) undertook the previous day. They prompt the interviewee with short questions in a hearing-like approach to obtain an account of what the interviewee did. The researchers use the interview transcripts as observation notes from which they draw their data. While the researchers explain the reason for using this approach—it allowed them to obtain a continuous account about one day of practice without disrupting or intruding on the professor—they do not describe the impact of this approach on the data that is generated. From an ANT position the technique used generates effects and reflection and description on this could give us some sense of the limits and

potentials of such an approach and provide a more networked or relational understanding of the results. What the interviews generate is an account of local activities. The interviews establish limits on the number of actors gathered and in play in the networks. The researchers do account for 'cutting the network' (Strathern, 1996) at the *direct context of interaction* meaning what is included by the interviewee's account. The researchers acknowledge that this decision to limit the network "always brings some sort of premature closure" (Decuypere & Simons, 2014, p. ff4).

It is notable that there are no breakdowns, tensions, or accidents in the *humandigital* network that emerges in the study. This could be for a number of reasons: the nature of the questions that were asked; the hearing-like approach to the interview; the memory and decisions of what to say by the interviewee; the one-day timeframe of the study; the researchers' interpretation of the data. It could also be related to a key decision the researchers made to not include "contents or meanings of activities" (p. 93). Although the observational notes are derived from the interview with the academic, the study does not present the viewpoint of the academic, "but instead consider the academic-- in what he or she is doing and relating to – to be part of a practice of operations and regions in which he or she, together with other actors, is engaged (Mol, 2002; Moser, 2008)" (p. 96).

Reassembling the Social. Through their three-part methodology, Decuypere and Simons' study can be seen to enact some of the core principles of ANT. The authors,

- withhold *a priori* assumptions about causality as it relates to professor practices and increasing digitization in the university;
- treat all actors as belonging to one relational plane as demonstrated through their use of Gephi to produce maps;
- emphasize heterogeneity;

    - e.g., networked actors are continuously being transformed by their relations with other actors and networks;
- demonstrate that academic practices are assemblages and always in the process of being made;
- focus on description and visualization over social explanation leaving the research open;
- compose a relational understanding of digitization in academic practice, and foreground the concept of *humandigital.*

The outcome of this approach with its attention to connections, agencies, movements, and effects is a reassembling of the social. This is achieved through precise descriptions of movements and translations within the actor-network. Latour's three checks for the vitality of an ANT study are broad and overlapping. Latour is the first to admit that these criteria are contestable. Nonetheless, they provide lenses with which to discern the aliveness of an ANT study.

Analysis and Discussion

While interest in ANT for the purposes of educational research continues to grow, few scholars have attempted to use ANT as the sole methodology in a study and none have developed or applied the approach as set out by Latour in RAS, as the sole methodology. While some concepts from *RAS* are borrowed or enacted by researchers working in education, many are not. This dissertation explores the usefulness of some of the overlooked ideas offered in RAS with a view toward demonstrating how RAS presents a methodology that can be enacted without necessarily integrating or relying on other approaches. This literature review with its specific focus on methodology is a first step towards assessing the scholarly literature in terms of strategies and methods invoked in ANT-based research.

Three research questions were advanced to guide the review of literature: How is ANT expressed in the education scholarly literature? The first question was broad and exploratory as is often the case for qualitative research; it unfastened presumptions and enabled the researcher to develop greater familiarity with the literature for later assessment. The next two research questions are more succinct and oriented towards methodology: How are ANT ideas, methods or sensibilities integrated with research design? Also considered are the strategies scholars invoke in their advancement of ANT. A discussion and analysis of each follows. The series of research studies and texts presented demonstrates how researchers have made decisions to integrate the philosophical principles of ANT into a workable methodology.

How is ANT Expressed in the Education Literature?

ANT research in education began in the mid-1990s and remains in its early stages. Researchers are experimenting with ANT ideas within specialized areas and combining it with other methodologies as they rethink the importance of materiality and relations and reconsider the social in ontological and networked terms. In the education literature selected for this review there is a genuine attempt by researchers to grasp relations and an overarching consensus that relations are fundamental to the constitution of the social. There is also a general acknowledgement that ANT research takes many forms. Several scholars (Decuypere, Simons & Masschelein, 2011; Hamilton, 2011; Tatnall, 2014) draw on Callon's (1986, 1999) four moments of translation (*problematisation*, *interressement*, *mobilisation*, and *enrolment*) as a way to apply the ANT concept of translation. In the first moment, *problematization*, the researcher follows the actors as an idea, issue or problem is framed; an *obligatory passage point* (OPP) is established to which all actors eventually come to agree. For Tatnall this is the most challenging but necessary stage as it requires shared understanding of the many factors among all the actors before any

technological or ICT implementation can happen. For Hamilton (2011), problematization is contentious as well as illuminating: she shows how the results of the standardized tests (IALS) create a particular reality and a problem that the government identifies as literacy; the subsequent development of national literacy policy becomes an obligatory passage point for those working in adult education.

All the research texts attend to the association of human and nonhuman actors; they also understand the social to be fluid and relational: it's in the association or interaction of actors that the social, in the form of an (actor)-network, exists. Rather than perceiving the social as a context or container in which action takes place, they see the social as a dynamic and emergent web of associations. The actors do move through the social; rather, they constitute it and are simultaneously constituted by it.

Because of the potentially endless nature of actor-networks, all ANT researchers must set limits. Some give more attention to human than non-human actors (Bisset et al., 2013; Habib & Johannesen, 2014). Some use other criteria for setting limits or cutting the network. In each case, these limits are articulated.

How are ANT Approaches Integrated with Research Design?

When ANT is integrated with the research design, it can generally be said that the whole of the design is altered. In the case study of a nutritional program implementation in health settings by Bisset, Potvin and Daniel (2013), ANT ideas are used as theoretical context; the treatment of the nutritionists' *intervention translators,* or, to use Latour's terminology, mediators, has direct impact on the research question. Settings and experiences were built into the coding of the analytic framework, thus taking into account emergent experiences of nutritionists as they mediate the programs that are being implemented within specific health settings. Actor network

theory, drawn from a range of ANT scholars—Akrich, Callon, and Latour, (2002), Callon (1986) and Latour (1987, 2005)—allows the researchers to consider how connections are built within fluid and unstable networks. This approach, which treats the actors (nutritionists) as active mediators in networks of associations contrasts with most diffusion models that treat actors as passive. Through its emphasis on situational (relational) concerns over solely technical concerns, the study intervenes in the research area of health promotion.

Using ANT as a lens, Decuypere, Simons and Masschelein (2011) demonstrate how an experimental study by Chen et al. (2003) on the topic of mobile learning gained stability in the field to the point of *irreversibility*, meaning that the network of associations—publications, practices, applications and research—that has emerged in relation to the study have stabilized the field to the point that it cannot return to its former state. This makes it difficult for scholars to insert new ideas that put into question the accumulated knowledge structures. The research by Decuypere et al. (2011), with its emphasis on using ANT concepts to revisit an experimental research design, aims to keep the discourse on the topic open.

Adam and Tatnall (2010) use actor-network theory as the predominant framework. In a case study they conducted--information and communication technologies were shown to benefit students with learning disabilities—neither human nor technological actors are privileged—both have the ability to negotiate associations, and both have intentional and unintentional effects (section 3) within the actor-networks of which they are a part. The main method—the *ANT research process*—involves a series of iterative steps to ensure that key actors are continuously identified and interviewed throughout the process; the interviews can lead the researcher to other actors. By combining the *ANT research process* with quantitative or qualitative data gathering methods, Adam and Tatnall integrate empirical data collection methods into an ANT-based study.

the researchers are able to identify and follow a whole community of actors. Other ANT tools adopted by Adam and Tatnall include Callon's (1986) four instances of translation.

Problematisation, as expressed by Adam and Tatnall (2010), sees the need for actors to negotiate and share a similar understanding of the problem. This approach is compositional: ANT offers a holistic framework for gathering the stakeholders and designing more appropriately for and with the students. Tatnall (2014) takes a similar approach but extends the research to show that actors' beliefs are embedded in curriculum. In this case, the software too can be embedded to pedagogically support the student's unique communication and engagement skills and produce a better socio-technical adoption, as informed actors can make informed decisions.

Hamilton (2011) adopts the descriptive/reflective story writing + analysis format of Moser and Law (1999) and Law (2003) as well as Callon's (1986) four moments of translation. She writes three stories that provide the material for a demonstration of the ways *problematisation* (and obligatory passage points), *interressement*, *mobilisation* and *enrolment* can illuminate the background processes and points of escape in national literacy policy and programs. Hamilton's experience as a practitioner and a researcher along with previous research and historical data inform each story. Her stories, combined with analysis convey the operations of power-especially as occurring in the background--as well as the disconnects and escapes.

Koyama's (2017) research on citizenship and civic engagement among Latino youth draws upon two approaches: actor-network theory (ANT) and critical discourse theory (CDA).

ANT informs the research question by adding the concepts assemble and enact to the CDA concepts interpret, understand and contest (Question 1), and by including the human and the nonhuman (Question 2).

Research Questions:

In what ways are discourses of civic engagement and citizenship assembled, interpreted, understood, enacted, and contested in Arizona? What are the relationships between civic education policy, discursive enactments of citizenship, Latino high school students' online civic practices? (p. 4)

This allows Koyama to treat text as a mediator. In addition to being supportive and influential, ANT's role in this research is also critical. Koyama's reference to "qualculation", a term developed by Callon and Law (2005), is a way to characterize the American Civics Act tests (based on the civics part of the U.S. Citizenship and Immigration Services' naturalization test) that all high school youth are expected to write and pass. *Qualculation* is a term that calculates together arithmetic and qualitative elements: "citizenship identity and civic engagement, are rendered coherent and calculable" (p. 13).

Similar to Hamilton's commentaries on the IALS tests as a government rationalized program for assessing literacy, citizenship too is defined in ways that privileges a certain kind of citizenship and value of civics knowledge. A student, Koyama writes, who posts their civic experience on deportation in a blog is different from a student who reads about citizenship from a textbook. The student who blogs forms connections with a range of ideas and people from the communities to which they are attached, which is quite a different combination of associations assembled by the student in the classroom with the textbook (p. 8). Through an ANT lens, considerable differences between the two actor-networks emerge.

The heuristics for the study of human-technology practices developed by Adams and Thompson (2011) differs from the other ANT-based research texts reviewed: although empirically based, is a philosophical and theoretical project rather than a study. The researchers

repackage ANT and translate it into a practical methodology or set of heuristics. In other words, it is less a strategy in using ANT and more a strategy for making ANT usable. The ANT-based heuristics can be used on their own or combined with other *technology-in-use* heuristics from phenomenological, techno-science, media ecology and critical media studies to name a few, keeping ANT and the other approaches open. The heuristics related to ANT bring attention to "breakdowns", "disruptions" and "tensions", a key aspect of ANT, not mentioned in the other research texts. In these moments, movements and connections with far-reaching effects that might otherwise be missed become visible.

Unlike many of the ANT-informed studies reviewed, Decuypere and Simons (2014) draw upon ANT principles almost exclusively. ANT principles, expressed as three sensibilities, inform the research theoretically. These sensibilities include: avoiding a priori assumptions about what constitutes the social; holding the assumption that agencies are distributed and located within webs of relations and that actors effect and are effected in relation to other actors; and that actors, or in this case academic practice, is always in the making. These principles are enacted in three methodological steps with each step being associated with a research question. To collect their data about the tasks performed by a professor in the course of one day, they interview the professor using Interview to the Double (ITTD). Gephi software is used to compose visualizations of relations between actors (human and nonhuman). These visualizations become instruments for identifying regions of activity and the emergence of a digital infrastructure. Mapping graphically is an important contribution as it is through these inscriptions that a new understanding of the social emerges. Rather than a discussion on the effects of neoliberalist politics on academics in the universities, we are given a different kind of rendering, one that

shows the extent to which academic practices are hybridized with technologies to create the *humandigital.*

The interview provides the researchers with the data they need to map interactions and practices. By focussing on a highly delineated network, the researchers are able to go into greater detail than if they had extended the networks. This is different from Adam and Tatnall (2010) who include a wider range of actors (stakeholders, resources and policies). Adam and Tatnall use interviews to expand the actor-network as the research proceeds.

Chapter Summary

Educational researchers working in a range of subject areas have applied actor-network theory concepts or principles to their scholarship. The review presented has been exploratory asking first, how is ANT expressed in the education literature? Recognizing the challenges associated with an ANT approach with its emphasis on ideas rather than any fixed methodological approach this sample of ANT-based research demonstrated increased interest on the part of researchers to engage ANT principles as a way to tackle complexity and relations. In chapter 3, we look more closely at the ideas of ANT as set out by Latour in *Reassembling the Social*. This close look at RAS not only allows the ideas of ANT to percolate, but to eventually reassemble into an adapted (i.e., translated) ANT approach.

Chapter 4. *Reassembling the Social* (Latour, 2005): An Overview

Purpose of the Chapter

This chapter explores ANT—as set out by Bruno Latour in *Reassembling the Social: An Introduction to actor-network theory* (2005) (RAS)—as a methodology for studying controversy

as expressed in media accounts. It begins with a general overview of ANT as a practice; key principles and specific terminology of ANT are accompanied with illustrative examples from news stories on the topic of massive open online courses (MOOCs). This is a preparatory step for the application of an ANT approach (Chapter 5) to the study of news stories on massive open online courses (MOOCs) published in the *International Herald Tribune*[xlv] and the *International New York Times* (INYT) from 2012 to 2015. A review of the methodology as described in RAS is provided in a diagram to give readers an overarching view (see Figure 4.1). RAS is a composition of philosophical, theoretical, sociological, and methodological assertions in which a metaphysical undertaking for the 'analyst' (researcher is substituted) is suggested. Other than the two broad steps--"Taking into Account" (part I) and "Putting in Order" (part II)—no exact blueprints for "doing" ANT are given in RAS. Certain ANT-related ideas are emphasized over others, including: the five uncertainties associated with "Taking into Account"; the three movements associated with "Putting in Order"; and various conceptual tools addressed in the three movements**.** Discussion about the role of the researcher concludes the chapter.

A final point: this summary is limited to RAS and, in that sense, the ideas in this chapter do not necessarily connect up with ideas asserted in other scholarly contributions by Bruno Latour[xlvi] and colleagues. The summary as presented here serves as the basis for the next chapter in which core ideas of ANT are translated into a workable methodology for the study of the controversy of MOOCs published in the *International New York Times from 2012 to 2015.*

Method[ology] in RAS: An Overview

First the Metaphysics then the Ontology: Continuously and Separately

There are two parts to an ANT approach that are continuously exercised by the ANT researcher: the first is metaphysical, the second, ontological. The first part, which Latour refers

tp as “taking into account” (p. 257), addresses the metaphysical question that of which the social world consists. The researcher begins by deploying five uncertainties about the social world in order to take into account the many actors–human and nonhuman–implicated in a controversy. The second part, “putting into order” (p. 257), addresses the ontological question of how the multiplicity and flux found in the first step are put in order and stabilized by the actors themselves. The researcher follows the actors in the controversy, observing and describing their movements and the tools they deploy (such as formats, standards, and metrologies); in this way, the researcher comes to see how the social is conceived by the multiplicities that constitute it. The researcher is also an actor in the study–she observes and describes the actor-network that becomes visible to her. To avoid foreclosing on the future collective (an ANT concept that is distinct from the concept of “society” as used in French sociology, notably by Émile Durkheim), parts I and II must be continuously exercised, yet always kept separate. When *society* is evoked in RAS*,* it refers to “the assembly of already gathered entities” (p. 75); in other words, society as something composed of predetermined social orders, categorizations and classifications. The *collective,* on the other hand, is “the project of assembling new entities not yet gathered together and which […] appear as not being made of social stuff” (p. 75); that is, the construction of actor-networks. In RAS, the collective replaces society. A third step–*Composition*—is introduced but not elaborated upon in RAS. In this step, we see how the assemblages gathered in the research can *restore* (presumably) a sense of being in the *collective* after the new multiplicities (human and nonhuman) are taken into account and the ways the social is stabilized are newly observed.

This chapter begins with Part 1 The Metaphysics: Gathering the Multiplicity (a “taking into account”), an overview of the first part of an ANT approach. In addition to a review of the

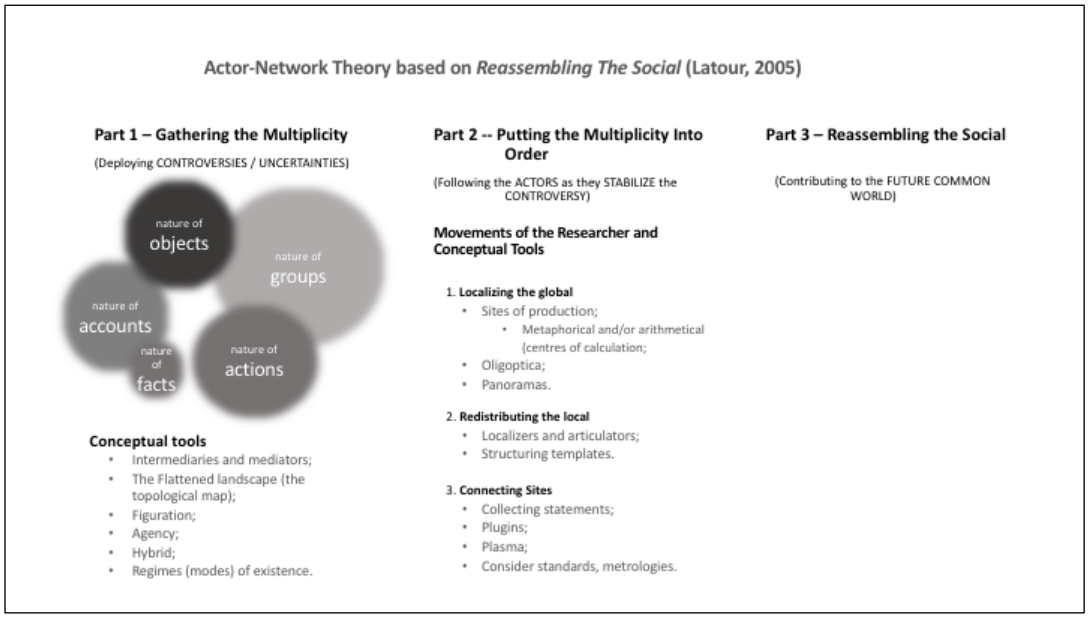
five uncertainties, examples of how the approach can be translated toward the analysis of news stories are provided. Part 2 The Ontology: Putting the Multiplicity in Order follows. A series of cognitive tools and ANT terminology is made available. Based on the principles addressed in the chapter, the role of the researcher is provided.

The Metaphysics: Gathering the Multiplicity

In *RAS*, the universe is constituted by controversies--states in which there is instability and uncertainty (Latour, 2005, pp. 21-22); thus, ANT research begins with a controversy. In a controversy, the alignment of actors shifts, some associations are dissolved, new associations are made, and new resources are mobilized, leaving traces that can be followed. In this state of instability, it becomes possible for researchers to see social connections that, once stabilized or normalized, become imperceptible to us. The ANT researcher waits for actors to deploy the "full range of controversies in which they are immersed" (p. 23) and then follows them as they express themselves and put things in order. The process of following actors within concrete, changing relations is slow, and the recording of traces is abstract, detailed and empirical: only this way can the researcher be sure that no entities are excluded from the *future collective* without due process[xlvii].

Figure 4.1

An Overview of Actor-Network Theory Based on Reassembling the Social (Latour, 2005)



Note. An interpretation of Actor-Network Theory based on *Reassembling the Social* (Latour, 2005) by C. Silva (2018). This overview takes into account Latour's two-step process: Part I, Gathering the Multiplicity; and Part 2, Putting the Multiplicity in Order. Conceptual Tools are associated with each step. The three movements can guide the researcher in ontological description and analysis.

Selecting a controversy is a necessary first step. However, because controversies are continuously being produced, it's possible to start anywhere (Fenwick & Edwards, 2011). For the researcher embarking on an ANT study, Latour offers five uncertainties, or "types of controversies about *what* this universe is made of" (p. 21), to pre-empt them from establishing a predetermined order to things, actions, and relations. These uncertainties are about: the nature of groups, the nature of actions, the nature of objects, the nature of facts and the nature of accounts. Below is a description of each uncertainty.

Deploying Five Uncertainties. Staying with five uncertainties helps the researcher stay with ANT principles as she gathers the multiplicities implicated in a controversy so that the research does not confirm a prior set of beliefs, but can be of service in the making of the future common world.

The Nature of Groups. Controversies Leave Traces

Controversies leave traces as they attempt to stabilize. The first uncertainty concerns the *nature of groups.* The researcher looks for groups but does not assume in advance what might constitute a group or how a group might come together or dissolve. The ANT researcher follows the formation and dissolution of groups by following the actors (p. 2005, p. 29) in a controversy, and notes how groups are made, defined, shored up, undermined, and so on by the actors themselves in continuous processes. The researcher takes note when groups attribute qualities to competing groups: for example, when one group deems another to be “archaic”, “obsolescent”, or even “dangerous” (2005, p. 32). Actors produce their own sociology and define their own groups. Groups, Latour writes, “are made to talk, anti-groups are mapped, new resources are fetched so as to make their boundaries more durable, and professionals with their highly-specialized paraphernalia are mobilized” (2005, p. 31).

Terminology: Intermediaries and Mediators. In observing group formation, the researcher notes the difference between *intermediaries*—"what transports meaning or force without transformation: defining its inputs is enough to define its outputs”—and *mediators*—which “transform, translate, distort, and modify the meaning or the elements they are supposed to carry” (Latour, 2005, p. 39). The researcher follows as mediators trigger other mediators but does not assume that what is a mediator in one instant won’t be an intermediary in another. A computer (Latour’s example) might “transport meaning without transformation” (i.e., be an

intermediary) when everything is working. As soon as it breaks down, it becomes a complex mediator; similarly, Latour writes, a "highly sophisticated panel during an academic conference (i.e., a mediator) may become a perfectly predictable and uneventful intermediary in rubber stamping a decision made elsewhere[31]" (p. 39).

The Nature of Actions: There is No One Causality.

The second uncertainty concerns the *nature of actions*. There is never one cause for an action. Latour distinguishes between an "actant" (the one who acts) and an "agent" (the one that causes the action). The actant in an actor-network is never the single source of any action; rather, the actant is "the moving target of a vast array of entities swarming toward it" (p. 46). "An actor is what is *made* to act by many others" (p. 46). He asks, "When we act, who else is acting? How many agents are also present?" (p. 43).

Distinguishing between abstract or concrete entities is irrelevant from an ANT approach. The agent is a figuration—perhaps a worldview giving shape to the actors being followed and described. There are different figurations (an important distinction for writing an account), all of which produce different ways to make actors do things. Latour reminds us that actors have their own worldviews, which exceed those deployed by the researcher engaged in sociology—"Actors have many philosophies but sociologists think they should stick to only a few" (p. 52). In a news story by Levin (2012) published in the *International New York Times*, a figuration appears through the literary device we refer to as a metaphor: the force of three technological advancements is described as causing a "seismic shift" (para. 1) and a "tsunami" (para. 4) in online education, and the spread of publicity on the topic by the media is described as a "wave" (para. 6). In this example, socio-technical forces are rhetorically interwoven with natural forces.

These forces are expressed as figurations—they have effects contributing to the meaning of the story but make little sense on their own.

The Nature of Objects: Enter Power.

The third uncertainty concerns the *nature of objects*, and it is here that Latour addresses the problem of hierarchies and power. Latour argues that social interactions alone are not sufficient to build and maintain hierarchies—non-human actors must be added to make the hierarchies strong and enduring. "[O]bjects", Latour writes, "are what explains the hierarchical landscape" (Latour, 2005, p. 73). The interweaving of human and non-human actors, or 'inter-objectivity' in Latour's terminology, results in the spatial and temporal extension of interactions and the collapse of the micro/macro dichotomy. It isn't that objects simply explain/maintain hierarchies or exist in multiplicities; rather, "what is new is that objects are suddenly highlighted not only as being full-blown actors, but also as what explains the contrasted landscape we started with, the overarching powers of society, the huge asymmetries, the crushing exercise of power" (2005, p. 72).

As actions unfold, connections usually "zigzag" (p. 75) from human-human to object-object. We might notice how objects "authorize, allow, afford, encourage, permit, suggest, influence, block, render possible, forbid" (Latour, 2005, p. 72) as well as enroll and inform. In RAS, the term used to describe the sociology of associations is hybrid or hybridization. The actual "world" is a hybridizing one: nature and culture as separate entities don't really exist, except in the way that they are made to appear separate when stabilized by the actors themselves, who believe or continue to construct them as separate. In ANT, the social is hybrid:

> ANT is not the empty claim that objects do things 'instead' of human actors: it simply says that no science of the social can even begin if the question of who and what

> participates in the action is not first of all thoroughly explored, even though it might mean letting elements in which, for lack of a better term, we would call *non-humans* (Latour, 2005, p. 72).

The Nature of Facts: From Matters of Fact to Matters of Concern.

The fourth uncertainty concerns the *nature of facts*. The emphasis in ANT shifts from 'matters of fact' (the objective and ground of Modern sciences) to 'matters of concern': uncertain, controversial, unusual and interesting gatherings of entities (Latour, 2005, pp. 114-120). Facts are not dismissed by Latour, but redefined. Following the insights of Science Studies, Latour argues that facts can be both real *and* constructed: "Facts were facts—meaning exact—*because* they were fabricated—meaning that they emerged out of artificial situations" (Latour, 2005, p. 90). Latour uses the example of the laboratory, where contrivance and objectivity work together: "Things were true because they were well constructed" (p. 90). The construction of facts then speaks to this inter-weaving between artificiality and reality. This does not imply that facts everywhere are the same. Latour proposes that there are different "regimes of existence", such as science, law, religion, economies, each with their own methods ("circuits and instruments"), for fabricating different facts and truths. Sensitivity to the methods of these regimes is required to keep the constitution of the social world open (Blok and Jensen, 2011, p. 119).

How is it that things come together? To address this Latour once again distinguishes between the "sociology of the social", designated by intermediaries, and the "sociology of associations" denoted by a concatenation of mediators:

> We don't know yet how all those actors are connected, but we can state as the new default position before the study starts that all the actors we are going to deploy might be

> associated in such a way that they make others do things. This is done not by transporting a force that would remain the same throughout as some sort of faithful intermediary, but by generating transformations manifested by the many unexpected events triggered in the other mediators that follow them along the line. This is what I dubbed the 'principle of irreduction' and such is the philosophical meaning of ANT: a concatenation of mediators does not trace the same connections and does not require the same type of explanations as a retinue of intermediaries transporting a cause. (Latour, 2005, p. 107)

Latour's point is that a fact is a fact because it is well built, not because it carries an inherent absolute truth. That we consider facts truth, he writes, is a testament to the robustness of their construction.

Terminology: Agency(ies). Latour writes, "agencies are always presented in an account as doing something, that is, making some difference to a state of affairs, transforming some As into Bs through trials with Cs" (pp. 52-3). An agency is always followed by "some explicit theory of action" (p. 52). Agencies are always given a figuration. Returning to the example of the "seismic shift", "tsunami" and "wave of publicity" (Lewin, 2012, July 18), the agency (issue)—technological advancement in online education—is given the figuration of natural forces—a "seismic shift" and a "tsunami"—that we commonly associate (if humans are involved) with natural disasters. Like facts, agencies should not be presented as 'matters of fact', instead they should be considered 'matters of concern' and their *fabrication* and *stabilizing mechanisms* made transparent (Latour, 2005, p. 120).

The Nature of Accounts: Keeping Track and Writing Well

The fifth uncertainty concerns the *nature of accounts*. The ANT researcher must understand that they are an actor in the actor-network that appears through the research and be

diligent in mapping the chain of associations that appear without imposing their own interpretations. The truth-effects of the artificial-yet-accurate account by an ANT scholar is dependent on the sensitivity and care with which they trace the chain of actions and treat each participant as a mediator, as well as the sensitivity of the reader to trace the network anew (p. 132). “Good sociology has to be well written; if not, the social doesn’t appear through it” (p. 124).

To keep track of every move – including those of the researcher in the production of the text—Latour recommends using four notebooks:

1. A *log of the enquiry* that includes: reflexive writing; the story of the researcher’s enquiry; the research and how it develops; discussions about adjustments to the identification of the controversy as one moves through it; examination of how one’s thinking about the controversy changes; and reflections on how this effects the research.
2. An *indexing system* that allows the analyst to keep records in a chronological order and sort them into increasingly refined categories.
3. *Continuous writing trials* done throughout the study.
4. A *register of the effects* that the written account has on the actors.

In each case, the researcher describes rather than analyzes. They don’t make connections between entities; rather, they describe what appears and then open up their account to the actors. In this way, their text “*performs* the social”, that is, it assembles participants “in such a way that they can be “collected together" (Latour, 2005, p. 138). The social appears, not as something static, but as something dynamic with continuously changing boundaries. It is through description that the social (of associations) is deployed.

The Ontology: Putting the Multiplicity in Order

After gathering the multiplicity (the metaphysics), the next step is to map how the actors put the multiplicity in order and stabilize the controversy (the ontology).

Avoid Jumping from the Local to the Global

In this step, the researcher maps the ontology of the controversy in three movements, each with its own tools that help the researcher describe what holds the multiplicity together. In the first movement—showing how the global is constructed within well-defined sites of production—the researcher traces the construction of the global as a representation within delimited sites of production. *Panoramas* and *oligoptica* are conceptual tools that help the researcher identify constructions of the global. In the second Movement—showing how the local is made up of other times and distant places—the researcher traces the construction of the local. *Articulators* or *localizers* are conceptual tools that help the researcher follow the local as it is redistributed. In the third movement--whatever connections are made, *new conduits* are formed[xlviii]—the researcher attends to the connections that appear on the *topological map*. At the points of connection, conduits are formed that allow for the transport of new entities.

Throughout, the researcher follows the empirical traces of movement. In the sociology of the social, Latour explains, researchers tend to jump from the local or micro sphere to the global or macro sphere. In ANT, tools are introduced that prevent researchers from taking shortcuts to explain the social world. The differences between the local and the global are a topic of theoretical debate in the field of sociology. Latour poses the following questions: what happens when we move from one level to the next? What are the associations we make to get us from the local to the global, or which associations do we avoid?

First Movement: How the Global is Constructed

In the first movement we see that there is no such thing as the global. The global is a representation that is always generated locally within specific *sites of production*. A site of production is any locale (rather than a place or location) where the world is brought in to be transformed and propelled back out (Latour, 2005). Many locales fall within this broad definition; the artist's studio, the bread maker's kitchen, the engineer's construction site, the professor's seminar class, the farmer's fields, the New York Times editor's field desk and the researcher's lab are all sites of production. Latour distinguishes two types of sites of production that are of particular interest to the ANT researcher because they produce the global; these are *sites of metaphorical production* (e.g., an editorial newsroom) and sites of mathematical or data production, called *centres of calculation* (e.g., Wall Street).

Terminology: Sites of Production. Sites of production in a general sense are locales where the world is brought in to be transformed and propelled back out.

Terminology: Sites of Metaphorical Production. An editorial room is a site of metaphorical production: information comes in and gets pumped back out in the form of news stories, editorials or op-eds. The world that is described in these reports is a function of the demarcated locale in which it is produced. Latour notes that "even Karl Marx in the British Library needs a desk to assemble the formidable forces of capitalism" (p. 175).

Terminology: Centres of Calculation. *Centres of calculation* produce data. Connected to other centres of calculations, they generate global overviews through such documents as mathematical charts, graphs and tables. Wall Street is an example of a centre of calculation: it is a highly networked locale in which transactions take place and activities happen. These

transactions leave empirically traceable movements from within, through or in combination with "allies" to and from a single location.

The author of this dissertation operates in a site of production. There is an office or room where a computer is situated that allows research to be gathered via the Internet; from this locale the researcher composes her notebooks and digital files and communicates with her advisors and colleagues; it is a primary site of production for research. Objects such as books, papers, reports, USB keys, passwords, digital files, graphs and statistics move into and from the office, but mostly, information is stored in and moved from one device to another. Ideas are transported to and from, and knowledge is produced in such places. It is not a question of one site of production being bigger or smaller than another. It is not a question of context as though some things exist inside other things. It is only a question of actor-networks, constituted by their connections. It is these connections that the researcher traces.

Representations of the 'Global' that Emanate from Sites of Production. From sites of production, two types of representations emanate that present a view of the global: the *oligopticon*, a highly detailed, narrow view in which we see a small part of the connected whole very well, and the *panorama*, a seemingly seamless representation of a whole.

Terminology: Panorama. A panorama is an image of a seamless whole. Panoramas seem to "see *everything*. But they also see *nothing* since they simply *show* an image painted (or projected) on the tiny wall of a room fully *closed* to the outside" (Latour, 2005, p. 187). Panoramas "design a picture which has no gap in it, giving the spectator the powerful impression of being fully immersed in the real world without any artificial mediations or costly flows of information leading from or to the outside" (Latour, 2005, p. 188). In the 19th century, the term panorama referred to topographical paintings and photographs that were housed in large, rounded

buildings to give viewers an experience of being in a landscape; in ANT, the term has a broader significance. A panorama, in ANT, can take the form of anything that provides us with a complete view; these macro-images can inform actors as they move about the world; they can also create in them a "desire for wholeness" (Latour, 2005, p. 189).

The ANT researcher makes the locale of the panorama visible and shows how the global that it purports to represent derives from localized associations. It could be said that a corpus of news stories on the topic of MOOCs provides a panorama of the world, (some) editorials provide visions of possibility, and spokespeople quoted in texts provide *panoramic sketches* (my expression, not Latour's). The statement by Richard A. DeMillo—director at the Center for 21st Century Universities from the Georgia Institute of Technology—"This is the tsunami" (Lewin, 2012), is an example of a panoramic sketch. While brief, the statement invokes imagery that can loom large for the reader; it can be encompassing. The string of four words by DeMillo that appear on a page of the INYT are a trace to an interview on the topic of massive open online courses (MOOCs), an expression on a state of being made by a university administrator in awe of MOOCs, an excerpt specially selected for and placed in a story by the journalist as she builds a coherently structured story, and a form of rhetoric.

The key point here is that panoramas, which often point to a globally imagined context, are made from localized interactions. But because panoramas create a sense of coherence and give the impression of a seamless whole, they can have force. As ANT researchers, we identify panoramas; but, as Latour cautions, we mustn't confuse them with the social. In ANT, we are not following the contexts provided by panoramas as representations, we are tracing the associations in which panoramas are encountered as performative and capable of mediating and generating effects.

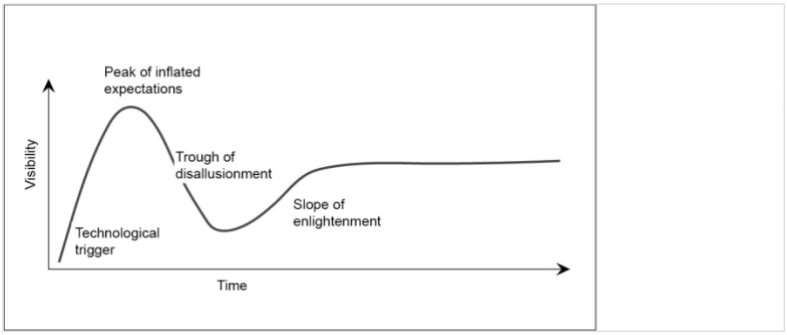
Panoramas are Contexts in Association. Panoramas can take the form of anything that provides us with a complete view; they create a picture of coherence; they give the impression of continuity. In and of itself, a panorama is only a set of connections in an actor-network. Again, actor-networks themselves have no context; rather, they are constituted by their associations. The identification of panoramas can help the researcher distinguish between representation, as understood in the sociology of the social, and enactment, as understood in the sociology of associations.

The Gartner Hype Cycle—a model designed to help decision-makers discern between (media) hype and reality of new technologies—appears as a panoramic image in several articles on the topic of MOOCs; both academics and journalists refer to the rising and dwindling media interest in MOOCs in relation to it (Daniel, 2016; Koller, 2015; Selingo, 2014; Trucano, 2013). In the INYT, George Siemens is both paraphrased and quoted as saying "what was happening was part of a natural process. 'We're moving from the hype to the implementation […] It's exciting to see universities saying, 'fine, you woke us up,' and beginning to grapple with how the Internet can change the university, how it doesn't have to be all about teaching 25 people in a room" (Selingo, 2014). In the Gartner Hype Model (Figure 4.2) a new technology is depicted in predictable stages: first it is adopted enthusiastically until it reaches a "peak of inflated expectations", a trend intricately connected to media attention; at this point the new technology moves into a "trough of disillusionment"; then to a slope of "enlightenment"; and finally, ascends into a "plateau of productivity". MOOCs, having "fallen from their 'peak of inflated expectations' and in the INYT moving into the 'trough of disillusionment' (Selingo, 2014) is predictable. The deployment of this model makes the adoption of new technologies and the movements of human consumers appear as though they were natural and universal. In this view,

no disruptions endure, and every obstacle is located in the relevant stage, assuring us that (eventually) all will be well; it is a panorama that explains the social to us.

Figure 4.2

Gartner Hype Cycle and Moore Technology Adoption Cycle



Note. Adapted from "Massive open online courses: What will be their legacy?" by J. Daniel, 2016, *FEMS Microbiology Letters*, *363* (8), p. 3.

Terminology: Oligoptica. An oligoptica is a narrow, detailed view. While panoramas suggest "complete control" (everything is accounted for in the view), oligoptica suggest the opposite, a "lack of control" (2005, p. 188), as only a small aspect of the social is visible. Like panoramas, oligoptica are local and concrete; they gain strength and reach through their many connections. We can think of research by a doctoral student working on her dissertation as an oligoptica. The doctoral student extracts and analyzes a series of INYT news stories providing a sturdy but limited view of the social in that they are topic specific. Panoramas and oligoptica are not the social but the coming together of the social. They are, Latour argues, part of the multiplicity to be deployed and carefully studied.

Terminology: The Topological Map. The topological map that the ANT researcher produces keeps everything flat on the surface—there is no 'over' or 'under', only folds of time and space. On the topological map, everything exists on one level; what was once considered global is now at the same level and at the same scale as the local. This allows the researcher to

follow the connections being formed by the actors, and to "move continuously from local production sites to global structures" (Latour, 2005, p. 117). The map can take any form as long as the actors are gathered together on a single plane of existence; it can be folded but remains flat and everything remains visible. The task of the researcher is to fully describe the relations that appear on the map: "The goal is to render visible the long chain of actors linking sites to one another without missing a single step" (p. 173). Latour is not suggesting that there are no macro-phenomena; rather, he is proposing that macro-phenomena exist at the same level as local interactions. If different scales exist, they are determined by the actors, not the researcher (see Latour, 2005, pp. 183-7). If scales shift, it is because these shifts are enacted by the actor-network.

On the topological map, actor-networks appear as 'star-like shapes' connected to other actor-networks that they feed and feed off of. Power, Latour argues, is disproportionate on the map: for example, it can be quite strong in actors-networks in which chains of science and technology are concentrated. Latour refers to these points of concentration as black boxes.

Second Movement: How the Local is Made Up of Other Times and Places

"No place dominates enough to be global and no place is self-contained enough to be local" (Latour, 2005, p. 204)

In the first movement we see that the global is always locally constructed. In the second movement, we see that the local must also be built: "Locals are localized. Places are placed" (p. 196). Like the "global," Latour argues, the "local" too has no concrete existence (p. 192). The basic premise is that locations are made into places because things come together from other places, and times: a technology produced in 2012 conditions actions and relations in 2017; a blueprint in an architect's office conditions actions and relations in the researcher's office. When

we move in to look at the "local" we find human and non-human connecting elements, which Latour refers to as *articulators* and *localizers*.

Terminology: Articulators and Localizers. Articulators and localizers "[transport the] presence of places into other ones" (Latour, 2005, p. 194). Those articulators and localizers are the multitude of material devices and intellectual technologies—classrooms, languages, curricula, professional structures, to identify a few—that function as "structuring templates" within the channels of actor-networks (p. 196).

Using the example of blueprints used to construct a building, Latour argues that articulators and localizers do not determine how actors will act (e.g., in a building based on those plans) but, together with other localizers and articulators, they generate effects[xlix]. Those that function as mediators introduce novelty and surprise; those that function as intermediaries bring stability and predictability (Blok & Jensen, 2011). Together, they disrupt the boundaries of the local (that we understand as place), giving it the same star-like shape as the sites of production that generate the global.

Terminology: Structuring Templates. While there are no underlying structures, there are *structuring templates*—standards and conventions—that circulate from other times and places and perform in local interactions (p. 196). With the advent of digital technologies, the production and dissemination of news has changed, however standards and conventions such as "fact-checking", corroboration, and even objectivity continue to inform the writing—paraphrasing and quotes—of digitally produced news: the physical organization of the news stories and media are also based on structuring templates—mastheads, indices, sections, headings, paragraph lengths, photos, and by-lines. Newspapers have rules and regulations (Schudson, 1981; Anderson, Downie & Schudson, 2016) and journalism programs teach ethical

practices (McNair, 1995/2018), preparing journalists and journalism students for a practice that ensures the dissemination of "facts"[l].

Latour (2005) sets out several features of the interactions that produce the local: interactions[li] are not *isotopic*—effects generated in one moment consist of effects generated from different moments and other places; interactions are not *synchronic*—time is always folded, meaning that the ingredients in any actor-network may have been produced in entirely different eras; interactions are not *synoptic*--it's not necessarily possible to see all the actors involved in any given action, which doesn't suggest that they are not present; interactions are not *homogeneous*—the materiality in which action is transported isn't necessarily *homogenous*; and finally, interactions are not *isobaric*—some actors are more visible, while others remain in the background (pp 200-202). Interactions Latour argues, move in all directions and cannot be held together through *social ties*. The researcher follows the trails left by the objects and materials that are a part of the continuously emerging social.

Terminology: Plugins. Just as "society" and the "social" are treated as composite assemblages produced through relations, so too are such explanatory concepts as identity, subjectivity, interiority, intentionality and morality. Human actors acquire subjectivity by plugging in to resources such as legal papers, spreadsheets, magazines, gestures, clichés, barcodes, etc. that circulate within the social. When *downloaded* to the individual actor, these plug-ins generate mental and cognitive competence and allow actors to have attributes. In RAS, interiorities, subjectivities, and intentionalities are built in much the same way as other kinds of constructions: "[n]othing pertains to a subject that has not been given to it" (Latour, 3005, p. 21). Latour states:

> "You need to subscribe to a lot of subjectifiers to become a subject and you need to download a lot of individualizers to become an individual—just as you need to hook up a lot of localizers to have a local place and a lot of oligoptica for a context to 'dominate' over some other sites" (p. 294).

News stories can function as plugin-ins: they may provide someone with a sense of belonging to an international or local knowledge community; they may reference a certain education or reinforce a sense of being in-the-know; they may reflect a political stance, or a specific set of business interests.

Third Movement: How Connections are Made

In the first move, the global is relocated: all that is global is locally made; and, in the second move, the local is redistributed: it always consists of disparate times and places. If there is a local site, it has to have been assembled. This continuous process of assembly is what constitutes an actor network. Latour writes:

> "Let us remember that any site will be taken as an actor network if it is the source of what acts at a distance on other sites—hence giving it a star-like shape—and is the end point of all the transactions leading to it—hence giving it the same star-like shape. So the word 'site' should not be taken as a synonym of the local that we have abandoned in the previous chapter" (p. 223n.304).

It is only when the first two movements are enacted that the connections in the actor network become evident and the third movement takes place. With each connection, a new conduit is established, making it possible for researchers to trace the social as it is constructed through associations between entities. The social world is formed, formatted and informed (p. 226).

To continue acting, networks must continuously be made; connections need to be enduring.

Standards help to stabilize controversies; they contribute to *metrology*—measures or stands based on shared agreements allowing for the circulation of universals. While the sociology of the social produces metrics to develop and support theories of the social, the sociology of associations traces the metrological chains that support these social theories.

Terminology: Form. A form, Latour writes, is "simply something which allows something else to be transported from one site to another" (p. 223). Forms have a "connecting ability" (p. 226); they also have "material traceability" (p. 226). Information takes one form or another.

Terminology: Plasma. If the social exists within the chains of connections, what is it that lies in between the connections? This, Latour writes, is *terra incognita* (p. 221), what he calls *plasma.*

Plasma is everything not accounted for, everything that is "not yet formatted, not yet measured, not yet socialized, not yet engaged in metrological chains, and not yet covered, surveyed, mobilized, or subjectified" (p. 345); it is the *in between*, what we do not yet know.

In ANT, law, economics, and politics—to identify a few domains—are not things that act as hidden forces—"they don't cover, nor encompass, nor gather, nor explain"; what they do is "circulate", establish "formats", and "standardize" and "coordinate" (p. 246). In ANT, associations are described (p. 246). Latour asks, what interferes with our seeing of possible connections? The metaphorical vocabulary that collects actors into groups can do this.

Terminology: Collectors. *Collectors* seem to be Modern categories. Of particular interest to Latour are the collectors, "Society" and "Nature", two Modern categories that he

rejects as: "premature attempts to collect in two opposite assemblies the one common world.[354]" (p. 254).

Terminology: Collecting Statements. *Collecting statements* are expressions that define standards for the social and, as such, define the criteria for belonging; they do the collecting. When Richard A. DeMillo, the director of the Center for 21st Century Universities at Georgia Tech, says, "It's all so new that everyone's feeling their way around, but the potential upside for this experiment is so big that it's hard for me to imagine any large research university that wouldn't want to be involved" (Lewin, 2012, July 18 para. 4), he is making a collecting statement. Not in the same way that Latour is referring to Nature and Society, but in another way, one that aggregates large universities in relation to small universities or colleges, a boundary delineation that I will return to in the next chapter as I examine more closely the roles assigned to higher education in the INYT corpus.

Summary

Latour presents the researcher with three tasks that must be done sequentially: the first is deployment—the researcher deploys controversies (uncertainties about groups, actions, objects, facts and accounts) to gauge the number of new participants in any future assemblage (Part I); the second is stabilization—the researcher follows the actors to see how they stabilize the uncertainties by building formats, standards, and metrologies that produce both the local and the global (Part II); and the third is composition, the task of reassembling of the social—the researcher(s) maps the connections and the movement of forms that constitute the actor network. For each step, a number of conceptual thinking tools with which to work and think have been offered.

The Role of the Researcher in ANT

Some of the key requirements of the ANT researcher are described in this section. In RAS Latour makes the case that sociologists or, even specifically, critical sociologists, appear always to know more about the people they study than the people themselves (Venturini, 2010a; Latour, 2005). In ANT, researchers 'take into account' all the possible actors that make up the actor-network, including themselves. In a sociology of associations approach, the researcher follows the actors, lets the actors speak for themselves, and doesn't interfere in their worldviews or overlay their speech with "an all-purpose meta-language" (Latour, 2005, p. 125) that provides a form of social explanation. In ANT the emphasis is on description over explanation, followed by analysis. After all, ANT is analytical. Withholding a priori ideas about what the social consists of helps the researcher stay focussed on the actors and the actor-networks as they are developing. In controversies, worldviews are expressed in the form of agencies. The researcher observes, describes and maps these agencies, withholding judgement along the way. In the ANT study of stories about MOOCs in the *International New York Times* between 2012 to 2015 (Chapter 5), the researcher gathers the agencies and maps the movements of mediators and intermediaries as they stabilize the actor-network.

The researcher makes no assumptions about the meanings of the actions or entities involved; they do not rely on abstract explanations for what they see; eventually after many re-writes they turn the map over in a public way (perhaps through exhibitions, community meetings, conversations or online modalities) to serve as possible guides for the actors as they negotiate their way toward an inclusive and more compassionate world. This is the researcher's contribution to the Future Collective.

While it is possible to achieve a sense of ANT theoretically, it is nearly impossible to learn ANT

without doing it. As stated earlier, Law and Singleton (2013) describe ANT as a sensibility, a worldly practice or craft that works "slowly both on and in the world, as uncertain, as empirically sensitive, as situated, and as passionate because it stays with the trouble" (p. 489). To stay with uncertainty requires that the researcher takes time to patiently observe, follow, map and describe. A number of scholars attest to the importance of slowing down[lii]. Latour advises, "we will have to learn how to slow down at each step" (p. 17) and warns: "ANT, I am afraid to say, will turn out to be agonizingly slow" (p. 25). An indicator of quality in an ANT project is that the actors' concepts are allowed to be stronger than those of the researcher. Writing is key: an ANT text must be well-written for the social to appear.

Chapter Summary

Working towards a methodology requires understanding ANT and putting it into practice. It involves engaging with the world. The purpose of the chapter was to provide a summary of some key aspects of ANT as described in RAS: the five uncertainties—the nature of groups, the nature of action, the nature of objects, the nature of facts and the nature of accounts—help the researcher to keep an open mind as they follow the actors. Terminology and ideas associated with the terminology were introduced. The next chapter involves two major steps: the first attempts to translate ANT principles into a workable methodology; the second engages the translated methodology with a controversy on Massive Open Online Courses as expressed in the *International New York Times* corpus.

Chapter 5. Translating and Enacting ANT

Purpose of the Chapter

In the previous chapter, a summary of Bruno Latour's two step actor-network theory (ANT) approach was described. Chapter 5 builds on ANT as described in *Reassembling the Social* (2005) by translating ANT "The Method[ology]: First the Metaphysics then the Ontology" (Chapter 4), into a workable approach for the study of a controversy in higher education as expressed in news media. The translated methodology is then used to study the controversy of massive open online courses (MOOCs) as expressed in the *International New York Times* (2012-2015).

Three conceptual tools—navigational codes (ncodes), strands (and substrands) and confluences—emerge in the enactment of the translated ANT approach. They are used to follow and analyze the mechanisms by which meanings simultaneously endure and change across time in the corpus of 31 news stories. In addition to demonstrating the translated ANT approach, this study seeks to contribute to the literature in education by offering an investigation of MOOCs as covered in media using a realist constructivist approach, one that emphasizes associations, materiality and network effects.

Abstract

While many educational scholars draw on the ideas of actor-network theory, few have used ANT methodologically. ANT offers researchers a way to follow actors in situations of uncertainty or controversy (Latour, 2005). In controversies, relationships that might otherwise be indiscernible become visible (Venturini, 2010a). This was the case from 2012 to 2015 when mainstream news coverage on the topic of massive open online courses (MOOCs) reached a peak. Educational scholars have analyzed the media coverage on MOOCs using Critical Discourse Analysis and Topic Modelling, recognizing these years as a distinct episode in news reporting on MOOCs and, more broadly, in public debate on an educational technology. Because ANT is a set of principles and conceptual tools rather than a set methodology, the first objective is to translate ANT principles and tools into a workable approach for the analysis of news stories.

The research asks: How can an ANT approach be applied to the analysis of news stories? The second objective is to demonstrate the translated methodology in a pilot study of a corpus of 31 news stories published by the *International New York Times* (INYT) from July 2012 to December 2015. It asks: What does the translated ANT approach show us about how the controversy of MOOCs in higher education is expressed in the INYT corpus? What is the social that appears? Navigational codes, strands and confluences emerge as a set of instruments making explicit the ways in which meanings and effects are constructed across the corpus.

Introduction

This research begins by setting out a process for translating ANT principles as discussed in *Reassembling the Social* (RAS) where Bruno Latour (2005) has set out a two-step approach for the analysis of the social of associations, making available several principles and conceptual tools along the way. In this chapter the principles and conceptual tools of ANT are translated into a workable methodology for the analysis of news stories and applied to the controversy surrounding Massive Open Online Courses (MOOCs) as expressed in the *International New York Times* (INYT) from 2012 through 2015. Three questions are posed: How can an ANT approach be applied to the analysis of news stories? What does this translated ANT approach show us about how the controversy of MOOCs in higher education is expressed in the corpus? What is the social that is revealed? The first question addresses the methods of a translated ANT methodology, a necessary practice before engaging ANT principles. The second and third questions test the translated methodology by deploying the approach and emergent tools directly to the MOOC controversy as expressed in the corpus.

To address the first question, key ANT principles as expressed in RAS (Latour, 2005), were translated into a series of navigational codes or ncodes designated as: Agencies, BoundaryFormations, Actions, ImperativeStatements and ActorsTheories. These ncodes became the translated methodology. Next, the corpus consisting of 31 news stories on the topic of

MOOCs published in the INYT was coded with these ncodes in a process similar to open coding that makes repeated meanings visible. During this process, new tools emerged: strands, substands and confluences. Strands appeared when passages of text with enduring and repeated meanings were associated with one another; smaller strands that constitute the strands were identified as substrands. When specific passages of text were shared with more than one strand, they were designated confluences. When the strands, substrands and confluences were mapped according to ANT principles, a networked shape began to appear, making the relationships and potential functions of the passages in the corpus more evident. Although the corpus is constituted by 31 sequentially published news stories, the ANT approach treats the corpus as a network of actors and effects. This network is dynamic.

To address the second research question—What does this translated ANT approach show us about how the controversy of MOOCs in higher education is expressed in the corpus?—three strands were mapped creating visual records of the associations that had been constructed by the researcher. While attempting to withhold a priori ideas about what constitutes the social, each of the three strands was then charted and described.

To address the third research question--What is the social that is revealed?—the researcher zoomed in on the actor-network; one passage in each of the three strands was analyzed in detail using the four ncodes—Agencies, BoundaryFormations, Actions, and ActorsTheories—as analytical tools.

To summarize, section I provides a background on the controversy surrounding the launching of MOOCs by some of the large U.S. research universities during the early 2010s. The large enrolments and the ease of building courses using MOOCs caught the attention of the popular media. It also stirred interest in academia. Section II provides a review of the literature:

eight peer-reviewed studies of the news coverage on MOOCs are summarized and commentary is provided. Section III responds to the first research question, ANT principles and tools as outlined in RAS are translated into a form that can be enacted for the study of the INYT corpus.

In Section IV the translated methodology is developed and tested against the corpus; section IV is the enactment of the translated ANT approach. The findings include the development of strands, substrands and confluences. While ten strands are identified, the focus includes detailed maps, descriptions and charts of three strands designated as—the Origins, Inevitability of MOOCs and Becoming Financially Sustainable strands. Using ncodes a single passage extracted from each of the three strands is analyzed. Thus, the findings are both the methodology and the tools that emerged in the enactment of ANT principles with the corpus.

Part I Visualizing Controversy, Massive Open Online Courses (MOOCs)

When massive open online courses (MOOCs) were launched in late 2011 and publicized by a private consortium of universities, a controversy in higher education became visible in the media. Beginning in 2011, news coverage of MOOCs, with their seemingly accessible online platforms, quickly gained the attention of varied publics, including educators, university administrators, government officials, industry executives, and students. Claims and counterclaims were made about MOOCs in the media, often with scant empirical evidence. Already in 2012, an article in the *New York Times* declared it the Year of the MOOC (Pappano, 2012). Scholars had barely begun to study the phenomenon when reports were issued by university administrators on the viability of MOOCs—reports that showed clearly the degree to which education and popular media accounts relied upon one another for their information (e.g., Pursel, Zhang, Jablokow, Choi, & Velego, 2016; Yuan & Powell, 2013). The controversy on MOOCs was unfolding across multiple domains. Professor blogs (e.g., Stewart, 2014; Devlin,

2014; Allen, n.d.), student blogs (Moos, 2013), popular news source blogs (Rangnekar, 2013), education news sources (see Marginson, 2012; Watters, 2012), popular news sources (Johnson, 2012), university learning centres (Riddle, 2012), academic peer-reviewed literature (Liyanagunawardena, Adams & Williams, 2013; Veletsianos & Shepherdson, 2015), and political and social commentaries (e.g., Bates, 2014; Hall, 2013; Mirrlees & Alvi, 2014) were weighing in on MOOCs.

The controversy of MOOCs was frequently mentioned in both the academic peer-reviewed literature and popular news media. Debates were polarized: some writers advocated for MOOCs as a way to make education more accessible (Lewin, 2012) while others cautioned that, without critical analysis, MOOCs had the potential to reify or worsen current disparities in education (Altbach, 2014; Krupnick, 2014; Rivard, 2013). These debates caught the interest of a handful of educational scholars who recognized 2012 to 2015 as a distinct episode in news reporting on educational technological issues in the public domain (Brown, 2016; Bulfin, Pangrazio & Selwyn, 2014; Kovanović, Joksimović, Gašević, Siemens & Hatala, 2015). Using Critical Discourse Analysis (CDA), Bulfin, Pangrazio and Selwyn (2014) and Selwyn, Bulfin and Pangrazo (2015) identify prominent themes within mainstream media reports on MOOCs from January 2012 and December 2013; their research asks: do news reports about MOOCs reify inequalities in higher education? Kovanović, Joksimović et al. (2015) use Topic Modelling to find the main topics of public discourse from 2008[liii] to the first half of 2014; the research asks: what changes [in the literature] have occurred over time in media reporting on MOOCs? A review of the literature on the coverage of MOOCs in the media demonstrates the prevalence of CDA, Content Analysis and Grounded Theory approaches to the topic. A critical summary of key research is provided.

Massive open online courses (MOOCs) were launched primarily through Canadian university research initiatives in the mid to late 2000s. The early MOOCS followed principles of open learning and explored a number of theoretical and practical ideas easily propelled and tied to the networked and digital attributes of the Internet—open thinking (Couros, 2006); connectivism, (Downes, 2012); another version of connectivism (Siemens, 2005; 2017); and rhizomatic education (Cormier, 2008). Much has already been written about this recent history. The MOOCs referred to in this dissertation are those launched by several for-profit (e.g., Udacity, Coursera) and one non-profit (i.e., edX) MOOC platform providers in partnership with U.S. elite private universities beginning in 2011. These initiatives, unlike the connectivist or c-MOOCs developed by Canadian researchers, garnered a great deal of media attention from popular, business and education news sources.

The MOOCs launched by elite U.S. universities were based on sequential, modular course structures—the emphasis being a top to bottom approach to education (Mackness & Bell, 2015). Pre-recorded video lectures, readings, and discussion forums or blogs were offered (Liu, McKelroy, Kange, Harron & Liu, 2016). As mentioned earlier they were originally available at no to little cost and required no application process, they were open to anyone (McAuley, Stewart, Cormier, & Siemens, 2010, p. 10); people could attend some sessions but not others if they chose (Burd, Smith & Reisman, 2014). With no academic prerequisites, the initial MOOCs offered no formal accreditation.

By 2013, the MOOC phenomenon was increasingly a subject of academic research. A first systematic review of the literature on MOOCs was conducted by Liyanagunawardena, Adams, and Williams (2013); reviewing both peer-reviewed and non-peer-reviewed publications between 2008 and 2012, Liyanagunawardena and colleagues mapped the scholarship, developing

initial thematic categories of research (e.g., case studies, MOOC providers, educational theory and technology). At that point any and all research on the topic was limited so this first systematic review of the literature had marked a major foray into the new area of research on MOOCs. It was not surprising that a number of articles on the topic of MOOCs found in this first review were of an introductory nature, and included the earlier MOOCs, based on connectivist approaches.

Ebben and Murphy (2014), whose data collection yielded 25 peer-reviewed articles (2009-2013), further organized the research, establishing it into two phases of nascent scholarship (2009-2013): the first with a focus on connectivism, engagement and creativity (2009-2011/2012) and the second with a focus on learning analytics, assessment and critical discourses (2012-2013). Jacoby (2014) offered a narrative review focused on the effects of MOOCs on higher education as it pertains to disruptive innovation theory. Veletsianos and Shepherdson (2016) conducted a systematic review of literature on the topic of MOOCs covering the period 2013 to 2015. They addressed what they saw as gaps in the MOOC literature, noting, for example that much of the scholarship had not methodologically distinguished between the data collected and its subsequent analysis—a key detail for ascertaining what can be known about MOOCs, they argued. Veletsianos and Shepherdson addressed this question by conducting a broad literature review taking into account both qualitative and quantitative approaches and including published articles and conference papers. The authors identified five categories (or strands[liv]) of research: student learning (83.6%); design and implementation of MOOCs (46.4%); perceptions about MOOCs and their educational and financial impacts (10.9%); instructors and teaching; and papers related to institutions of higher education and MOOC research. More recently, van de Oudeweetering and Agirdag (2018) studied the extent to which MOOCs are

available to underprivileged populations. Based on thirty-one studies from 2013-2015 the researchers found that ICT requirements, prerequisite knowledge and costs (despite reductions) continue to function as barriers to underprivileged populations. Finally, Joksimović, Poquet, Kovanović, Dowell, Mills, Gašević, Graesser and Brooks (2018) conducted a systematic review in which they examined learning construct models and their predictability for measuring learning outcomes in MOOCs. Interestingly, much of the early academic research would make mention of the news coverage on the topic, referring in some way to Laura Pappano's news article entitled, "The Year of the MOOC", an expression that seemed to stick. Scholarly interest in news reporting on this emerging educational technology resulted in a new entry (i.e., outside of the field of communications) in the field of educational technology: media coverage of technological issues as they relate to higher education.

MOOCs and Media Coverage

When MOOCs received high profile coverage in the news, they garnered the attention of *specialist educational technology circles* (Bulfin, Pangrazio & Selwyn, 2014). They also caught the attention of scholars from other fields with similar or related interests. This review provides a survey of the scholarly literature on the news coverage of xMOOCs from 2008 up to and including 2015. While not an exhaustive review, the articles summarized here draw attention to the research interests by scholars working predominantly in the field of educational technology (Bulfin, Pangrazio & Selwyn, 2014; Kovanović et al., 2015), but also those working in the areas of higher education (Brown, Costello, Donlon & Giolla-Mhichil, 2016; White, Leon & White, 2015), communications (Dumitrica, 2017), and labour studies (Rhoads, Sayil Camacho, Toven-Lindsey & Berdan Lozano, 2015). The literature cited addresses news coverage of MOOCs during the period of study from different disciplinary perspectives and can expand our point of

view and understanding of the issues. Note, there is a limitation to this multi-disciplinary approach: articles are likely to exceed the individual researcher's expertise. This was also the case for the first literature review of ANT-based research in the field of education addressed in Chapter 3. As in that literature review, I do my best to ameliorate the issue by reading closely, describing well and acknowledging limitations.

News coverage of massive open online courses (MOOCs) increased dramatically in 2012-14, along with interest in online delivery systems by university administrators, politicians and policymakers (Brown et al., 2016). Researchers took note of these developments, including those with specialized knowledge in the field of educational technology (Bulfin et al., 2014; Kovanović et al., 2015). For some academics, the crescendo of public interest in MOOCs signaled an "urgency [for] debate in the digital age" (Bulfin et al., 2014); indeed, MOOCs became "the topic of the day" (White, Leon & White, 2015) in universities. The subject of MOOCs was addressed at many international and national conferences[lv]. Reception of MOOCs by academics within the field of education, not surprisingly, was mixed. At "Transformation in Undergraduate Education: Beyond MOOCs", a panel held at the 2014 Annual Conference of the Federation for the Humanities / Conference annuelle 2014 de la Federation des sciences humaines in St. Catherines (Ontario), Thérèse Laferrière from l'Université Laval expressed the ambivalence that many felt as well as the view that the implementation of MOOCs had structural implications for the university. That MOOCs were changing ways of working by employees and academics was a concern also expressed by researchers (White, Leon & White, 2015; White & White, 2016).

Laferrière argued that as universities increasingly move towards tackling complex problems that necessitate collaboration and partnerships across departments and institutions, they

will need to develop new structures and policies to facilitate it. The issue, she contended, is not the technology per se, but the lack of incentive for collaboration. Regarding MOOCs, Laferrière added, "we can build on MOOCs but we don't need too many of them". Brown et al. (2016) from Dublin City University, who conducted a study on the coverage of MOOCs by Irish media, urged scholars to use this moment to reflect on the bigger questions that face higher education and humanity:

> Although we cannot predict the future, the important thing is to refocus our attention on where we want to end up, so that MOOCs help to serve big ideas rather than being the big idea in itself [30] (p. 40).

As xMOOCs became increasingly newsworthy, generating discussion in public forums about the state of online learning in post-secondary institutions (Daniel, 2013, 2016) and the global impact of MOOCs on the future of higher education, scholars were cautiously optimistic.

Philippe G. Altbach, former director of the Center for International Higher Education in the Lynch School of Education at Boston College, was one of the early voices calling for a critical investigation of the massification that was being advanced through MOOCs. Asking as to who controls the knowledge, Altbach argued that, with MOOCs, less developed areas will continue to use imported technologies, pedagogical objectives and course content from predominantly U.S. academic contexts (Altbach, 2014); Western knowledge traditions—literature, philosophy, social science methodologies—and assumptions associated with Western disciplines (Altbach, 2014) will contribute to the already existing and growing inequities between nations and reify forms of hegemonic domination, despite assertions by MOOC developers that they offer the most innovative modes of pedagogical expertise from the world's highest-ranking universities. For Altbach, the problem was not that MOOCs were Western, but

that “their proliferation in education is powerful and makes it more difficult for alternative voices to be heard” (Altbach, 2014). Altbach problematizes the instrumentalist view that technology is neutral, a mere tool, free of embedded ‘social’ values (for critique also see Feenberg, 2002) and points out that not everyone has the freedom to study, access to the Internet or knows the language of the MOOC, which tends to be English or other colonial languages. Not all learners have the skills to navigate the pedagogy of self-regulation (Kizilcec, Pérez-Sanagustín & Maldonado, 2017).

Part II: Review of the Literature

The following review presents a survey of the academic literature on the topic of the news coverage of MOOCs. A search for academic literature was conducted using ERIC and Google Scholar. Of sixteen studies found between 2012 to 2017, nine were purposefully reviewed and added to the compilation. The decision to include articles was based on two criteria: first, the article needed to be substantiated empirically, and second, it needed to have as its subject matter the study of news coverage of MOOCs.

Critical Discourse Theory

Bulfin, Pangrazio and Selwyn (2014) from Monash University (Australia) applied CDA (Fairclough, 2003) to the analysis of six popular and three educational news-media sources: the *New York Times* (U.S.), the *Washington Post* (U.S.), *Times/Sunday Times* (UK), the *Guardian/Observer* (UK), *The Australian* and *The Age* (Australia), the *Chronicle of Higher Education* (U.S.)*, Times Higher* (UK) *Education* and *Education Week* (U.S.). Fourteen issues and meanings were derived from 457 distinct news articles. Among the more prevalent themes found were: MOOCs as a source of inevitable change (e.g., disruption of education as we know it and the marking of it as a significant historical moment); MOOCs are portrayed as science and

invention though origin narratives; MOOCs are associated with natural phenomena (e.g., waves, tsunami and an avalanche).

Other key issues include the concept of "free" as a concept privileged over the emancipatory benefits of education. Size and scale is another prominent theme: MOOCs are described as "huge" or vast, and with "unlimited capacity". MOOCs are represented as a democratizing force for education for anyone with an Internet connection (pp. 295-296). Statements such as "MOOCs of high-profile elite universities" (p. 294) is another prominent theme. Bulfin et al. (2014) conclude that MOOCs are not neutral, and neither is the news that brings them to the public; in particular, the news media obscures the socio-technical origins of MOOCs. MOOCs, the authors argue "are deeply implicated in the longstanding politics and economics of higher education" (p. 302) during decades of neoliberal reform. Given the power of media to influence policymakers or decision-makers in public and private spheres, the authors call for more detailed and nuanced studies to be conducted. In their next study (Selwyn, Bulfin & Pangrazio, 2015), they provide a more detailed analysis of the data.

Selwyn, Bulfin and Pangrazio (2015) suggest that, unlike other educational technology advancements, MOOCs, due to the media coverage of them, have become a "matter of sustained concern" (p. 176) for a full range of stakeholders beyond the *specialist educational technology circles* (p. 176) including "policymakers", "vice-chancellors", "teaching unions", "higher education practitioners" and the "general public" (p. 176). Building on their previous research (Bulfin, Pangrazio & Selwyn, 2014) Selwyn and colleagues explore how discursive constructions of MOOCs in news sources might speak against "dominant structures of production and power" (p. 177) and the concerns around higher education they produce. CDA

based on Fairclough (1989, 1995) and van Dijk (1993) and Frame Analysis are applied to a corpus of six popular news-media sources and three "specialist" educational sources.

In total, 354 descriptive articles and 103 opinion articles (i.e., editorials, op-eds, comments, letters and analyses) (p. 179) are reviewed. The authors identified fifteen discursive themes including: "1. Size and scale, 2. Higher education marketplace, 3. General sense of transformation, 4. Business and economic aspects" (p.181). These themes are analyzed "against the broad notion of change" (p. 182)—a prominent thematic outcome of the previous study (inevitability of change) (see Bulfin et al., 2015). The main themes, "change, massification, marketization, and monetisation" (p. 189), were consistently evident across the corpus. Among some of the interpretive findings are:

- MOOCs are seen in economic rather than educational terms;
- popular news sources emphasize elite university participation;
- specialist education newspapers emphasize teachers, pedagogy and the economic significance of online education;
- discourses work to legitimize power and control.

In both studies—Bulfin et al. (2014) and Selwyn et al. (2015)—the results are rich, detailed and labour intensive, as is often expected of qualitative research approaches. Interpretations of the corpus are made through the lens of CDA—(Fairclough, 2003) for Bulfin et al. (2014) and (Fairclough 1989, 1995) for Selwyn et al. (2015)—which includes specific assumptions about how the social is constructed through "power imbalances and the domination of élite institutions" (Bulfin et al., 2014, p. 303; Selwyn et al. 2015, p. 178). The view taken is that MOOCs are "reinforcing the established *status quo* in higher education" (Bulfin et al., 2014, p. 300), benefitting those who already stand to gain, and eroding the profession of teaching

through deprofessionalization, casualization and outsourcing. Key differences between an ANT approach and CDA are that the ANT researcher withholds ideas about what constitutes the social as they go about following the actors, and describes rather than explains (at least initially), an approach consistent with an ontological orientation over an epistemological one. ANT asks, what is there?

Data Modelling

Kovanović, Joksimović, Gašević, Siemens and Hatala (2015) from the University of Edinburgh, Simon Fraser University, and the University of Texas gathered 3,958 articles from 591 English news sources related to MOOCs that were published between 2008[lvi] and June 2014 to identify key themes and topics of discourse about MOOCs. They also document how media coverage of MOOCs changed over time, who reported on MOOCs and how frequently.

Kovanović, Joksimović and colleagues used an automated Data Modelling (DM) technique for the topic modeling of texts[lvii] and Latent Dirichlet Allocation (LDA) for their analysis. LDA assumes that words that co-occur frequently in a corpus are likely to belong to the same topic (Zhao, Jiang, Weng, He, Lim, Yan & Li, 2011). Based on this approach, 32,589 unique terms were extracted, leaving 757 terms for analysis. In total, 4486 article-topics were assigned. Among the top publishers were *U-Wire* (281), *The Australian Financial Review* (162), *Chronicle of Higher Education* (143), *The Times Higher Education Supplement* (143), *PR Newswire* (102), *The Conversation* (83), *Financial Times* (FT.com) (76), the NYTimes.com Feed (76) and *The New York Times* (75). Kovanović, Joksimović et al. (2015) found that education news sources produced the greatest number of MOOC related news stories, however financial news sources also published a substantial number of articles on MOOCs[lviii].

Results showed that public media coverage of MOOCs decreased in the second quartile

of 2014 by almost 50% (n=370) from its highest point in the third quartile of 2013 (n=715). Based on the optimal number of topics found (92), the 30 top topics and distinctive terms were listed. They demonstrate that at the beginning (2012-2013), MOOC providers, partnerships and course offering announcements were the most discussed topics but that these dropped off quickly by 2014. In 2013, international MOOC discussions were frequently discussed, followed in 2014 by business and management of MOOCs, government-related issues, employability, conferences, and data analytics.

With the exception of data analytics, most topics suggested by this research can also be found in the *International New York Times* (INYT) corpus. The shift toward international topics referred to by Kovanović, Joksimović et al. occurred in 2013; this is consistent with the INYT corpus of 31 news stories that will be analyzed in Chapter 5. The turn towards an international focus in the INYT corpus occurs when a story about an international conference held at the University of London by the Observatory on Borderless Higher Education is published (Guttenplan, 2013). Another article (a news brief) on the formation of British-Indian partnerships during a trade commission trip headed by then Prime Minister David Cameron follows; MOOCs are an element in the trade deal, along with British universities and the British Library (Lau and Yang, 2013). Finally, a short brief in which two opposing views exist over the timing of contractual agreements between representatives of Chinese universities and Coursera's press relations company is described (Lau, 2013).

Kovanović, Gašević, Joksimović, Siemens and Hatala (2015) conducted another systematic study that looked specifically at European news coverage of MOOCs between 2012 and 2015. Using automated DM and Latent Dirichlet Allocation (LDA)—similar to Kovanović, Joksimović et al., (2015)—732 terms were extracted from an initial 15,882. Forty-three

distinctive topics were produced. News sources from the UK predominated, including the *Times Higher Education* supplement (99) with the highest number of publications, the *Financial Times* (FT.Com) (49), the *Guardian* (47), the *Financial Times* (31), the *Press. Assoc. National Newswire* (30), *The Irish Times* (18) the *Australian Financial Review* (11), and the *Sundaytimes.co.uk* (10). Based on extracted terms, Kovanović, Gašević and colleagues (2015) provided topic labels for the twenty most relevant terms, including: 1. FutureLearn; 2. Business and Management MOOCs; 3. MOOC revolution; 4. MOOCs for K-12 education; 5. MOOCs and university funding; 6. MOOCs in Ireland; 7. MOOC course announcements; 8. MOOCS and global educational market; 9. openSAP press releases; and 10. MOOC signup figures for UK universities [lix]. The three leading topics declined over time, while other topics increased in 2013, including MOOC reports, university funding and openSAP, MOOCs for training, and MOOC market.

The European study, like the previous study by Kovanović, Joksimović, et al. (2015), demonstrates a shift in focus from the large platform providers towards issues associated with MOOC implementation. Some scholars associated this shift with the Gartner Hype Cycle Model, referring to MOOCs as having entered the "plateau of productivity phase" (Daniel, 2016) or the "slope of enlightenment phase" (Bozkurt, Ozdamar Keskin, & De Waard, 2016).

As mentioned earlier, LDA assumes that words that co-occur frequently in a corpus are likely to belong to the same topic. The ANT-based approach that is used in Chapter 5 also attends to repetitions of words; however, unlike LDA it considers the meanings of the words, which it traces in the form of strands. In its attention to these strands of meaning and the relations among them the ANT-based approach is distinguished from a topic or data modelling approach.

Case Study and Discourse Analysis

Brown, Costello, Donlon and Giolla-Mhichil (2016) from Dublin City University conducted a case study to better understand the coverage of MOOCs in the Irish news media. Using Discourse Analysis (DA), Brown et al. (2016) reviewed 74 articles from ten distinct news sources published between 2012 and the end of June 2015. Results showed that most articles (77%) were positive, a few (4%) were negative, and several (19%) were neutral. A key observation by the authors was that content privileged innovations by elite institutions (73%), specifically Trinity College Dublin and Queen's University Belfast. Most news articles (70%) were descriptive.

In addition to the analysis, the authors provide a narrative, focused on the local experience of MOOC integration in the university. As a final note, Brown and colleagues suggest that the news coverage on MOOCs should give more attention to industry-university partnerships as they are key stakeholders in the *MOOC movement*. The authors conclude that research on the benefits to society that investments in online modalities could have is sparse.

Brown and colleagues provide a "country-specific" analysis, focusing on news coverage in Ireland. Here an empirical analysis is combined with narrative, the telling of a story as it relates to the experience of researchers working with MOOCs in the university setting. MOOCs, it is argued, (Rhoads, Sayil Camacho, Toven-Lindsey & Berdan, 2015; Rhoads, 2018) fit well into the current economic and political neoliberal climate where corporate interests are ranked over those of the public good. Scholars tend to see the emergence of MOOCs as part of neoliberalist transformations where the marketization (Bulfin et al., 2014) and monetization of education (Selwyn et al., 2015) and its privatization (Gašević, Kovanović, Joksimović & Siemens, 2014; Rhoads, Sayil Camacho, Toven-Lindsey & Berdan, 2015) are prioritized.

Dumitrica sees the news coverage of MOOCs as a site of struggle where interests between higher education and technology play out and are negotiated within a neoliberal climate.

Neoliberalism and Critical Discourse Analysis

With a focus on the Canadian coverage of MOOCs, Dumitrica (2017) used a thematic analysis informed by CDA to analyze 48 news stories from English-language national and local newspapers including *University Affairs* and *Academic Matters* from July 2012 to March 2014. A manifest coding approach was used to develop themes. Two descriptors—*access* and *money*—were identified as broad areas and further associated with sets of particularized themes. Associated with the theme of *access* (MOOC education is for everyone) were: Removing spatial barriers; Removing traditional/cultural barriers; Cultural imperialism through MOOCs; Recovering socioeconomic barriers of MOOCs, and the Corporatization of the university through MOOCs. A counter-dominant theme associated with access included Removing economic barriers. Associated with the theme of *money* (The economy of MOOCs) were: the prevalence of the economic vocabulary; Removing economic barriers to students; the Commodification of MOOCs, and the Cost of MOOCs to faculty members. A counter-dominant theme to money was the MOOC business model (p. 459). Dumitrica argues that concerns associated with access and money are presented in the literature as something that can be easily resolved through the technology of MOOCs**.**

Even when a neoliberal economic framing of MOOCs predominates in the news she argues, professional magazines continue to produce spaces of resistance, where counter-dominant discourses or "alternative social imaginaries of education as a public good" (p. 456) can flourish. These moments, Dumitrica argues, shift discourse from economic framings to civic concerns.

Content Analysis and Grounded Theory

White, Leon and White (2015) from the University of Southampton (UK) conducted a two-part study to determine the main concerns motivating universities as they attempt to integrate MOOCs. A content analysis of grey literature carried out in 2013 was used to identify debates about MOOCs and a grounded theory approach with stakeholder interviews in 2014 revealed perspectives on current MOOC development in the university. Based on the two previous studies, twelve themes were identified including: the impact that MOOCs have on teaching; MOOCs as a mission of higher education; MOOCs as institutional strategy for staying current and for providing opportunity for experimentation; MOOCs are providers of data on learners; and MOOCs help to form new work dynamics in the university.

The most frequent theme evident in 57 of the articles, emphasized teacher adaptation to teaching practice including discussion of perceived pedagogical benefits associated with MOOCs. Some of these benefits included the flipped classroom strategy for large lectures and the building of high-quality content for reuse or repurposing. New relations and altered dynamics between staff, experts and advisors in the development of MOOCs were evident in 30 instances. New business models (n=19), MOOC experimentation and innovation (n=11), MOOCs as a form of marketing for higher education institutions (n=6), MOOC completion rates, and MOOCs as a way for the university to stay informed comprised few instances. White et al. (2015) suggest that their study ranked pedagogy first when compared to results by Bulfin et al. (2014), which ranked it sixth out of 14 categories. This ranking is perhaps a reflection of the authors' framing, which prioritizes learning in the higher education institution.

Critical Discourse Analysis and Labour Process Theory

Rhoads, Sayil Camacho, Toven-Lindsey, and Berdan Lozano (2015) argue that the implementation of MOOCs serves to provide colleges and universities "greater control over faculty labor" and therefore to "reduce the production costs of the basic university course" (p. 415). Rhoads et al., (2015) used CDA (Fairclough 2003, 2012) combined with Harry Braverman's (1974) Labour Process Theory to critically explore the emergence of xMOOCs and their contribution to the deskilling of faculty labour. The authors examined 122 documents, including a range of news reports (*Chronicle of Higher Education, New York Times, Inside Higher Education, Washington Post*), institutional papers and legislative and policy documents dated between 2008 and 2014.

Three themes provide a framework for analysis: "1) the context for the rise of the MOOC; 2) xMOOCs and the reshaping of faculty labor; 3) opposition arising from the professorate" (p. 403). In a general overview, the authors note that online courses correspond "with lower costs while simultaneously increasing enrollments and access" (p. 406) and that online modalities are equated with increased faculty productivity (p. 407). Automation and digitization have facilitated course massification. The authors ask how is it possible for leading xMOOC advocates such as Bill Gates and Daphne Koller to so readily accept the redefinition of professors' instructional roles in online teaching and the replacement of traditional lecture professors with video lectures developed by "star" professors from elite institutions? They argue that the move by the university to claim copyright for *faculty-produced materials* is what has spurred resistance on the part of the professorate towards MOOCs.

Opposition, they state, emanated from the faculty, faculty associations and unions, but the major media outlets were slow to pick this up; it was first mentioned in early 2014 in the

Chronicle of Higher Education. Disputes about MOOCs in universities were largely framed by the popular media as "pro-MOOC voices", thereby marginalizing the opposition to them expressed by labour (p. 413). Opposition by San Jose State University (SJSU) faculty members to the contracting out of an edX course taught by Harvard professor Michael Sandel in 2013 led to Sandel withdrawing the course. Faculty literature tended to deal with deskilling, the marginalization of roles, loss of workplace rights and the reification of inequalities among students from lower socioeconomic backgrounds. The authors conclude that "massive online formats" are favouring a neoliberal agenda, limiting professors' skills "in favor of an intellectually deskilled technocratic vision of teaching and learning" (p. 419). The issues in this research are detailed and draw upon media coverage that far exceeds the scope of the popular media. The degree to which educational media coverage and popular media coverage are distinct could be an interesting future path to follow.

Discussion

Eight studies that examined the coverage of MOOCs between 2008 and 2015 were reviewed. Four used Critical Discourse Analysis (CDA) or Discourse Analysis (DA). Two applied Data Modelling (DM), one combined two studies that used Content Analysis and Grounded Theory and another combined CDA with Harry Braverman's Labour Process Theory. The eight articles in this review are not easily comparable, in part because the range of methodologies and the nature of the research questions posed are not aligned. Understood in a different way, this compilation of articles documents an historical moment that is important to educators.

It could be argued that this small collection of research belongs to a larger body on the impacts of media coverage on education. There has been general agreement that, by shaping and

prioritizing the types of education topics covered and the ways these topics are expressed, media plays a role in the development of education policy and public awareness (Kuttner, 2018). The authors of the eight articles agree on the importance of studying media coverage out of concern for the impact it has on public perception. In higher education, the topic of MOOCs has had resonance. The silver lining of this abundance of coverage is that it has inspired deliberation and debate about, and experimentation with, MOOCs within institutions locally, nationally and internationally.

The two qualitative studies by Bulfin et al. (2014) and Selwyn et al. (2015) reassert the claim that media representations reify existing inequities in education through their continuous privileging of MOOCs in a market economy—"the main discourses of change, massification, marketization and monetisation were in evidence across the different titles, suggesting a stability of these discourses across different contexts" (Selwyn et al. 2015, p. 189)—and ask how can resistance enter the discourse and what are the effects within it? In her analysis of news coverage, Dumitrica (2017) argues that while a dominant economically framed discourse on MOOCs exists, it doesn't go unchallenged. The difference between the ways that MOOCs are represented in professional magazines—where higher education, technology and profit is emphasized—compared to newspapers—where MOOCs are presented as the solution to "inefficient and outdated" higher education structures—suggests to her that there is a counter-narrative that exists within academic communities, one which supports "education as a public good" (p. 456).

Rhoads and colleagues assert that xMOOCs, in particular, challenge the very nature of academic labour in the university by taking the notion of "deskilling" to "an entirely new level" (p. 416). And while oppositional perspectives were offered in educational media—by professors,

faculty associations and unions—their concerns were simultaneously diminished through expressions of the professor "being out of touch" or unwilling to consider the benefits of MOOCs for their students. Rhoads et al. point out that when ideas by certain proponents of MOOCs—in particular influential people like Bill Gates—get their ideas expressed in the news, they give shape to the conversation on higher education policy, sometimes with little knowledge on the topic; those who need to be speaking on the subject are not at the table. For Selwyn and colleagues, it is not only important to consider what news articles say or represent; it matters equally what is not said or omitted.

The omission of technology as a complex set of processes including the Internet, "video streaming" and "computer-mediated-communication" and the lack of historical reference to "openness", the formative concept that preceded MOOCs, combined with an emphasis on *free of charge* obscures the more countercultural aspects (p. 189) of online education. Scholars working in the field of educational technology—an important public or receivership of news on the topic of MOOCs—demonstrate through academic research that what is or is not seen matters to the analysis of the data. This reality points to the framing, agenda setting and gaps in the media, and raises still another question. Is it possible to trace multiple forces and find the places where there are convergences and compromises and even reorientations in news stories?

Conclusion: Turning Towards ANT

The ANT approach deployed in this dissertation is most closely aligned with inquiry-based paradigms that are constructivist (i.e., social constructivist) and have participatory orientations (Lincoln, Lynham & Guba, 2012, pp. 102-115). The research aligns with Bulfin et al. (2014) and Selwyn et al. (2015) in its emphasis on the discursive construction of MOOCs, but it differs from them in its emphasis on associations, materiality and effects. ANT foregrounds

existence (i.e., ontology) over knowledge (i.e., epistemology). Rather than approaching a controversy with an historical set of framings, the ANT researcher works with uncertainty, stays open to heterogeneity and movement, follows the actors and maps the networks they constitute within a corpus of news stories. What then, is the purpose of a literature review in light of an ANT approach on the same subject of investigation and exploration?

In general terms, the purpose of a literature review is to give the researcher insight into an ongoing academic conversation; based on this, the researcher addresses a void in the scholarship and conducts new research, extends existing research, and/or compares research (Creswell, 2018). The literature review can take a number of approaches: it can be a survey of the literature, a systematic review, and/or an in-depth critical review (Huff, 2009). A literature review for an ANT-based study demonstrates the scholarly interest in phenomena, raises matters of concern as established by scholars and becomes a record of the ways in which social science academic communities go about stabilizing matters of concern.

However, an ANT approach does not frame problematics in the ways described in many literature reviews, nor can ANT research easily fill a void. In this dissertation, ANT provides a way to collect worldviews and identify propositions that alter the lens through which the researcher engages the world, making pre-held assumptions and categorical representations evident and allowing for the re-examination the mechanisms through which the social is enacted—how actors (human and non-human) assemble and disassemble in relational terms. As an ontological approach ANT asserts a way for the researcher to overcome a priori assumptions about what constitutes the social in order that the social, as a dynamic, emergent actor-network constituted by humans and non-humans can appear. The review of the literature on the news

coverage of MOOCs with its emphasis on methodology paves the way to compare an ANT with previous research.

In Part II of Chapter 5, a major task was to apply ANT principles to the analysis of the INYT corpus. Three sequential tasks were undertaken and documented. The first action was the selection of ANT principles from RAS. This was followed by an interpretation of the principle, and finally the principles were applied directly to excerpts from the INYT corpus. As we will see, enacting the methods of ANT leads to the development of various new conceptual tools.

Part III Translating and Enacting ANT

Because actor-network theory is a set of principles and conceptual tools rather than a fixed methodology, a first research objective is to translate ANT into a workable approach for the analysis of news stories. This chapter must first address the research question: how can an actor-network theory (ANT) be translated into a workable approach for the analysis of news stories? In *Reassembling the Social* (RAS) (2005), Latour sets out two broad steps that are to be enacted sequentially and iteratively by the researcher: Part I is Gathering the Multiplicity. It involves gathering the multiplicity (actors) while keeping in mind the five uncertainties about what constitutes the social; and Part II, Putting the Multiplicity in Order involves following the actors gathered in the first step through three sequential movements (i.e., localizing the global, redistributing the local and connecting sites).

There are no specified guidelines for doing ANT apart from recommendations[lx] about the order of the two steps and three movements (Chapter 4). Following a brief discussion of translation, a core proposition of ANT, this section provides a table that visualizes three key

actions undertaken by the researcher to translate ANT principles into a workable methodology for the analysis of media coverage on massive open online courses (MOOCs) in higher education. ANT principles carried into the translated methodology are discussed in preparation for the next section, which demonstrates the ANT methodology.

What is Translation?

Translation is a core proposition of ANT. According to Latour (Latour, 2010), to translate is to "transcribe, transpose, displace, and transfer all at once—and therefore to transport while at the same time transforming" (p. ##). Translation is movement or action. Action is always composed, but its source is ambiguous (Latour, 2015)—there is no single cause and effect; rather, there are many causes and effects. Fenwick and Edwards suggest that translation is that moment when material and immaterial entities connect and "work upon one another to *translate* or change to become part of a network of coordinated things and actions" (2011, p. 98).

Translation has been successful, they add, when "the actant becomes translated to become a performing part of the network, the actant behaves with what appears to be particular intentions, morals, even consciousness and subjectivity […] it behaves as an actor" (p. 98). In this dissertation news stories are understood as a network of mediators—meanings that translate or change one another or change the researcher as she and the text *effect* one another. The ANT researcher looks closely at how meanings connect up with other meanings in the corpus and attempts to describe in detail the mechanics of change. ANT is what Law refers to as the "empirical version of poststructuralism" (2009, p. 146). ANT research must be grounded in case study.

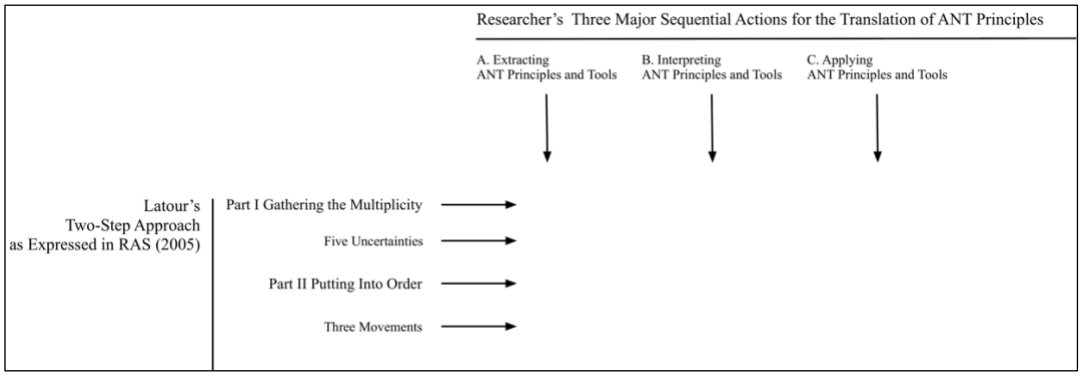
Latour (2005) sets out the principle of translation in general terms in RAS: three broad steps and various conceptual tools are described, but he does not indicate how they are to be

applied, and more specifically how they could be applied to a corpus. Hence, the first objective is to translate principles of ANT into a workable methodology for the analysis of news media. This involves three main sequential actions designated as A, B, and C (see Figure 5.1) on the part of the researcher, each of which is aligned with the broad two-step approach inspired by Latour (2005). The first action (A. ANT principles and tools) consists of extracting ANT principles and tools as expressed in RAS. The second action (B. Interpretation of ANT principles and tools) involves interpreting and describing the principles and tools that have been extracted. The third action (C. Application of ANT principles and tools) is the application of ANT principles and tools as interpreted in the second action.

The three sequential actions are undertaken across Latour's two-step approach: the gathering of the multiplicity according to the five uncertainties, and the putting in order according to the three movements. Figure 5.1 provides a general sketch of the three actions (denoted by A., B., and C. columns) analyzed across the five uncertainties and three movements (rows).

Figure 5.1

Three Actions for the Translation of ANT Principles



Note. A chart depicting a general approach to the translation of ANT principles into a workable methodology for the analysis of news stories. Presented vertically is the two-step approach expressed in RAS. Presented horizontally are three sequential actions taken by the researcher. A. begins with an extracting of ANT principles and tools from RAS, followed by B., the interpreting of principles and tools and C., the applying of ANT principles and tools with the INYT corpus.

For practical reasons, only some of the conceptual tools deemed relevant for news analysis were included in the final translation. Latour's concepts *articulators*, *plugins* and *plasma,* for example, are not dealt with in this translation. On the other hand, concepts such as *sites of production (panoramas)*, *collecting statements* and the *flattened landscape* were deemed necessary to the project and are engaged.

Table 5.1 provides a record of the researcher's actions taken to translate ANT principles into a workable methodology for the analysis of news stories. Column A lists the core principles arranged according to the five uncertainties and the three movements as expressed in RAS. Column B includes several notes denoting the researcher's understanding of ANT principles. The third column includes notes and examples of ways in which an ANT principle is associated to textual passages from the INYT corpus.

Table 5.1

Towards a Workable ANT Methodology for the Analysis of News Stories

STEP I: GATHERING THE MULTIPLICITY			
	A. Extracting (selecting) ANT Principles and Tools (Latour, 2005)	B. Interpreting ANT Principles and Tools	C. Applying ANT Principles and Tools to the INYT Corpus of News Stories
FIVE UNCERTAINTIES			

1. Nature of Groups	*[Groups]are made to talk, anti-groups are mapped, new resources are fetched so as to make their boundaries more durable, and professionals with their highly-specialized paraphernalia are mobilized.* (p. 31) *Groups are not silent things, but rather the provisional product of a constant uproar made by the millions of contradictory voices about what is a group and who pertains to what.* (p.31) Groups need *group makers, group talkers, and group holders.* (p. 32) *For the sociologists of associations, any study of any group by any social scientist is part and parcel of what makes the group exist, last, decay, or disappear.* (p. 33)	The following questions were posed: 1. How do we know what is a group? 2. Who or what is defining the group? 3. What resources are being deployed to make the group endure? 4. Are there *anti-groups*? (p. 31) Author notes on ANT principles: What a group is, is not assumed at the outset. Groups are in continuous formation. For a group to be defined, anti-groups too must be established; groups are *formed or redistributed.* (p. 33) Groups are always changing.	BoundaryFormations was created as a general reference to group formation; it is defined as differentiation produced through expression. For the purposes of this study, group formation is examined in the content and meaning of the text. The question of group formation through the structure of the text is only touched upon. Example of BoundaryFormation: An international conference on online learning organized by the Observatory on Borderless Higher Education at the University of London is provided. A clear distinction is made between U.S. and European approaches to online development. An instance of this as BoundaryFormation is: *While the atmosphere around the open courses in the United States resembles the early stages of an oil boom, the reaction in Europe seems distinctly cautious.* (Guttenplan, 2013, Feb.18, para. 8).
2. Nature of Actions	*Agencies are always presented in an account as doing something, that is, making some difference to a state of affairs, transforming some As into Bs through trials with Cs.*[52] (p. 53) *Action is always dislocated, articulated, delegated,*	The following questions were posed: 1. How do groups hold together in the story? (In order for a group to exist, it must be continuously being formed. 2. What are the actors' own theories of the social? 3. What agencies (referring to issues) are presented?	Action was created as a general reference. Agencies come together in actions to alter some *state of affairs*. In this example action is limited to the content. Some examples of actions are provided below: Example. Agency: Ellen N. Junn, provost and vice president for academic affairs at

	translated. (p. 165) *If agency is one thing, its figuration is another. What is doing the action is always provided in the account with some flesh and features that make them have some form or shape, no matter how vague.* (p. 53) *An actor is what is made to act by many others.* (p. 46) It is *the moving target of a vast array of entities swarming toward it.* (p. 46) *When we act, who else is acting?* (p. 43) *Actors propose their own theories that exceed that of the researcher.* (p. 57)	4. What figurations are the actors being given? What figurations are we being given? In other words, what form do these agencies take? Author notes on ANT principles: Agencies (issues) come about through many connections. Agencies are forces, that manifest when they come together in actions that alter some *state of affairs*. An action is an event that comes about from mediations; there is no single cause and effect. Actors express the full gamut of possible world views. These may be difficult to see if the observations and descriptions of the researcher is interpreted through the lens of their own particular adopted social theory.	the university in San Jose, said the California State University system was facing a crisis because more than 50 percent of entering students could not meet basic university entry requirements. Action: The action is a phone call from Jerry Brown, Governor, state of California to S. Thrun (Udacity) to fix the problem of students not meeting basic higher education entry requirements.
TOOLS **Mediators and Intermediaries**	*An intermediary […] is what transports meaning or force without transformation: defining its inputs is enough to define its outputs […] Mediators, on the other hand, cannot be counted as just one; they might count for one, for nothing, for several, or for infinity. Their input is never a good predictor of their output; their specificity has to be taken into account*	Objects, when activated, become mediators. From an ANT lens, objects become mediators because they can effect change in a situation that is not necessarily predictable. Objects are part of a network of effects. News stories themselves can be mediators because they can inform, influence, deceive—they have force, they do things, even if it is only momentarily.	Mediators News stories and the elements within them are treated as mediators connecting up with other mediators forming passage actor-networks. Agencies beget actions which beget agencies which beget actions—the multiplicity of mediators. A step towards understanding that texts do things.

	every time.[30] (p. 39) *Mediators transform, translate, distort, and modify the meaning or the elements they are supposed to carry.* (p. 39) *No matter how complicated an intermediary is, it may, for all practical purposes, count for just one—or even for nothing at all because it can be easily forgotten. No matter how apparently simple a mediator may look, it may become complex; it may lead in multiple directions which will modify all the contradictory accounts attributed to its role.* (p. 39)		
3. Nature of Objects	Objects have agency. Objects, *authorize, allow, afford, encourage, permit, suggest, influence, block, render possible, forbid.* (p. 72) *ANT is not the empty claim that objects do things 'instead' of human actors: it simply says that no science of the social can even begin if the question of who and what participates in the action is not first of all thoroughly explored, even though it might mean letting elements in which,*	The following question was posed: 1. Who and/or what participates in an action? Author notes on ANT principles: Objects have agency. Social interactions alone are not enough to build and maintain hierarchies. Objects make hierarchies strong and enduring and have been, according to Latour (2005) have been excluded for too long (i.e., the sociology of the social has privileged interaction as a central human activity).	Objects Objects may function to give groups cohesion and solidity. 1. Objects are mediators 2. In a news story, ideas too become objects. 3. Ideas mediate within the story and across the stories. They hold meaning together (synchronically within a text and diachronically across the texts) creating a sense of coherence and incoherence and change. 4. When they reappear across the stories, they are identified as *strands*. 5. When a strand is identified, it implies that there is endurance to an idea; in other words the idea

	for lack of a better term, we would call non-humans. (p. 72) *What is new is that objects are suddenly highlighted not only as being full-blown actors, but also as what explains the contrasted landscape we started with, the overarching powers of society, the huge asymmetries, the crushing exercise of power.* (p. 72)	The collective is increased because it now includes objects as mediators in a sociology of association, meaning the social is in flux.	seems to hold across time. Example. An example of an enduring idea that becomes a strand is the repeated telling of the story of the first MOOC.
4. N**ature of Facts**	Matters of fact are matters of concern (p. 114). *While highly uncertain and loudly disputed, these real, objective, atypical and, above all,* interesting *agencies are taken not exactly as object but rather as gatherings.* [157] (p. 114) *We simply have to make sure that their diversity is not prematurely closed by one hegemonic version of one kind of matter of fact claiming to be what is present in experience—and that goes, of course, for 'power' and 'Society' as well as for 'matter' and 'Nature'.* (p. 118)	The following questions were posed: 1. Is the story put together well? 2. Does it persuade, inform, authorize…? 3. What are the facts in news media as it relates to education? 4. What do media facts look like when treated as matters of concern? Author notes on ANT principles: Matters of fact become matters of concern for the researcher. The approach to be taken is not to assume a plurality of views of a single thing, but rather to accept the multiplicity of the thing itself.	An ANT approach offers a highly detailed analysis of news coverage without relying on social forces as an explanation. The actors being followed might however rely on social forces to explain their conditions. An ANT approach attempts to keep discussions about the news coverage of MOOCs open, as matters of concern are always debatable. Example. Referring to MOOCs, Selingo writes (2014, Nov. 3) writes, *When massive open online courses first grabbed the spotlight in 2011, many saw in them promise of a revolutionary force that would disrupt traditional higher education by expanding access and reducing costs. The hope was that MOOCs — classes from elite universities, most of them free, in some cases enrolling hundreds of thousands of students each —would make it possible for anyone to acquire an education, whether a villager in Turkey or a*

			college dropout in the United States. (para. 1). In this example, the social force being invoked is the force of innovation in the form of MOOCs, a possible solution to poverty and no access to higher education, globally. In an ANT approach, the researcher traces the effects of such a statement in the corpus. In this instance, the effect is scale.
5. Nature of Accounts	*A good ANT account is a narrative or a description or a proposition where all the actors* do something *and don't just sit there. As soon as the actors are treated not as intermediaries but as mediators, they render the movement of the social visible to the reader. Thus, through many textual inventions, the social may become again a circulating entity that is no longer composed of the stale assemblage of what passed earlier as being part of society.*[181] (p. 128) *A text in our definition of social science, is thus a test on how many actors the writer is able to treat as mediators and how far he or she is able to achieve the social.* (p. 129) *So, network is an expression to check how*	The following question was posed: The ANT researcher must understand that they are an actor in the actor-network that appears through the research and be diligent in mapping the chain of associations without imposing their own interpretations on the actors' views. 1. How possible is this? Author notes on ANT principles: Accounts include gathering the actors or multiplicity and describing as they go about stabilizing the controversy. For the social to appear through the network traced by the researcher, a descriptive method of writing is required. Maps that can help to visualize the social can be used.	Various tools (conceptual and practical) are deployed for the purpose of documentation, description, analysis and record keeping: ▪ multiplicity maps (Gephi visualizing software) ▪ a database, to help hold together the corpus and record researcher decisions (Atlas.ti qualitative data analysis and research software) ▪ design tools to help follow strands and actor networks Two new conceptual tools have been added to the analysis. They are strands and substrands and confluences. *Strands***:** ideas (and meaning) in the corpus that retain a trace of an original idea; there are changes at each articulation over time. Strands are never singular, they exist in association with other strands. Strands emerge later in the process. Strands are similar to themes in that they emerge from the data not algorithmically, but through interpretation using an inductive, open coding, approach. Strands have

	much energy, movement, and specificity our own reports are able to capture. Network is a concept, not a thing out there. It is a tool to help describe something, not what is being described. (p. 131) *Good sociology has to be well written; if not, the social doesn't appear through it.* (p. 124) Four notebooks 1. *Log of enquiry* 2. *Indexing system* 3. *Writing trials* 4. *Register of effects*		no fixed boundaries. To pull a strand from the network, means that other strands get pulled along too. *Substrands:* help the researcher to follow the actors (passages of text). Substrands are not contained by strands. They are their own but related entities. All the substrands are part of the strand network. Substrands emerge later in the process. Strands are made by the researcher from the corpus of 31 INYT news stories. And reconceptualized in the researcher's understanding of an actor-network. To conceptualize the text as a network does not mean that it loses its structure. It means that the text is understood to be fluid and relational (a mediator) rather than fixed and static (an intermediary). The text is activated by the reader. *Confluences:* different strands that share a similar passage. They too emerge later in the process.
STEP II PUTTING THE MULTIPLICITY IN ORDER			
	A. Extracting (selecting) ANT Principles and Tools (Latour, 2005)	B. Interpreting ANT Principle and Tools	C. Applying ANT Principles and Tools to the INYT Corpus of News Stories
TOOLS **The flattened landscape** (p. 183)	Keeping the social flat Also referred to as *an alternative topography* (p. 172) and can be thought of as a single plane of existence. *They [sociologists of the social] have been forced to constantly migrate between two types of sites—the local interaction and the global*	Author notes on ANT principles: All the actors reside on one level, thereby avoiding the macro-micro divide of the sociology of the social (as traditionally conceived). By removing the frame of a social theoretical lens, we begin to see traceable connections not visible through macro-micro frameworks.	Some software structurally allows for one plane of existence (i.e., Gephi, Atlas.ti). Drawing on paper can be a topographical map with which to gather the actors on one level. This research uses Atlas.ti to follow associations.

	context. (p. 165)	The flattened landscape is one plane of existence is further explored through the three movements—the localizing the global (there is no global), redistributing the local (there is no local) and connecting sites (conduits are formed wherever connections are made, leaving empirical traces)	
THREE MOVEMENTS			
1. Localizing the Global	*We will first relocate the global so as to break down the automatism that leads from interaction to "Context".* (p. 172) Conceptual tools: ▪ Sites of Production (metaphorical) ▪ Panorama(s) ▪ Oligoptica	Author notes on ANT principles: The global is a representation produced within sites of production. There is no context, only connections. Anything global is always produced locally. A context can be mapped. Tools Sites of production are locales where the global is generated as a representation. Panoramas are representations of a seamless whole. Oligoptica are highly detailed representations of a slice of the social.	Sites of production might include, for example, the New York Times Co., the field editor's desk, the researcher's workspace and FACTIVA. The researcher's office is the site of production of the study. The INYT corpus of 31 documents is accessed through FACTIVA database. Numerous representations of the global are presented in the corpus. Example of a Panorama Friedman's INYT editorial (2013, Jan. 18) speaks of a "budding revolution in global online higher education", which will "lift more people out of poverty", make education more affordable, and "unlock a billion more brains to solve the world's biggest problems […] nothing has more potential to enable us to reimagine higher education than the massive open online course, or MOOC, platforms that are being developed by the likes of Stanford and the Massachusetts Institute of Technology and companies like

			Coursera and Udacity" The Gartner Hype Cycle is another example, which is described in this chapter. Example of an oligoptica. Pappano's (2013, Sept. 16) news feature about her experience with Battushig Myanganbayar, a young boy from Mongolia who excelled in an edX course offered through M.I.T. on circuits and electronics is an example of an oligoptica: *Battushig has the round cheeks of a young boy, but he is not your typical teenager. He hasn't read Harry Potter ('What will I learn from that?') and doesn't like listening to music (when a friend saw him wearing headphones, he couldn't believe it; it turned out Battushig was preparing for the SAT).* (para. 4).
2. Redistributing the Local	*We will […] redistribute the local so as to understand why interaction is such an abstraction.* (p. 172) Conceptual tools: ▪ Structuring templates	Author notes on ANT principles: The local is made up of other times and distant places. There is no local, only a convergence of incoming and outgoing. Locales are made into places. There is no determining underlying structure; there are however structuring templates. Tools: Structuring templates are standards and conventions that circulate from other times and places.	Example of a structuring template. The news is written as a story, with a plot, a literary convention (Schudson, 2003, pp 177-193). Classifications of news stories such as ed-ops, briefs, interviews and magazine features suggest differences in structure and writing styles, but demonstrate a carry over from the past.
3. Connecting Sites	*Finally, we will connect the sites revealed by the two former moves, highlighting*	Author notes on ANT principles: The first two moves are	Not immediately obvious, but the connectors are produced in part by the researcher in the form of mapping

	the various vehicles that make up the definition of the social understood as association.[221] (p. 172) Conceptual tools: Collecting statements, (e.g., 'Society' and 'Nature').	enacted in order to make the connections between sites visible. Tools: Collecting statements are calls to assemble and express the social according to the actors' worldviews. Collecting statements are expressions that define standards for the social and as such define the criteria for belonging.	strands, substrands and confluences.
			Created a category called **ImperativeStatement**s; they were developed from collecting statements as expressed by Latour but are specific to the INYT corpus. These statements exert pressure to belong. They tell us how large universities are to behave. Example of an mperativeStatement. When Richard A. DeMillo, the director of the Center for 21st Century Universities at Georgia Tech says, *'It's all so new that everyone's feeling their way around, but the potential upside for this experiment is so big that it's hard for me to imagine any large research university that wouldn't want to be involved'* (Lewin, 2012, July 18), the statement speaks for and includes expected conduct for research universities. It along with other ImperativeStatements apply pressure to research universities to join the MOOC movement. An unnamed aggregator is the United States.

Application of ANT Principles

The application of ANT principles is also the translation of them. Interpreted ANT principles have now become a set of navigational codes (ncodes) (Table 5.1, Column C) that can later be used for the analysis of the INYT corpus. These ncodes work as guides alerting the researcher to examples of ANT principles found within the INYT corpus. For practical purposes only five are developed; it is possible however to advance others. Below the five ncodes are defined. Following is an example of the way they might be applied to a passage from the INYT corpus.

Navigational Codes (Ncodes)

As part of the move to engage ANT in an analysis of news media, a series of codes originating from the five uncertainties, three movements and tools in RAS were developed. Navigational codes (ncodes) signal where one or more ANT principles are enacted in a news story. Ncodes developed for the study include: BoundaryFormations, Actions, Agencies, ActorsTheories[lxi] and ImperativeStatements. They are reviewed and defined below.

BoundaryFormations. BoundaryFormations point to group formation in the text. Characteristics are attributed to to actors/groups either directly or indirectly. For example, the expression *elite universities* implies at least two formations—elite universities is stated and non-elite universities is is implied. Boundaries are in constant formation; they can shift, dissolve, be disrupted and reinforced. They hold momentarily and sometimes for longer periods of time.

Agencies and Actions. Agencies (issues) are forces that manifest when they come together in actions that alter some *state of affairs*. Agencies come about through many connections; they are tied to one another and work together. Actions are events. While there is no single cause or effect of an action, actors may speak as though there is. In news stories, actions

may appear to attempt to resolve an agency, only to produce more agencies. For example, an agency about cheating gives rise to a number of technological solutions (e.g., Signature Track, a technology for tracking typewriting habits), which in turn gives rise to new agencies—generating revenue and eliciting debate on the role of technology in education.

ActorsTheories. In a news story, actors express their theories about the world. For example, a professor of computer science and engineering from Vanderbilt University states that Signature Track "smack[s] of big brother" but then follows with "but it doesn't seem any worse than an instructor at the front consistently looking at you, and it may even be more efficient" (Eisenberg, 2013, para. 7), demonstrating a worldview that forwards technology as a possible benefit because it is efficient. In the corpus, there is no view that effectively challenges any aspect of the implementation of a technology to track mass numbers of exam-writing students.

ImperativeStatements. ImperativeStatements are statements that apply pressure to agree to a particular view or engage in a particular act. For example, "There is a fear of being left behind, so we are considering what to do" (Guttenplan, 2013, para. 23). This fear of being left behind is expressed numerous times in the corpus.

How Ncodes are Applied to Passages of Text

Figure 5.2 demonstrates how ncoding is used as a way to keep ANT principles in mind while reading the corpus. Each ncode points to a passage of text. The application of ncodes is demonstrated with the quote below; it is attributed to Adrian Smith, Vice Chancellor at London University, speaking during an international conference on online learning:

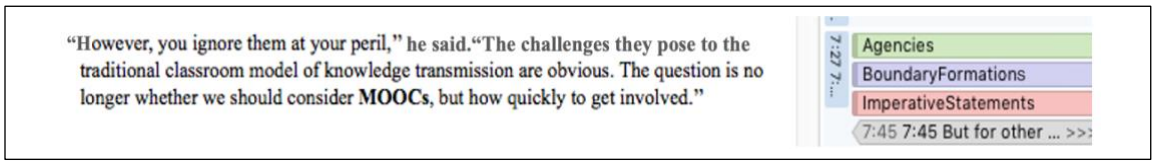
> However, you ignore them [MOOCs] at your peril' he said. 'The challenges they pose to the traditional classroom model of knowledge transmission are obvious. The question is

no longer whether we should consider MOOCs, but how quickly to get involved (Guttenplan, 2013, para 7).

This passage is marked with three ncodes: Agencies, BoundaryFormations and ImperativeStatements. The first sentences express the Agency: universities are afraid of being left behind. The next sentence, "The question is no longer whether we should consider MOOCs, but how quickly to get involved", expresses a BoundaryFormation between those who get involved and those who do not. The passage is also an ImperativeStatement that urges compliance from the audience attendees attending the conference as expressed in the news story and from the readers of the INYT story.

Figure 5.2

Example of Applying Three Ncodes to a Passage of Text from the INYT Corpus



Note. Ncodes–Agencies, BoundaryFormations and ImperativeStatements—are applied to a section of text: Guttenplan (2013, Feb. 18, para 7). There are letter omissions from the first sentence. The passage should read: "However you ignore them at your peril," he said. "The challenges they pose to the…"

* Relational links (7:45 7:45 But for the other…>>>+) associate meanings or ideas in one location to meanings or ideas in another location.

So far, ANT has provided us with a set of core principles that help the researcher take into account the heterogenous nature of existence. In the second step, ANT provides a set of movements and conceptual tools to help the researcher engage with the data collected in the first step. In this study, several ANT ideas from the two steps are translated so as to be applicable to the corpus as demonstrated in 5.2.

Summary

The navigational codes or ncodes are new tools developed specifically to work with news stories in a direct way. They themselves constitute a methodological finding. They have become part of the methodology and serve to keep ANT principles in the researcher's mind. Without them, it may be too easy to fall back on sociological assumptions. Two uncertainties in RAS gave rise to ncodes. From the first uncertainty, the nature of groups came the ncode BoundaryFormation. And from the second uncertainty, the nature of actions, came the three ncodes Actions, Agencies and ActorsTheories. In RAS, Latour describes Nature and Society as two collectors that compel us to a binary understanding of the social. This binary construction is continually reinforced by collecting statements that separate existence (i.e., Western existence) into containers such as science and humanities. I have adapted this concept in the ncodes designating them as ImperativeStatements. They function as pressure statements that call on university administrators to decide between partnering with MOOC providers or being left behind.

Enacting the Translated ANT Methodology

The first objective was to translate Latour's ANT approach as elaborated in RAS into a workable methodology. This required that I, the researcher, interpret ANT principles and develop a way to analytically engage the corpus of 31 news stories on the topic of MOOCs. The second objective was to engage the adapted ANT methodology using the controversy of MOOCs as expressed in the INYT from 2012 to 2015. In this section, two overarching research questions are posed. What does the translated ANT approach show us about how the controversy of MOOCs in higher education is expressed in the INYT corpus? To address this question, the translated ANT methodology must be enacted: maps are drawn and observations about the corpus are described.

These actions led to the development of three more new methodological tools, designated as strands, substrands and confluences.

These tools are added to the methodological findings as they emerge in the process of enacting the methodology and are elaborated upon in the methodology. In a final methodological stage, I return to the ncodes; they are used to analyze passages from the corpus and they address a third research question: What is the social that is revealed? In alignment with the research questions, this section is the translated methodology, enacted. It is the demonstration (i.e., the study) of ANT on the topic of MOOCs as covered by the INYT. A series of steps and decisions are documented. The Findings are both the enactment of the methodological steps (i.e., description, mapping, charting and engaging ncodes) and the analysis stemming from the methodology.

Method

Start with a Controversy

The research began with what I perceived to be a state of instability and uncertainty in higher education that was related to the launching of MOOCs. A number of scholars have noted that MOOCs became a topic of media attention in 2012. As discussed at the beginning of Chapter 5 (see Part I Visualizing Controversy, Massive Open Online Courses (MOOCs)) the review of literature, debates on the future of higher education ensued. Discussion of MOOCs first emerged in the news media; academic research on MOOCs was still relatively sparse in 2012, as MOOCs were an emerging educational technology.

Describe the Locale from Which to Observe the Controversy

Articles on the topic of MOOCs were gathered from varied sources including educational and popular media, academic literature and the blogs of academics. To narrow the search, I

worked with the *International New York Times* (INYT). There were several reasons for this: the INYT has immense global reach and outlook and is highly influential[lxii]; it is a *newspaper of record* (i.e., reliable and authoritative); the NYT, from which the INYT emerges, has a long practice of fact-checking events, which is integral to the organization's mission and reputation; and finally it has a long history that sets it apart from other news sources.

Founded in 1851, it has followed what Martin and Hansen (1998) refer to as the *information model* in which journalists responding to decades of monopoly growth, and hence the loss of individual and community identity, and propaganda reporting, journalists adopted objectivity and a focus on facts (pp. 30-3). Currently the NYT has taken on various approaches, expanding its education section, producing short video documentaries of contemporary events and engaging readers with interactive statistical graphics and re-enactment videos.

The print version of the INYT has a current circulation of 132,913 and is published in English Monday through Friday. The NYT has a current print circulation of 583,657. The NYTimes.com Feed, which continuously outputs content published by the NYTimes.com online site and NYT Blogs, had 21,780,020 unique visitors per month (https://global-factiva-com.lib-ezproxy.concordia.ca/sb/default.aspx?lnep=hp) as of December 2019. Clearly the NYT, whether national or international, has a substantial reach, especially in its digital form.

Conduct a Search Strategy

The scholarly literature on the news coverage on MOOCs was reviewed. Given that the INYT and the NYT publish similar news stories, an initial search strategy extracted results for both the INYT and the NYT, allowing for comparison and familiarization with the data. Using the keywords "massive open online course" and "MOOC", including the plural versions, a total of 143 results were retrieved from the *New York Times* and 41 were extracted from the

International New York Times.

This search strategy showed that with the exception of differing titles for the INYT and NYT, some variations to verb tense and the omission of photo by-lines for INYT articles, the content of the two publications as extracted from the database was virtually identical. Appendix C compares the titles of 31 INYT news stories to the same 31 news stories published in the NYT. The titles in the INYT have tended to be longer and more descriptive than the titles in the NYT for the same news stories.

The news stories in the INYT tend to be published a day later than in the NYT. For example, on January 15, 2013, the NYT published "California to Give Web Courses a Big Trial" (Lewin & Markoff, 2013); a day later, the INYT published the same story with the title "California sees promise in a new model of online education; Collaborative process may reduce dropout rate and ease professors' fears" (Lewin & Markoff, 2013). Editorials or Op-Ed column titles remain the same whether they are published in the INYT or NYT.

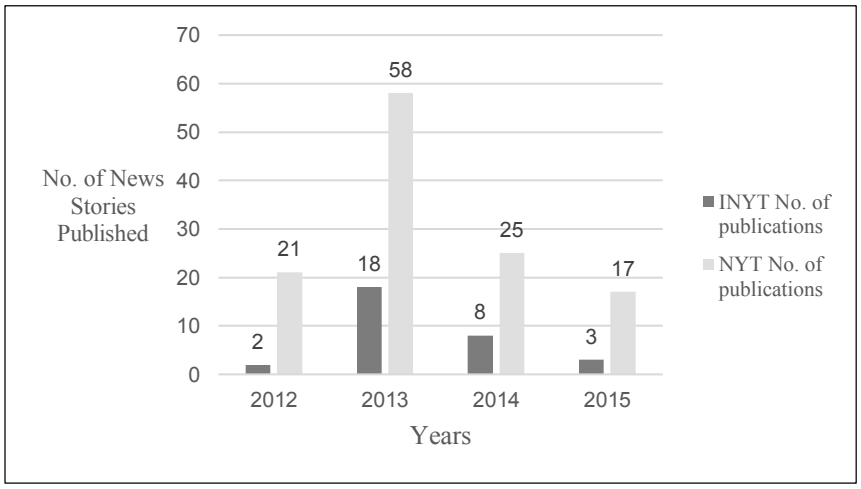
Most stories published in the INYT were the same as the version published in the NYT, except for "The Year of the MOOC" (2012) by Laura Pappano. In the NYT, Pappano's story contained 2,793 words; in the INYT, it contained 1,406 words. In the INYT version, "Suddenly, millions have started taking U.S. university classes online; Education" (2012), the latter half of the original story and the sub-titles were not included. It's interesting to note that the title "The Year of the MOOC", which became a popular reference in the early academic literature on MOOCs, did not appear in the INYT version of the story.

Delineate Boundaries. A manual review of both the INYT and the NYT showed that news stories in the INYT, while less in number (see Figure 5.3), closely followed the same key events that were identified in the NYT. The INYT news stories were selected from the NYT

database by editors affiliated with the corporation. For practical reasons, the smaller corpus the INYT was chosen as the corpus with which to enact the translated ANT methodology. Of the 41 results extracted from the INYT, a final collection of 31 were selected for analysis based on specific inclusion and exclusion criteria.

Figure 5.3

Number of New Stories Published by Year From 2012 to 2015



Note. Search results for the NYT (n^1=121) and INYT (n^2=31) starting July 2012 to December 2015, after inclusion/exclusion criteria are applied.

Determine Inclusion Exclusion Criteria

The INYT corpus included news items published from July 2012, when the INYT published its first news story on MOOCs, up to and including December 2015, when the INYT published its final story on MOOCs. All types of news items were deemed acceptable, including news stories, editorials, news briefs, information articles, magazine feature stories, and interviews. From an ANT point of view, it was not necessary to edit out some news entities, as they all become mediators in the actor-network. Ten news items were excluded from the corpus; these included those in which the content deviated from MOOCs or in which MOOCs were only

peripherally mentioned, including one book review. An editorial by Morozov (2013) was included even though it made little reference to MOOCs because the discussion about "openness" in it provided a unique point of view relevant to the subject of MOOCs. A summary of the inclusion exclusion criteria is provided in Table 5.2.

Table 5.2

Inclusion and Exclusion Criteria

Inclusion	**Exclusion**
INYT news stories	Minimal or no mention of MOOCs
News, editorials, interviews, information news, news briefs, feature articles, and book reviews when MOOCs are the topic	before 2012
News stories published from July 2012 to December 2015	News items published before Jan. 1, 2012
	News items published after on or after Jan. 1, 2016

Table 5.3 presents a complete list of the 31 INYT news stories that were delineated as the corpus of study arranged by date, editorial news classification, number of words, author and title. The majority of the news stories were classified by the INYT as finance stories (16), followed by news (11) and editorials (4). Among the eleven news stories are a feature article, an information piece and a news brief. Of the sixteen finance stories, one is also a news brief. These classifications are informative in that they identify the stories as relevant to financial or economic interests from the perspective of the INYT, and which are themes or topics addressed in the literature reviewed (Dumitrica, 2017; Kovanovic et al., 2014; Selwyn et al., 2015).

Table 5.3

INYT Corpus on the Subject of MOOCs 2012 to 2015

ID	Date	Editorial News source	No. of words	Author(s)	Title (INYT)
1	18-Jul-12	*INHT finance	1,340	T. Lewin	Consortium bolsters shift in university education;
2	05-Nov-12	INHT finance	1,406	L. Pappano	Suddenly, millions have started taking U.S. university classes online; Education
3	08-Jan-13	INHT news	1,937	T. Lewin	A rush to reinvent learning; Students flock to Web, but a model that pays the bills remains elusive
4	16-Jan-13	INHT finance	1,212	T. Lewin, J. Markoff	California sees promise in a new model of online education; Collaborative process may reduce dropout rate and ease professors' fears
5	28-Jan-13	INHT edit	1,161	T. L. Friedman	Revolution hits the universities
6	28-Jan-13	INHT finance	1,086	A. Smale	Elite forum hears of learning's next wave; Davos 2013
7	18-Feb-13	INHT news	1,312	D.D. Guttenplan	A hit in the U.S., open online courses get a cautious reception in Europe; Skeptics raise concerns about profit motive,but some

					institutions sign on
8	22-Feb-13	INHT finance	750	T. Lewin	Universities around world rush to offer online classes
9	25-Feb-13	INHT news	564	J. Lau, C. Yang	Universities UK welcomes Indian partnerships; Briefly: Education
10	04-Mar-13	INHT finance	934	A. Eisenberg	How to stop cheats when test is online; Novelties
11	07-Mar-13	INHT edit	889	T. L. Friedman	The professors' stage
12	18-Mar-13	INHT edit	851	E. Morozov	Open and closed
13	06-Apr-13	INHT news	1,091	J. Markoff	Coming to campus: Software to grade essays; Evaluating written work with machines sets off a debate at universities
31	22-Jul-2013	INHT news	497	J. Lau	U.S. online course provider tries to enter China market; Briefly: Education
14	10-Aug-13	INHT news	1,432	T. Lewin	Educators planning big leap in online coursework; Elite master's degree at a discount price could upend on-campus model
15	16-Sep-13	INHT news	1,356	L. Pappano	The long path from Mongolia to M.I.T., by way of the Web
16	23-Sep-13	INHT news	1,316	C. F. Schuetze	Another classroom revolution on the Web; Online open courses, often free or low-cost, catch on in Europe

17	26-Sep-13	INHT finance	93	A. Finder	Redefining education on the Web; Tool Kit
18	15-Oct-13	INHT finance	139	M. Coleman	College online -- everything but the campus; Special Report: Turning the Page
19	12-Dec-13	INHT news, INYT	1,176	T. Lewin	Setbacks force new look at mass web courses; Education
20	20-Feb-14	INHT edit, INYT	901	T. L. Friedman	Breakfast before the MOOC
21	14-Apr-14	INHT news, INYT	1,261	D.D. Guttenplan	Out in front in taking universities' mission online; International Education
22	28-Apr-14	INHT news, INYT	466	C. F. Schuetze	Adapting for the future at European conference; International Education
23	31-May-14	INHT finance, INYT	3026	J. Useem	Harvard Business School tests Web waters; Online course that breaks with traditional teaching has divided professors
24	05-Jun-14	INHT finance, INYT	920	K. Eaton	Via tablet or smartphone, MOOCs provide gateway to free education
25	19-Jun-14	INHT finance, INYT	1,085	E. Porter	A smart way to bypass college costs; Economic Scene
26	29-Aug-14	INHT finance, INYT	838	M. Wood	Bringing tech culture to the staid campus quad; Machine Learning
27	03-Nov-14	INHT finance, INYT	1,135	J. J. Selingo	After the hype, open online courses finding pitfalls; Education
28	17-Sep-15	INHT finance State of the Art, INYT	1,239	F. Manjoo	Tech training for the masses

29	15-Oct-15	finance, INYT	798	P. Cohen	U.S. to fund non-traditional education programs; Some coding boot camps and online classes may now be eligible for loans
30	31-Dec-15	finance, INYT	726	J. Markoff	Online courses gain in popularity

Note. *INHT (International Herald Tribune), which was owned by the New York Times.

** Article by Lau is ID no. 31 situated between 13 and 14.

Describe Sites of Production

In an ANT-based approach, the researcher is not a distant observer; rather, they are implicated in the production of accounts. The office of the researcher is a primary site of production because it is the locale where data enter and are transformed into a dissertation. From an ANT perspective, as applied by the researcher, the news stories are not just inert objects; rather, they are viewed as mediators: they carry information, have the capacity to effect other actors, such as readers, connect readers to other times and places, and enroll us in a community of thinkers.

The INYT is a second major site of production. Before the researcher even sees the news stories, they have already passed through and been part of many actor-networks. All the texts (news stories) have passed through the editorial approval and production processes of the INYT/NYT.

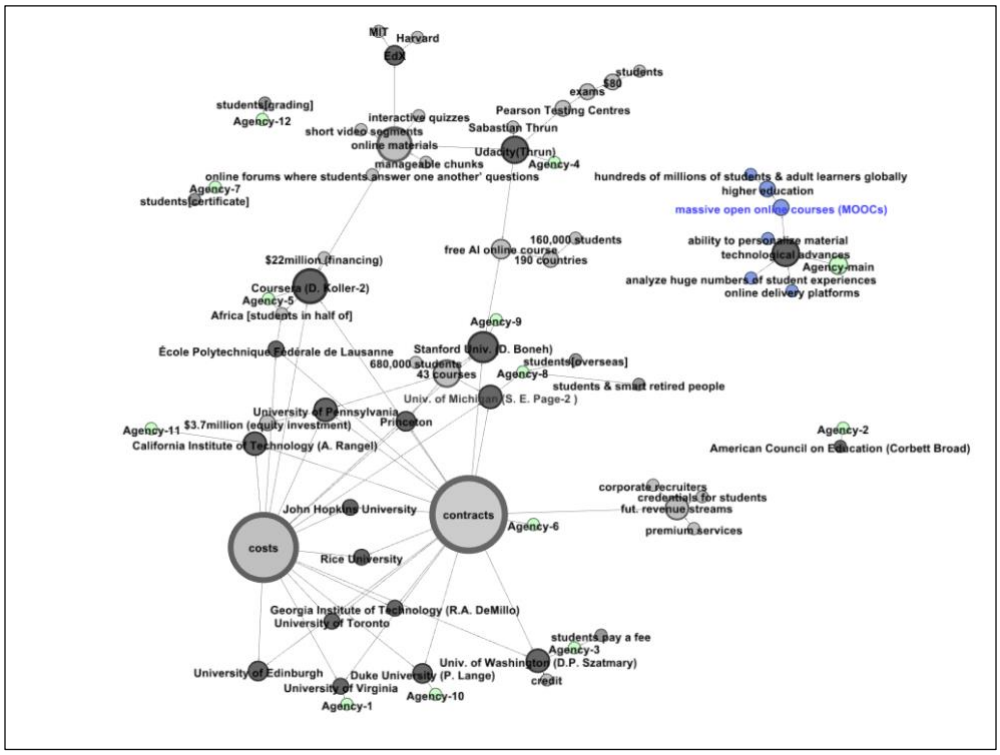
A third site of production is the FACTIVA international news database owned by Dow Jones and Company. It distributes 32,000 plus sources giving "students, faculty and librarians" access to news and industrial content, as distributed by ProQuest. By the time the researcher extracts information, the news story has undergone various digital transformations, which Proquest refers to as preparation for the academic market (https://tinyurl.com/ueyc5fh).

Gather the Multiplicity (Early Maps)

As part of the process of building familiarity with the data, each of the 31 news stories was summarized. A series of early maps was produced with the intention of making visible the actors for each story. Figure 5.4 is an example of these early relational maps produced using Gephi visualizing software. The methods in this next section emerged in the process of addressing the research questions while adhering to the ANT principles that have been described.

Figure 5.4

An Early Attempt to Follow the Actors on a Single Ontological Plane



Note: An early experimental map of the first INYT news story published on the topic of MOOCs. In this story, costs and contracts become visible through numerous university partnerships. The darker nodes suggest boundary delineation within the story. Initially missing from these early maps were the agencies asserted within each story. The green nodes, added later, denote agencies as they relate to particular nodes. Agency 4 (top central) refers to a quote in which Sebastian

Thrun (of Udacity) says that he has not yet "seen a single study that shows that online learning is better than other learning" (Lewin, 2012).

Put the Multiplicity in Order

There is no singular order to coding, mapping, describing and charting. However, it is important to include these activities in the methodology. It is only in the action of using ANT that led to the development of new tools.

Ncoding

Atlas.ti, a qualitative research software was used to collect the 31 news stories into one working database. Atlas.ti was chosen for its affordances, which allow the researcher to work visually with the text and in networks. Rather than emphasizing sequential modalities, Atlas.ti makes possible relational, or networked connections; visualizing connections can help support creative and exploratory research maneuvers; it works well with ANT. The software allows the researcher to make networks visible while holding to the specificity of the text. In other words, it is possible to follow an idea that would extend across several news stories while tracking shifts and details attached to that idea. The software allows for "practice-based knowledge making" (Konopásek, 2007, p. 276)—the idea that thinking is not separate from doing. In addition, being able to move text around in the form of objects is a reminder of its materiality. From an ANT point of view, this flexibility is necessary as it allows meanings or passages of text to be set up in relation to any other.

As outlined in the previous chapter, experimentation combined with the translation of ANT principles into a workable methodology led to the emergence of ncodes. Ncodes—BoundaryFormations, Actions, Agencies, ActorsTheories and ImperativeStatements—were deployed within the software, not as descriptors of content, but as markers of places in corpus

where the adapted ANT principles were evident. Lists of the ncodes (information documents) across the corpus were developed for reference and analysis.

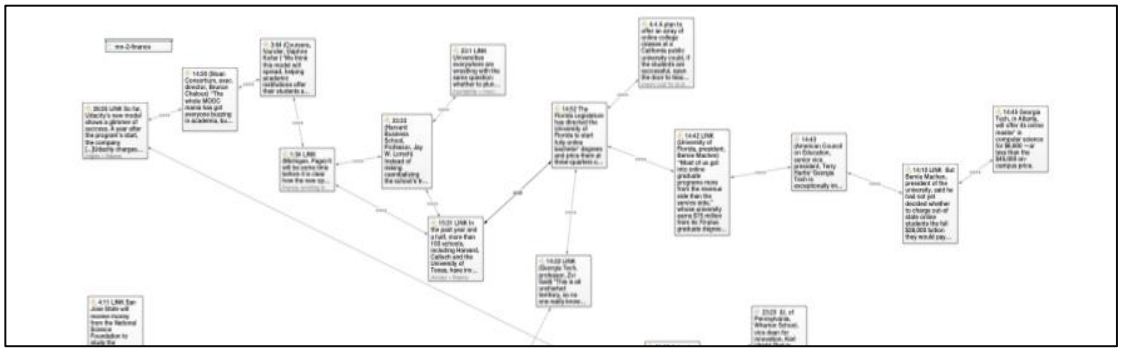
In addition, an information document was created for each of the 31 news stories. Each information document contained a title, date, events as expressed in the story, and a summary of the content of the story, as well as lists of Agencies (issues), ActorsTheories (worldviews), BoundaryDelineations and ImperativeStatements. These were used as references for analyzing the corpus. An example of a summary account is presented in Appendix D.

Mapping: Towards Strands and Confluences.

On the basis of the information documents and coded passages, ideas that endured across the corpus were identified. An adapted version of open coding (Strauss & Corbin, 1997, 2015) was used to demarcate and associate appearances of ideas that endured. Using the software, maps were created showing the connections between passages in which these ideas were expressed. These maps also showed where multiple ideas converged (see Figure 5.5). Passages of enduring ideas were designated as *strands* and when more than one strand converged in a passage, those passages were designated as *confluences*. A passage could be a part of multiple strands. In all cases, substrands of related ideas were identified within the strands.

Figure 5.5

Passages of Text as a Network of Associated Ideas

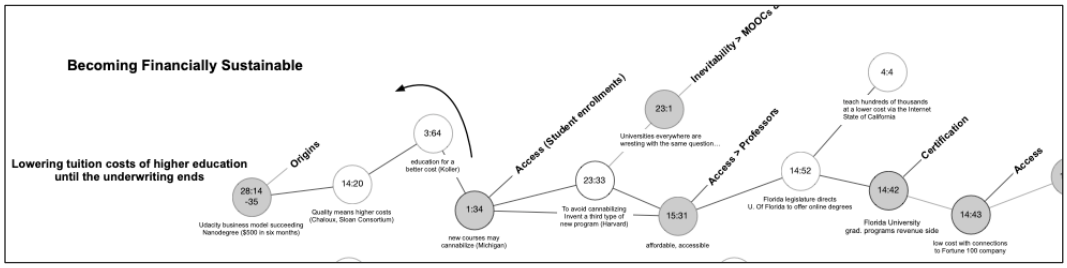


Note. Using Atlas.ti, passages of text are outputted in the form of a network that shows shifts or changes of an idea over time. These early passages would come to be identified as strands.

A final type of map (see Figure 5.6) was created to make the computer-generated networks more legible by indicating the location of the passages within the corpus and providing descriptors to the strands and substrands. For these maps, passages were edited to be succinct.

Figure 5.6

An Example of a Strand



Note. Passages of text from the corpus are linked. Numbers denote the location of an appearance (excerpt) and the grey-coloured nodes denote association with other strands (confluences) not included in the figure.

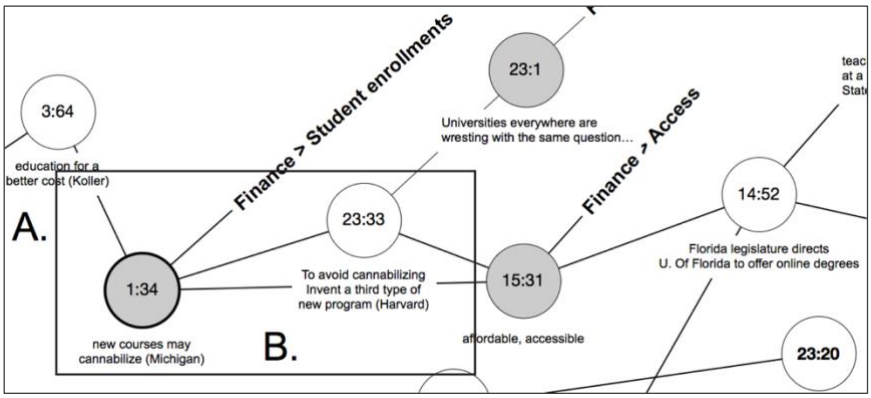
To stay on an ANT track, that is, to avoid seeking context or thinking of the text in representational terms, passages in strands are understood to be enactments. The strands are constructs by the researcher to trace the movements and associations of ideas expressed in the corpus. The challenge was to consider what it is that strands do, to take into account how they might function in a corpus.

A strand was mapped when a meaning or idea appeared multiple times in the corpus. In Figure 5.7, the idea that mass online education could cannibalize a university's online or traditional in-class programs and revenue appears in two separate news stories. In the area highlighted by the rectangle we see two appearances of this idea: the first appearance (1:34) is in the first of the thirty-one news stories with the passage located at position 34; the second appearance (23:33) is in the twenty-third news story with the passage located at position 33.

The first appearance (1:34) establishes the agency or concern that MOOCs "will ultimately cannibalize enrollment at the very universities that produce them" (Lewin, 2012, para. 13). This passage would have appeared as the ncode, Agencies, in the corpus. The second appearance (23:33) presents a solution to the agency: Harvard University creates a pre-MBA program that does not conflict with Harvard Business School's (HBS) traditional M.B.A. and executive education (Useem, 2014). The HBS, whose "traditional M.B.A. and executive education programs—which produced revenue of $108 million and $146 million last year [2013]", will remain intact with its creation of an entirely new program, presumably increasing its revenue (Useem, 2014, Para. 11). This passage would have appeared as the ncode, Actions, in the corpus. Together the two passages are associated and belong to one strand.

Figure 5.7

Detail of an Agency and an Action in a Strand



Note. The rectangle on the map highlights two passages of a related idea—that MOOCs might compete with courses already offered in the university and put at risk the other revenue producing courses of the university. The first, 1:34, is an agency (issue or concern); the second, 23:33, is an action or response to the first agency.

Strands are similar but not identical to themes. Like themes, strands emerge from the data through interpretation using an inductive approach. Unlike themes, strands follow ideas as they change through association with other ideas. Strands consist of passages. Some of the passages in the corpus are confluences; they are depicted as dark grey circles as depicted in Figure 5.7. Confluences are appearances that are associated with more than one strand.

Figure 5.7 passage 1:34 is grey, suggesting that as a *confluence* it connects up to another strand. In this case 1:34 connects to the Becoming Financially Sustainable and Student(s) strands. To pull a strand from the network, means that other strands associated with it get pulled along too. To pull a single passage from a strand, suggest that other passages of that and other strands get pulled along too. In other words, passages in strands that are confluences can be understood from various vantage points.

Describing

Describing is a way of writing that keeps the focus on the actors without imbuing external social lenses, or at least, attempting not to do so. This step is methodological, analytical and iterative. Writing continuously descriptively and reflexively throughout the duration of the project helps the researcher to become familiar with the corpus; it also helps the researcher to deepen their thinking about the corpus. Descriptions are not necessarily coherent; like the news stories they may include gaps. This is especially relevant to describing strands—passages include different Agencies, BoundaryFormations, Actions and ActorsTheories. There is no singular meaning to any passage.

Charting

Charting is a tracing of the researcher's decisions. These accounts can take the form of anecdotes, or tables that help to define terminology, track ideas or record shifts in the data or on the part of the researcher's thinking.

Summary

The first objective was to translate ANT principles into a workable form allowing for the analysis of news stories on a topic of importance to education. This process involved three sequential actions on the part of the researcher moving from extracting principles from RAS to interpreting those principles and finally deploying them in the study of the INYT corpus. This process is documented in Table 5.1. A set of new tools designated as ncodes were developed. The ncodes function as markers that assist the researcher in adopting an ANT perspective or sensibility towards the corpus. The second objective—using the translated ANT methodology in the analysis of news stories follows. It is only through the engagement of ANT principles with the corpus that the methodology fully emerges. The act of mapping, describing, and engaging

ncodes leads the researcher to the development of strands, substrands and confluences. *Strands* are similar to themes, but, unlike themes, follow passages of ideas as they change through their association with other ideas; there are changes at each articulation. Strands are never singular; they only exist in association with other strands. Confluences are passages that appear in more than one strand. Enacting ANT is an iterative approach that involves a continuous reconsideration of what it is that constitutes the social. We turn now to the results of the methodological approach used to see how some of the new tools are enacted and what they make evident about how the social is expressed in the INYT corpus.

Part IV: Findings

Findings demonstrates the results gained by engaging the translated ANT methodology with the corpus of news stories on the topic of Massive open online courses (MOOCs) published in the INYT between 2012 and 2015. The objective has been to demonstrate the enactment of the translated ANT methodology. Included in the methodology are the seven steps discussed in the previous section, including charting mapping and descriptive writing. Ncodes, strands, substrands and confluences are the newly developed thinking tools designed to help the researcher navigate a field of text-based heterogeneity and relationality. Ncodes were engaged to analyze three passages one from each of the three strands described.

How these findings address the second research question (i.e., What does this translated ANT approach show us about how the controversy of MOOCs in higher education is expressed in the corpus?) and third research question (i.e., What is the social that is revealed*?* is the focus of this section. Three sets of findings are provided. Note that findings are the enacting of ANT. The following points are the findings.

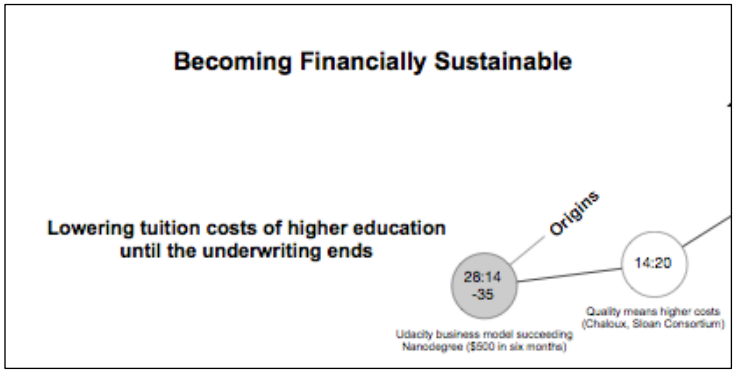
- Ten strands, with substrands, were extracted from the INYT corpus and their functions (effects) described.
- Three strands were selected for a detailed description and analysis; they include: Origins; Inevitability of MOOCs; and Becoming Financially Sustainable.
- Ncodes—BoundaryFormations, Agencies, Actions and ActorsTheories—are used to analyze a single passage of text from each of the three strands.

Review of Terminology

As previously mentioned, a strand is a device deployed by the researcher to follow ideas across the corpus. It is a way to identify and map continuity and modification in meaning. When mapped, strands appear as a series of nodes (circles) and lines (Figure 5.8). Each circle in a strand represents one passage of text in which the idea appears. Attached to each circle on a map of a strand are passages from the corpus. At the centre of each circle are two numbers separated by a colon: the first number denotes the news story source; the second number denotes the location of the passage in the news story. When a circle on the map is coloured grey, it means that the cited passage belongs to more than one strand. The points of passage where strands overlap are referred to as confluences. In Figure 5.8, which depicts an aspect of the Becoming Financially Sustainable strand, the circle marked 28:14-35 is not only associated with the Becoming Financially Sustainable strand but also with the Origins strand. The substrand, Lowering tuition costs of higher education until the underwriting ends, is also depicted.

Figure 5.8

Detail of the Becoming Financially Sustainable Strand



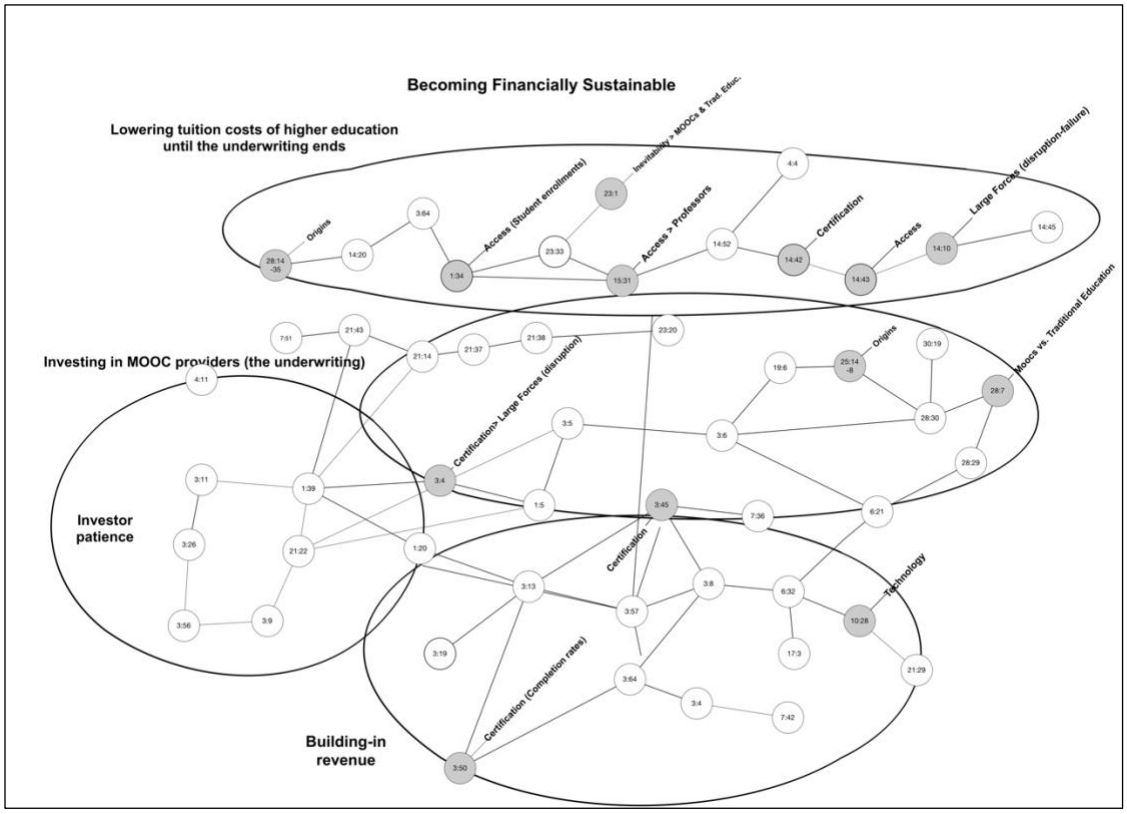
Note. A graphic detail depicting an aspect of the Becoming Financially Sustainable strand. A strand is made up of a series of connected passages of repeated ideas. Each circle points to the appearance of an idea in a passage of text from the INYT corpus. The dark circles are confluences (a passage of text that belongs to more than one strand). The strand 28:14-35 (left) belongs to both the Becoming Financially Sustainable and Origins strands.

Strands, Substrands and Confluences

To further distinguish the ideas that constitute the strands, substrands were introduced. In Figure 5.9 the strand Becoming Financially Sustainable has four substrands—Lowering tuition costs for higher education until the underwriting ends, Investing in MOOC providers (the underwriting), Investor patience and Building in revenue. All the substrands concern finance; together they are the strand. Passages are not identified or rated in terms of their relevance or importance to a strand because they are all seen as capable of exerting force or having effects—they all do things: they can enroll, coerce, inform, repel, support, induce feelings, and more. Strands, substrands, confluences and ncodes are tools that emerged while deploying the adapted ANT methodology. These conceptual tools help the researcher order and recall data and engage the corpus as material constructions and networked effects.

Figure 5.9

Becoming Financially Sustainable Strand and Substrands



Note. Circled areas highlight substrands: Lowering tuition costs of higher education until the underwriting ends; Investing in MOOC providers (the underwriting); Building-in revenue; and Investor patience. All contribute and feed into and out from the Becoming Financially Sustainable strand.

Ten Strands

Ten strands from the INYT corpus were mapped. See Appendix E for descriptions. A brief summary of each are as follows:

- *Origins* is the birth story of MOOC platform providers; it calls for and inspires the MOOC experiment.
- *Inevitability of MOOCs* is a bid to universities to join the MOOC experiment

- *Becoming Financially Sustainable* is a driver and rationalizer of the MOOC experiment
- *Access* expands the (MOOC project) networks and builds the global
- *Large forces* are figurations of change and diversion, whether in the form of high student enrollments, technological advancements, or the results of a university study
- *Technology* solves agencies (concerns) but it creates them too
- *Student(s)* are concepts that circulate; they function as metrics and exemplars in order to justify the MOOC experiment
- *Experiment* stabilizes risk (of failure or financial loss). There are safeguards and parameters built into it
- *Certification (accreditation)* are moves to standardize MOOCs
- *Professors speak* their agencies (concerns), describe their actions, and express worldviews; they argue for and against the MOOC experiment. Like students, *professors* too are a concept that circulates in the corpus

The strands presented here were constructed by the researcher on the basis of the mapping of repeated ideas throughout the corpus. They are not exhaustive or absolute. As an ontological project, there is no order of importance to the strands, and no necessary frequency to the expressions of meaning in a strand. Each strand makes visible a chain of passages that share meanings or effects. Confluences, passages that belong to more than one strand, become evident through mapping and description.

Detailed Accounts of Three Strands

The researcher followed and described the series of passages that constitute each of the three strands Origins, Inevitability of MOOCs, and Becoming Financially Sustainable. For each of the strands, charts, maps and descriptions were produced based on content. In keeping with an ANT approach, the relations and effects of strands on other strands were also considered in the descriptions.

Origins

The Origins strand includes 24 passages of text. The term Origins is applied to describe iterations of the story of the first xMOOC. The story begins with repeated references to Introduction to Artificial Intelligence, an open access university course developed by Sebastian Thrun and offered through Stanford University in 2011 that attracted 160,000 students from 190 countries. The 24 passages appear in 13 news stories published from July 12, 2012 to Sept. 15, 2015. This strand endures throughout the corpus.

The Origins strand has three substrands based on enduring associated ideas (Table 5.4): Formation of the consortia; Bringing online courses to the masses; and, From college classes to vocational education. In the first substrand, the story of the first MOOC is associated with the Formation of the consortia. This includes seven passages from July 18, 2012 to Sept. 26, 2013 and two confluences. In the second substrand, the story of the first MOOC is associated with Bringing online courses to the masses. This includes seven passages from Nov. 5, 2012 to Nov. 3, 2014 and two confluences. In the third substrand, the story of the first MOOC is associated with Moving from college classes to vocational education. This includes ten passages from Dec. 12, 2013 to Sept. 17, 2015 and four confluences.

To assist the researcher, the Origins strand with selected passages was mapped (see Figure 5.10). Ten confluences denoted by the darker grey circles appear where the Origins strand connects to other strands including Large forces (3); Technology (3); Experiment (1); Becoming Financially Sustainable (2); and Access (1).

Table 5.4 provides a chart of the Origins strand, identifying substrands, specific passages (numbered according to the news story and passage location of the text in the news story) and confluences as depicted in the Origins strand, substrands and confluences map (Figure 5.10). The table offers a way for the researcher to track their own constructs of strands in the corpus. This is followed by a descriptive overview of each strand and substrand. For demonstration purposes, only some confluences are identified.

Table 5.4

Chart of the Origins Strand, Substrands and Confluences.

Strand	Substrand	Passages	Confluences
Origins	The forming of the consortia	1:12, 2:3, 6:3, 1:49, 7:16, 7:18, 31:4*	1:12 Large forces (figuration of a wave, high student enrollments, low completion rates) 6:3 Large forces (upending of Western institutions)
	Bringing online courses to the masses	4:8, 4:12, 7:25, 14:3, 19:1, 16:37, 27:44	4:8 Technology (Gov. Brown of California seeks technological solution) 19:1 Experiment (San Jose State University experiment a flop)
	Moving from college classes to vocational education	19:6, 19:30, 19:24, 19:36, 19:47, 25:14, 25:17, 27:7, 28:17(2)**, 28:18 (2)	25:14 Finance+ (workplace training model) 25:17 Finance (Udacity nanodegree and corporate partnerships)

	28:17 Technology (scaling up and technological solution); Large forces (provides technical skills to millions of people) 28:18 Finance (nanodegree: lower education costs) Access (nanodegree: lower education costs) SHIFT: technology stabilizes the large force. Technology solves two problems: high costs of education and increased access to education

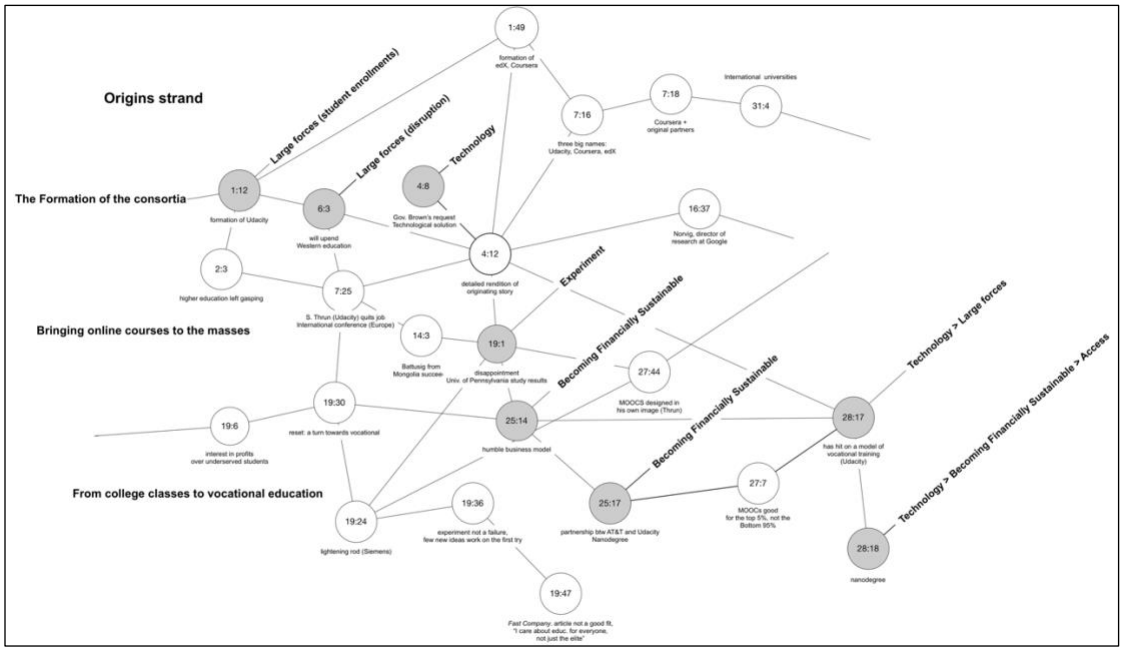
* News story 31 was published in the INYT by Lau (2013, July 22). The final news story is 30 and was published in the INYT by Markoff (2015, Dec. 31).

** Numbers in brackets suggests the passage is part of another substrand, but is counted only once.

✦ For brevity, Becoming Financially Sustainable is shortened to Finance.

Figure 5.10

Map of the Origins Strand, Substrands and Confluences



Note. An Origins strand, substrands and confluences map is depicted. The Origins strand includes three substrands: Formation of the consortia; Bringing online courses to the masses; and, From college classes to vocational education. Also depicted are several confluences; they are the passages denoted by the darker grey circles and identify connections between the Origins strand and other strands, such as the Becoming Financially Sustainable or Technology strands.

***Excerpts of the Descriptive Account of Origins*.** For the complete description of the Origins strand refer to Appendix F.

Forming of the Consortia. The Forming of the consortia substrand consists of a series of passages that together tell the story of the formation of Udacity (1:12), the private MOOC platform enterprise started by Stanford professor Sebastian Thrun. The basic content of the story sets it in the Fall of 2011, when Sebastian Thrun and his colleague teach a free online course, Introduction to Artificial Intelligence (6:3), at Stanford University. The course draws in 160,000 students from 190 countries. In the story, the course is attributed the power of a large force capable of "upend[ing] American and perhaps other Western Academic institutions" (Thrun as cited in Smale, 2013, para. 11).

There are three confluences along this substrand, two of which aggregate Origins with Large forces (1:12, 6:3). Large forces is a term given to both stabilizing and destabilizing forces. For example, large forces can be figurations such as a *seismic shift*, a *tsunami* or a *wave of publicity* (Lewin, 2012); they can also take the form of sizeable student enrollments as a disruptive force (Markoff, 2015) or the upscaling of technology to accommodate millions (Manjoo, 2015, Sept. 15). Large forces are any figuration of disruption or change. In the Origins strand, '[low] completion rates' is expressed as a concern. Low completion rates matter to Sebastian Thrun, who finds himself troubled by them enough to hire "online mentors to help students stick with the classes" (Lewin, 2013, Dec. 12). Outside of the Origins strand, low

completion rates is considered only lightly problematic as expressed by Lewin (2012, July 18): "only a small percentage [of students] completed the course", enrollments have been so high—in the millions—that even the fewer numbers of students who do complete a course is considered, "staggering" (para. 6). The concern for low completion rates is diminished by the magnitude of the enrollment metrics.

Bringing Online Courses to the Masses. A second substrand is Bringing online courses to the masses. Again, high number metrics for the first MOOC course are expressed (7:25) and continue to be associated with MOOCs as a revelation**.** In other words, the pace of MOOC growth continues to be fast and surprising; in a news story that covers a European conference organized by the Observatory on Borderless Higher Education, it is reported that "More than 160,000 students from 190 countries signed up, prompting Thrun to quit his day job (as a professor at Stanford University) and start his own online learning company, Udacity" (Guttenplan, 2013, Feb. 18).

In the same news story, Thrun is identified as "German", in keeping with the topic of differences between the U.S. and European approaches to online education and MOOCs:

> Ever since the German computer scientist Sebastian Thrun sent out an e-mail in 2011 announcing that his 'Introduction to Artificial Intelligence' course at Stanford University in California would be available free online, the education world has been both enthralled and terrified by the advent of massive open online courses, or MOOCs (para. 1).

The delineation expressed as "enthralled" and "terrified" by the "education world" points to two ideas. First, the emotions—polar opposites—foreshadow the two distinct approaches to the rapid growth of MOOCs: a U.S. that is onboard with MOOCs and a Europe that is deemed more critical and skeptical of them. Second, emotions signal agencies. In this case, emotion-

actors are on full display in this news story: anxiety looms, desperation inhabits, and while interest is widespread, so too is suspicion.

Inevitability of MOOCs

The Inevitability of MOOCs strand consists of imperatives or pressure statements compelling universities to join the MOOC experiment. These pressure statements bid universities to partner with the consortium (Lewin, 2012, July 18), to join the "bandwagon" (Pappano, 2012, Nov. 5), and to get on board with the "revolution" (Lewin, 2013, Jan. 8). The Inevitability of MOOCs strand includes twenty-two passages ranging from July 18, 2012 to May 31, 2014. This strand endures throughout the corpus.

The Inevitability of MOOCs strand has two substrands based on enduring associated ideas (Table 5.5), Universities fear being left behind and Reinventing learning: universities have to adapt, as depicted in the Inevitability of MOOCs map (Figure 5.11). In the first substrand, the bid for universities to join the MOOC experiment is identified as Universities fear being left behind. It includes eleven passages from July 18, 2012 to April 28, 2014. In the second substrand, the bid for universities to join the MOOC experiment is associated with Reinventing learning: Universities have to adapt. It includes eleven passages from Jan. 8, 2013 to Dec. 31, 2015 and shares a passage with the substrand Universities fear being left behind.

Table 5.5 provides an overview of the Inevitability of MOOCs strand showing the strand, substrands, passages and confluences. There are nine confluences in the Inevitability of MOOCs strand denoted by darker grey circles: Large forces (3); Experiment (2); Becoming financially sustainable (2); and Technology (2). Varied agencies appear along each of the substrands. The table allows the researcher to track their own constructs in the corpus. What follows is a descriptive overview of each strand and substrand.

Table 5.5

Chart of Inevitability of MOOCs Strand, Substrands and Confluences.

Strand	Substrand	Passages	Confluences
Inevitability of MOOCs	Universities fear being left behind	30:12, 14:20, 1:3, 3:4, 7:9, 7:18, 7:24, 7:27, 7:34, 8:18, 16:41	1:3 Large forces (can't 'imagine any large research university that wouldn't want to be involved') Experiment (large experiment) 3:4 Finance (Coursera has attracted $22 million in venture capital) 8:18 Experiment (still experimental but great promise, but we need more careful research) 16:41 Large forces ('there is a revolution out there') Technology ('universities have to turn to technological innovations to cope with the big increase of numbers')
	Reinventing learning: Universities have to adapt	30:12], 8:14, [7:9]**, 15:21, 23:72, 23:1, 6:30, 3:35, 11:19, 5:8, 5:34, 22:16	30:12 Large forces (MOOCs as a disruptive force that continues to evolve) 23:1 Finance✦ (risk of investment may cannibalize courses) 22:16 Technology (technology is changing; universities have to change to meet demand)

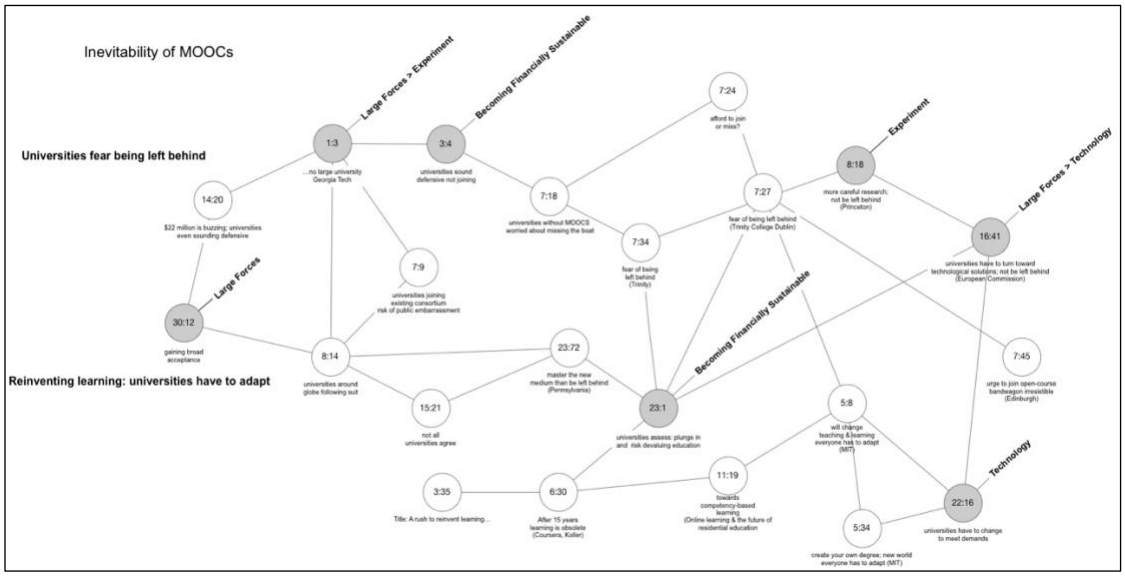
* News story 31 was published in the INYT by Lau (2013, July 22). The final news story is 30 and was published in the INYT by Markoff (2015, Dec. 31).

** Numbers in brackets suggests the passage is part of another substrand, but is counted only once.

✦ For brevity, Becoming Financially Sustainable is shortened to Finance.

Figure 5.11

Map of the Inevitability of MOOCs Strand, Substrands and Confluences



Note. An Inevitability of MOOCs strand, substrands and confluences map is depicted. This strand includes two substrands: Universities fear being left behind; and Reinventing learning: Universities have to adapt. Also depicted are several confluences; they are the passages denoted by the darker grey circles and identify connections between the Inevitability of MOOCs strand and other strands, such as the Becoming Financially Sustainable or Experiment strands.

Excerpts of the Descriptive Account of Inevitability of MOOCs

For a detailed description of the Inevitability of MOOCS strand see Appendix E.

Universities Fear Being Left Behind. Inevitability of MOOCs are pressure statements bidding universities to join the MOOC experiment. Passage 1:3 (cited below) is from the first news story published on the topic in the INYT, which establishes MOOCs as an unstoppable force to be reckoned with.

The statement, “it’s hard for me to imagine any large university that wouldn’t want to be involved” is the first of the imperative statements in the corpus. Together the statements in this

strand define the role of the large research university and begin to establish a social order among universities.

Universities and their spokespeople that for various reasons delay getting behind the MOOC project are attributed unappealing characteristics—defensiveness, fear, worry, missing out, confused, and even cynical. Coursera's acquisition of $22 million in venture capital is described as an event that has "created so much buzz that some universities sound a bit defensive about not leaping onto the bandwagon" (3:4) (Lewin, 2013, Jan. 8). Universities without "their own MOOCs worried about missing the boat" or "missing out on potential talent" (7:18) (Guttenplan, 2013, Feb. 18). The dean of graduate studies at Trinity College Dublin, Dr. Campbell, is quoted directly, "There is a fear of being left behind, so we are considering what to do" (7:34). Even for European universities, "the temptation to jump on the open-course bandwagon has been irresistible" (7:45) (Guttenplan, 2013, Feb. 18). Reiterating this sentiment is William G. Bowen, a former Princeton University president who is quoted as saying,

> One of the characteristics of academia is that nobody wants to be left behind […] There's great promise here, great potential, but we need more careful research, and there has not been sufficient attention to that, partly because a lot of the people creating these courses are missionaries, and missionaries are not, by and large, interested in testing their message (8:18) (Lewin, 2013, Feb. 22).

And, finally, European Commission spokesperson Dennis Abbot says,

> Normal business is not going to work: universities are going to have to turn to technological innovations to be able to cope with the big increase of numbers [...] There is a revolution out there at the moment; we cannot afford to be left behind (16:41) (Schuetz, 2013).

Being left behind or missing out are frequently expressed concerns by large research universities.

Becoming Financially Sustainable

Becoming Financially Sustainable is a driver of the MOOC experiment. The Becoming Financially Sustainable strand includes fifty-two passages ranging from July 18, 2012 to Dec. 31, 2015. This strand endures throughout the corpus. It includes concerns about the implementation of MOOCs in large research universities, the financial investments made to launch MOOC platform providers, the worldviews expressed by stakeholders about the MOOC project, and the long-term sustainability of MOOCs through revenue. The Becoming Financially Sustainable strand consists of four substrands based on enduring associated ideas (Table 5.6): Lowering tuition costs of higher education until the underwriting ends; Investing in MOOC providers (the underwriting); Investor patience; and Building in revenue. The first substrand, Lowering the costs of higher education until the underwriting ends, includes thirteen passages from July 18, 2012 to Dec. 31, 2015. The second substrand, Investing in MOOC platform providers (area C. in Figure 5.12), includes seventeen passages from July 18, 2012 to Dec. 31, 2015. The third substrand, Investor patience (area C in Figure 5.12), includes six passages from July 18, 2012 to April 14, 2014. The fourth substrand, Building-in revenue (area E, Figure 5.12, includes fifteen passages from July 18, 2012 to April 14, 2014.

There are sixteen confluences, denoted by the darker grey circles, where passages in Becoming Financially Sustainable coalesce with other strands including: Origins (2), Access (3), Inevitability (1), MOOCs vs. traditional education (2) Certification (4), Large forces (2), Professors (1) and Technology (1). Tables offers a way for the researcher to track their own movements in the corpus. What follows is a descriptive overview of each strand and substrands. Some confluences are identified.

Table 5.6

Chart of the Becoming Financially Sustainable Strand, Substrands and Confluences Map**.**

Strand	Substrand	Associations	Confluences
Becoming Financially Sustainable (Finance)	Lowering tuition costs until the underwriting ends	**1:34 A-a,**3:64, 14:20:**28:35; A-b. [1:34]**,** 23:33, **15:31**, **23:1**, 14:52, 4:4, **14-42, 14:43**, **14:10**, 14:45.	1:34 Access (student enrollments) 15:31 Access Professors 23:1 Inevitability MOOCs and Trad. Ed. 14:10 Large Forces (disruption-failure) 14:42 Certification 14:43 Access 28:14-35 Origins (business model and lower tuition for the masses)
	Investing in MOOC providers (the underwriting)	B- 4:11 7:51, 21:43, 21:14, 21:37, **21:38**, 23:20. 3:4, 1:5, 3:5, 3:6, 19:6, **25:18**, 28:30, 30:19, 28:29, **28:7.**	3:4 Certification Large Forces 25:14-18 Origins Udacity nanodegree and corporate partnerships 28:7 MOOCs vs Trad. Ed.
	Investor patience	C-1:39, 3:11, 3:26, 3:56, 3:9, 21:22. [1:39], **3:4**, 1:5, 3:5, 3:6, 6:21, 19:6, 25:18, 28:30, 30:19, 28**:7,** 28:29,	25:14 **+**Finance (workplace training model) 28:17 Technology (scaling up and technological solution) Large forces (technical skills to millions of people)
	Building in revenue	D. [1:39], 1:20, 3:13, 3:19, 3.57, 7:36, 3:8, **3:45**, 6:32, 17:3, **10:28**, 21:29, **3:50**, 3:64,	3:45 Certification 3:50 Accreditation 10:28 Technology

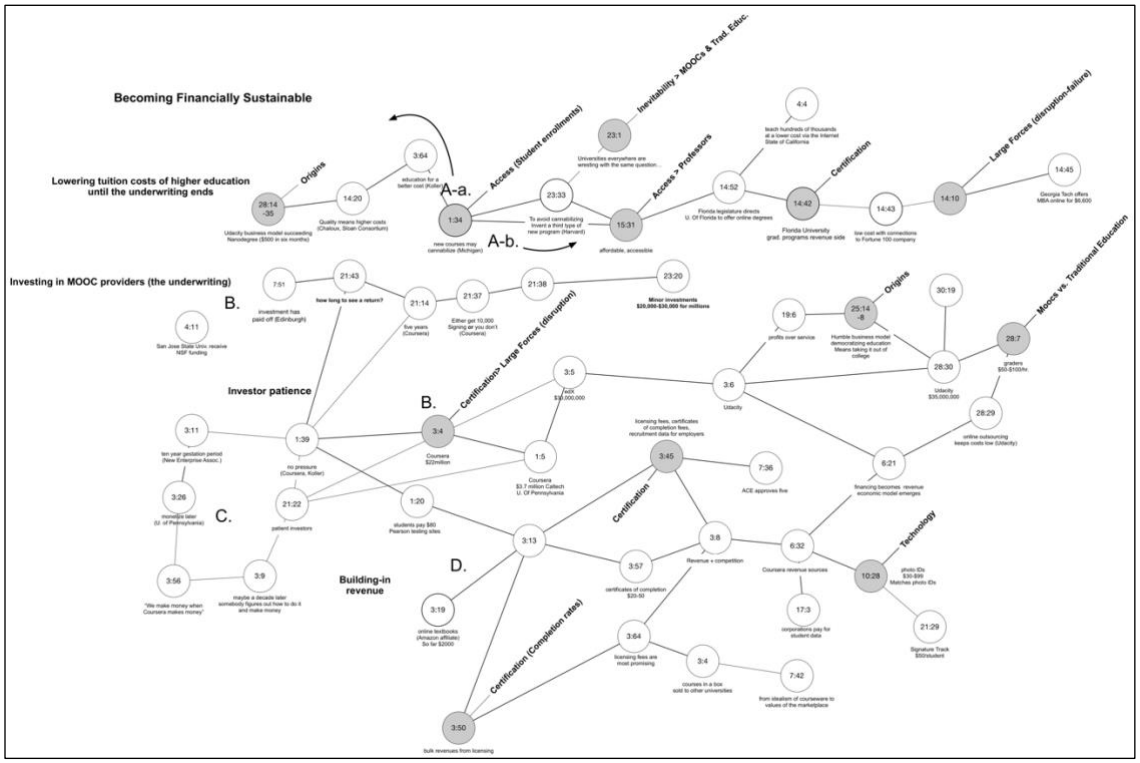
3:4, 7:42.

** Numbers in brackets suggests the passage is part of another substrand, but is counted only once.

✦ For brevity, Becoming Financially Sustainable is shortened to Finance. The letters in the chart refer to and match the letters on the map for the Becoming Financially Sustainable strand.

Figure 5.12

Map of Becoming Financially Sustainable Strand, Substrands and Confluences



Note. A Becoming Financially Sustainable strand, substrands and confluences map is depicted. The Becoming Financially Sustainable strand includes four substrands: Lowering tuition costs of higher education until the underwriting ends; Investing in MOOC providers (the underwriting); Investor patience; and, Building-in revenue. Also depicted are several confluences; they are the passages denoted by the darker grey circles and identify connections between the Becoming Financially Sustainable strand and other strands, such as the MOOCs and Traditional Education or Technology strands.

Excerpts of the Descriptive Account of Becoming Financially Sustainable. *For the complete description of the Becoming Financially Sustainable strand refer to Appendix G.*

Lowering Tuition Costs of Higher Education Until the Underwriting Ends. There is a concern in the Becoming Financially Sustainable strand that the new profit-oriented courses (MOOCs) will cannibalize student enrollments at the same universities that produce them (1:34) (Lewin, July 18, 2012, July 18). Passage 1:34 is depicted as moving in two directions (Figure 5.12). In the first direction, denoted by the letter A-a., MOOCs represent a new model for education, providing it to students for a lower cost (3:64) (Lewin, 2013, Jan. 8); this perspective is expressed by or attributed to Coursera, one of the key platform providers. For universities, however, the lower cost is considered to be a temporary measure. The Sloan Consortium argues that when the underwriting phase ends, "traditional tuition rates" (14:20) (Lewin, 2013, Aug. 10) will need to be reinstated to maintain quality. Udacity's response to lowering costs (28:14-35) is the nanodegree program, which offers IT courses for a monthly fee of $200; it takes an average of five months to complete the program, costing students $1000, half of which is returned to them after completion (28:14-35) (Manjoo, 2015, Sept. 17).

The second direction, denoted by the letter A-b., associates more directly to the issue of cannibalization, a question that all universities considering online education are said to be facing (23:1). The passage (23:1) connects with strands Inevitability of MOOCs and MOOCs and Traditional Education. This confluence raises the question: do universities "plunge into the rapidly growing realm of online teaching", risking "devaluing the on-campus education", or do they "risk being left behind" (23:1) (Useem, 2014, May 31, para. 4)? Circumventing this concern (23:33), Harvard Business School (HBS) proposes a different model, a new pre-MBA that

doesn't compete with Harvard's already existing high revenue producing programs ($108 million and $146 million for their current MBA and executive streams respectively). HBS professor Jay W. Lorsch comments, "Instead of having two big product lines, we may be on the verge of inventing a third," (23:33) (Useem, 2014, May 31, para. 12). There is a belief that MOOCs can make education "more affordable and accessible to far more students and eventually provide additional revenue streams for the universities that offer them" (15:31) (Pappano, 2013, Sept. 16).

Investor Patience. From the beginning, Daphne Koller, Coursera co-founder, states that MOOCs will need to be self-sustaining (1:39) but revenue is "not a pressing concern" (1:39) (Lewin, July 18, 2012, para. 14). Returns do not need to be immediate. Coursera financier Scott Sandell from New Enterprise Associates says, "Monetization is not the most important objective" (3:11) (para. 9). Instead, it is the accumulation of a "body of high-quality content" (para. 9) that matters, a product that can be sold to universities through licensing. Sandell reaffirms, "We invest with a very long mind-set, and the gestation period of the very best companies is at least 10 years" (Lewin, 2013, Jan. 8, para. 9). University of Pennsylvania law professor Edward Rock, a senior advisor on open course initiatives, expresses a similar idea: "Part of what Coursera's gotten right is that it makes more sense to build your user base first and then figure out later how to monetize it, than to worry too much at the beginning about how to monetize it" (Lewin, 2013, Jan. 8, para. 23). Duke University provost Peter Lange says, "We'll make money when Coursera makes money […] I don't think it will be too long down the road. We don't want to make the mistake the newspaper industry did, of giving our product away free online for too long." (Lewin, 2013, Jan. 8, para. 11).

Building-In Revenue. The fourth substrand in the Becoming Financially Sustainable strand is Building-in revenue. Despite the lack of urgency to generate revenue expressed in the Investor patience substrand, in the Building in revenue substrand there are continuous expressions of revenue generation.

Building in revenue crosses nine news stories in the corpus, beginning with the first and ending with the twenty-first. Substrands, Investing in MOOC providers (C.), Investor patience (D.) and Building in revenue (E.) associate with passage 1:39, which concerns Daphne Koller's statement that while courses have to be self-sustaining, it is not a pressing concern. From the beginning, Koller asserts that revenue can be generated by asking students to pay $80 to take exams at Pearson testing centres (Lewin, 2012). Passage 3:13 tells the story of increasing revenue: Coursera is already beginning to see "the first trickles of revenue now coming in" (Lewin, 2013, Jan. 8, para. 10). As an Amazon affiliate (3:19) Coursera makes money every time a student purchases a textbook (Lewin, 2013, Jan. 8); they also license remedial or introductory ("gateway") courses (3:50) that are taken by hundreds of thousands of students per year. Other revenue sources include charging students who complete courses $20 to $50 for certificates of completion (3:57), charging corporations for access to high-performing students in the field of software engineering (3:64), and selling ready-made "courses in a box" or video lectures that students can watch before attending a lecture (Lewin, 2013, Jan. 8, para. 12). Digital proctoring technologies, such as "Signature track", which matches webcam photographs and pictures with photo IDs and monitors typing habits, also bring in revenue for partners—students pay $30 to $99 per exam.

Applying Ncodes to Three Passages

Drawing on four ncodes—Agencies, BoundaryFormations, Actions, and ActorsTheories—an analysis of a single passage from each of the three strands previously described is provided. This analysis could be understood as zooming in on the topographical map to see how the social is being constructed in specific instances. But first, the definitions of the ncodes are reviewed: *Agencies* are many connections that, as forces, alter some *state of affairs*; they are expressed as matters of concern. *BoundaryFormations* are differentiations enacted by the text through explicit or implied comparisons' a group's force might build at the expense or disparagement of another, through its alignment with another group or simply by identifying another group. *Actions* are events that come about from many mediations; there is no identifiable single cause or effect and no single traceable source, although actors may attribute single causes to them. *ActorsTheories* are the many world views about the social that get expressed in the text. The purpose of the deployed methodology in the form of ncodes is to aid the researcher to distinguish between the sociology of the social—characterized by preconceived notions about the social as generally understood to be an outcome of Western Modernist ideals—and the sociology of associations—characterized by its attempt to see the social in new terms, through association, materiality, and functionality.

A Passage from the Origins Strand

The passage reviewed was:

> Many educators saw the move [of Udacity to vocational training] as an admission of defeat for the idea that online courses would democratize higher education—and confirmation that, at its core, Udacity, a company funded with venture capital, was more

interested in profits than in helping to educate underserved students. (19:6) (Lewin, 2013, Dec. 12, para. 13)

Background to the Passage. The passage examined, 19:6, is located on the From college classes to vocational education substrand on the Origins strand (see Figure 5.8). The story goes: following the release of the University of Pennsylvania research results and the failed attempt at San Jose to improve students' entry-grade levels through MOOCs, the promise that MOOCs would increase access to higher education for people from the poorest nations has been thrown into question.

In a profile in *Fast Company* magazine, Sebastian Thrun made public his decision to move from developing MOOCs for college classes to developing corporate partnerships for vocational training using MOOCs and charging a fee (Lewin, 2013). The move involves a shift towards offering certification for a fee upon completion of MOOC courses. On failed experiments, Thrun responds, "To all those people who declared our experiment a failure, you have to understand how innovation works. Few ideas work on the first try. Iteration is key to innovation. We are seeing significant improvement in learning outcomes and student engagement" (para. 20).

Agencies. Three agencies appear in the passage:

- the defeat of the aspiration to democratize education through the MOOC project
- that Udacity values profits over helping to educate underserved students and
- the incommensurability of democratic ideals and profit motives.

BoundaryFormations. There are two principal boundary formations: between private profits and democratic ideals; between "many educators" who are not on board the MOOC project and those educators who are.

Actions. The main action performed by the passage is the creation of a dichotomy with "underserved students" and "many educators" on one side, and profits and Udacity on the other. Whereas the concept underserved students is used in many places in the corpus in relation to the MOOC project, in this passage it is clearly located on the democratic ideals side of a dichotomy, and for-profit motives driven through venture capital are on the other. The passage is used to set up a series of charges against Udacity against which Thrun and the writer of the story offer a defense.

ActorsTheories. In the news story, the "many educators" see Thrun's move and Udacity's interest in profits as evidence of the failure of MOOCs to democratize higher education and to help educate underserved students. The remainder of the news story presents the view that failure is part of the process of innovation and pits the innovation of the private sector against the caution of the "many educators". In the organization of the story, with the private sector having the last word, the INYT expresses a worldview.

A Passage from the Inevitability of MOOCs Strand

The passage reviewed was:

> There has been an incredible amount of hype' about the online courses […] however, you ignore them [MOOCs] at your peril," he said. The challenges they pose to the traditional classroom model of knowledge transmission are obvious. The question is no longer whether we should consider MOOCs, but how quickly to get involved. (7:27) (Smith, n.d. as cited in Guttenplan, 2013, para. 7).

Background to the Passage. The passage examined, 7:27, is located on the Universities fear being left behind substrand of the Inevitability of MOOCs strand. Anxiety and a range of opinions on the topic of MOOCs permeate an international conference at the University of

London organized by the Observatory on Borderless Higher Education. The European experience of the MOOC project is skeptical, cautious, anxious, critical and, to some degree, accepting, in contrast to the U.S. experience of the MOOC project described as "the early stages of the oil boom" (Guttenplan, 2013, para. 8). The reporting of the international conference emphasizes a range of worldviews. Europeans are presented as experienced in the areas of online and distance education: the University of London has been involved "in the distance learning business since 1858", the Universitat Oberta de Catalunya (Barcelona) has offered open online courses since 1995, the University of Edinburgh founded in 1583 has no shortage of students; the open educational resources movement predates MOOCs.

Attempts to launch online programs in the early 2000s led some to be cautious about joining the MOOC project. The University of London vice chancellor Adrian Smith warns of the hype about MOOCs reminding the audience at the conference that there are 52,000 students enrolled in their international online programs "who take the same exams as their counterparts in Bloomsbury and receive a University of London degree" (para. 6). As the example passage demonstrates, despite skepticism, there is pressure to join the MOOC project.

Agencies. Five agencies appear in this passage:

1. There is a lot of (media) hype about MOOCs;
2. The MOOC project challenges the "traditional classroom model of knowledge transmission";
3. To ignore the MOOC project is to risk being in peril;
4. Joining the MOOC project is imperative;
5. There is no time for deliberation.

BoundaryFormations. MOOCs and the traditional classroom model of knowledge transmission are set in opposition to one another, with MOOCs having the potential to impact the traditional classroom modality in a seemingly one-way direction. A distinction is being made between hype, which universities should be critical of, and the threat to traditional models of education by the new online modality, which universities must take seriously. To survive, universities don't have the option of saying no to the MOOC project. The only decision is: on what timetable?

Actions. The statement by the vice-chancellor from the University of London suggests that the time for consideration of MOOCs is over and the time for engagement has arrived; this expresses a shift away from the skepticism, caution and critical consideration established at the beginning of the news story. The statement is both action and imperative.

ActorsTheories. MOOCs are a force that is changing the traditional classroom model of knowledge transmission. There is no time for further consideration or deliberation; there is only time to engage with them. The appearance of this passage toward the end of the news story is a closing thought, which again suggests an INYT worldview.

A Passage from the Becoming Financially Sustainable Strand

The passage reviewed was:

> 'Georgia Tech is exceptionally important because it's a prestigious institution offering an important degree at very low cost with a direct connection to a Fortune 100 corporation that will use it to fill their pipeline,' said Terry Hartle, senior vice president of the American Council on Education. 'It addresses a lot of the issues about universities that the public cares about. But how good and how transferable it is remain to be seen. (14:43) (Lewin, 2013, Aug. 10, para. 29)

Background to the Passage. Passage 14:43 is on the Lowering tuition costs of higher education until the underwriting ends substrand of the Becoming Financially Sustainable strand. The Georgia Institute of Technology (Georgia Tech) plans to develop an online Master of Computer Science program—a project that could *reshape* higher education in two ways: first, by offering accreditation for a graduate degree program taken entirely online, and second, by lowering the cost of tuition from $45,000 to $6,000 for that degree. Offering a full degree program online may "bring real change to higher education", something that, until this time has not happened with MOOCs (Lewin, 2013, August 10, para. 10). Other universities are watching the project closely. S. James Gates, Jr. an advisor to Barack Obama's Council of Advisors on Science and Technology, expresses the view that "this could begin the process of lowering the cost of education and lowering barriers for millions of Americans" (para. 11).

Phil Regier, executive vice provost of Arizona State University Online, suggests that the more faculty involvement is required online, the more a student should pay: "what we're seeing is different price points for different levels of faculty involvement". No or little touch, can be delivered for $6,000, but if the student wants "a higher-touch program, taught and graded by regular faculty, with a lot of faculty interaction, it's going to be more expensive" (para. 23). Georgia Tech would acquire 60 percent of revenue and Udacity, provider of the platform, the other 40 percent. With a projected budget of $3.1 million (AT&T contributed $2 million), it's predicted that by year three, the project would cost $14.3 million, including $4.7 million in profits.

The story is not entirely free of concerns: "some [faculty members] object to the whole idea of outsourcing part of their work" (para. 16). According to University of California (Santa Barbara) professor Chris Newfield, developing online degree programs is something universities

could do on their own if they had the money: “the whole history of private involvement in public education has been one of extracting resources. However well-intentioned, we don’t need a Trojan horse product that will take money out of the system” (para. 17). It’s suggested that a successful model like the one proposed by Georgia Tech could make public universities that have produced their own online programs for the same cost as their on-campus programs *vulnerable.* How this move by one university will impact others is the concern of other universities. The focus of lowering tuition plays out as economic concerns largely with some indication that public universities could be impacted.

Agencies. There are four agencies:

- this an important experiment in offering a prestigious degree at low cost (Terry Hartle, ACE)
- Fortune 100 corporations need well-educated labour
- the public cares about education issues and
- transferability and quality are important.

BoundaryFormations. There are prestigious universities and by implication non-prestigious universities; the place and interests of non-prestigious are less pronounced. The American Council on Education supports high quality programs at low cost leading to employment with successful corporations, issues which the public also cares about. Graduates of prestigious universities will be employed by the most prosperous companies. Less prestigious universities and less prosperous companies are not part of the experiment.

Actions. An experiment is taking shape amidst the uncertainty. The online experiment is being supported by public and private interests to provide a financially sustainable accredited

online program. It's the model and example of the potential of MOOCs to transform higher education. It is the concrete experiment to be watched.

***ActorsTheories*.** Prestigious universities are leaders. Having graduates of the most prestigious universities become employed by the most prosperous companies serves the public interest. Education in a prestigious university can be affordable. Again, positioned as a final statement in the news story, this suggests an INYT worldview.

Analysis and Discussion of Three Strands

In the previous section, ten strands were identified and considered in terms of their meaning and functionality in the corpus (see Appendix C). This was followed by maps, charts and descriptive accounts of the movement of ideas in three strands and their substrands, making the nature of connections evident in the writing (see Appendices D, E, and F). Five claims are made based on these descriptive accounts. They are: 1) Descriptive writing of passages in the strands challenges the notion of a one-direction singular story; 2) Mapping and describing strands makes evident constructs and their effects in the network; 3) Meaning is mediated through repetition; 4) Inclusion in the group that matters is a repeated imperative; and 5) The Movement of small and large amounts of money convey a rudimentary financial network. The ncodes, which were used as pathways to analyze passages from each of the three strands, are analyzed and discussed. Three claims are made: a) The Varied strengths of the mediators are demonstrated in different passages of text; b) Imperatives place limits on the social; and, c) The Passage itself becomes a mediator.

Both the descriptive accounts and the application of ncodes to passages from each of the three strands, as enactments of the translated ANT approach, are considered in relation to the second and third research questions posed: What does the translated ANT approach show us

about how the controversy of MOOCs in higher education is expressed in the INYT corpus? What is the social that appears? To begin, the following insights are garnered from the writing of descriptive accounts of strands and substrands.

1) ***Descriptive writing of the passages in the strands challenges the notion of a one direction singular story.***

Descriptive writing brings out the multivalent meanings of the stories being told. A key example is the birth story of MOOCs, found in the Origins strand; its main ingredients are the enrolment of 160,000 students from 190 countries in the Introduction to Artificial Intelligence course by Sebastian Thrun that led to the eventual formation of Udacity. The story, told repeatedly throughout the corpus, creates a sense of continuity and stability in the MOOC project. However, in describing the passages in which the story is told, descriptive writing of the passages of the strand makes evident how the story mediates in a range of controversies and is mediated by them. For example, the story mediates in the controversy of the failed experiments between the San José State University and Udacity partnership by recalling the "fact" of the platform's broad appeal to students (large enrollments). With the failure of the San José – Udacity partnership, the origins strand, deviates and becomes associated with vocational training rather than university degree programs. The fact is never challenged. Inflections too in the story are noted. For example, the mention of Thrun's German nationality in association with a European conference at which point coverage on the controversy of MOOCs extends beyond the U.S. to an international arena, or when Thrun's prior involvement with Google X Lab is mentioned in association with research conducted on the increased income of post-secondary graduates within the corporate sphere. The story is adapted to fit the controversy and the controversy is *effected* by the story.

2) Mapping and describing strands make evident constructs in the network.

Confluences—passages that belong to more than one strand—become evident through mapping. In a confluence, passages may have multiple meanings and effects. For example, in a news story that describes an event at Davos, the following passage appears as a confluence of the Origins and Large Forces strands:

> Sebastian Thrun, another Stanford computer science professor who introduced Udacity after seeing more than 160,000 students sign up for an online class on artificial intelligence in the autumn of 2011, predicts that this kind of learning will eventually upend American and perhaps other Western academic institutions. (6:3) (Smale, 2013, Jan. 28)

In this example the origin story of Udacity with its mass enrollments is connected to a figuration of massive change in higher education—the 'upending' of "American and perhaps other Western academic institutions". The story in the Origins strand begins with "three guys" in Thrun's living room, moves to an enterprise of 40 employees (Pappano, 2012, Nov. 5) and then, in this passage, to the projection that it will upend Western academic institutions. There is a rapid progression of scale expressed in the strand but because these expressions all exist on the same plane in the map, they are visible as constructs rather than reflections of reality. Nonetheless, these expressions of scale—from micro to macro—have effects in the network. Through this association, Udacity is figuratively catapulted from a specific local site of production--Thrun's living room in 2012--to a global force in 2013. In the flattened landscape of the ANT analysis the the micro and macro exist on the same plane. Confluences—in this case of the Origins and Large Forces and Technology strands—are key sites where meanings are modulated.

3) Meaning is mediated by association

In another example, a passage on the Origins strand is also on the Technology and Large Forces strands. The confluence appears in a news story on delivering online technical skills to the masses:

> Now Udacity, a four-year-old online teaching start-up, believes that after years of trial and error, it has hit on a model of vocational training that can be scaled up to teach technical skills to millions of people. Udacity's founder, Sebastian Thrun, a specialist in artificial intelligence at Stanford University who once ran Google X, the search company's advanced projects division, said that the "Nanodegree" program that the firm created last year will result in vastly lower education costs and wider accessibility. (Manjoo, 2015, para. 5)

The Origins story is now embedded in a story about the MOOC project in the aftermath of the University of Pennsylvania research results and the San José State University experiments. The confluence of the Technology, the Becoming Financially Sustainable and the Origins strand shifts the emphasis of the Origins strand from the delivery of MOOCs for college courses to the delivery of MOOCs for training in technology. At the same time this confluence gives power to the technology strand. The value of the technology strand, whose function in the corpus is to solve agencies (it creates them too), is affirmed. The Becoming Financially Sustainable strand continues to drive the MOOC experiment.

The emphasis on scale through the confluence with the Large Forces strand increases the force of the Origins and Technology strands. When the different events and confluences are described and mapped, it becomes possible to see how meaning is constructed: meaning endures through repetition and is modulated through connection. By following a strand through different events and confluences, its varied effects and function are revealed. The potential associated with

a networked approach is that it provides a dynamic, multidirectional and rich set of connections and variations. In this way it is distinct from the CDA approach used by Bulfin and colleagues (2014) which sought patterns. It is also distinct from Geertz's notion of "thick description" in that the ANT approach emphasizes change and movement while thick description emphasizes context.

4) Inclusion in the group that matters is a repeated imperative

Whereas repetition in the Origins strand concerned the retelling of a story, in the Inevitability of MOOCs strand the repetition is in the restaging of a particular tone of address. Scattered throughout and connected with multiple strands, imperative statements that bid universities to join the MOOC experiment and adapt to the new learning exert pressure in the corpus. In many cases, negative characteristics or a doomed fate are attributed to those universities that do not participate. In the following passage, there is a confluence of the Inevitability of MOOCs strand with the Large Forces and Experiment strands.

> 'This is the tsunami,' said Richard A. DeMillo, the director of the Center for 21st Century Universities at Georgia Tech, one of the new partners. 'It's all so new that everyone's feeling their way around, but the potential upside for this experiment is so big that it's hard for me to imagine any large research university that wouldn't want to be involved.' (1:3) (Lewin, 2012, July 18, para. 4)

The large forces in this passage are the figuration of the tsunami and the scale of the experiment. The imperative in this statement is expressed through the benefits of inclusion and the dangers of exclusion: those universities that join the MOOC experiment have everything to gain and those that hesitate or decline have everything to lose. Boundaries are being made between elite and non-elite universities, with elite competitive universities, government

institutions and being part of the future on the one side, and non-participating universities and being left behind on the other.

5) The Movement of small and large amounts of money convey a rudimentary financial network.

Mapping and describing the Becoming Financially Sustainable strand reveal a rudimentary money network in which large amounts of money moves from financiers and universities to private and public consortia and small amounts of money from large numbers of students moves to the consortia, universities and financiers.

Becoming Financially Sustainable is the largest of the ten strands that were identified, meaning that it consists of the greatest number of passages. In addition to the news story writer, there are three main speakers in the strand—universities engaged in the MOOC project, Udacity, and the investors; each of these speakers articulates different matters of concern.

For the prestigious universities, a pronounced agency is making online education financially sustainable without cannibalizing existing programs. The prestigious universities present several models: Harvard Business School proposes to increase their profits by adding an online pre-MBA program to their already high revenue producing MBA and executive programs and Georgia Tech is building an online master's degree program through corporate partnership (AT&T) that will be offered at a rate of tuition that is significantly less than the on-campus program ($45,000 to $6,600 a year) and is projected to bring in $4.7 million in profits by year three.

For Thrun-Udacity a pronounced agency is developing a model that will be effective in making education widely available at lower cost. Udacity courses are designed to stream trained workers into jobs in conjunction with corporate sponsorship.

For the investors a pronounced agency is to achieve return on investment whether it is in direct revenue or through the future workforce. They express no rush to do this as return on investment takes time: Scott Sandell, a financier at New Enterprise Associates is quoted in Lewin (2013, Jan 8) as saying, "We invest with a very long mind-set, and the gestation period of the very best companies is at least 10 years" (para. 9).

Beyond the gaps in the financial information there is an absence of voices discussing the financial implications of MOOCs for education. High-level university administrators from the large universities refer to the new partnerships in online education (MOOCs) in economic terms. When rank-and-file professors speak, it is largely about pedagogical matters. Students exist as circulating concepts in the Becoming Financially Sustainable strand; they figure as large numbers of consumers that justify the financial decisions made by university administrators. Students and professors appear largely as circulating concepts that function to support the construction of the corporate economy of MOOCs. Students never define the controversy.

In addition to the five claims associated with the construction of the social, the discussion of confluences demonstrates in part how the controversy of MOOCs can be conceived as a complex network that is constructed in the INYT. Of course, it is an incomplete account—there are seven more strands yet to be analyzed, signalling perhaps the long and slow process involved in engaging an ANT approach. With each analysis of a strand the nuances of the network become more visible. How each strand functions in relation to the others slowly becomes evident. We can see already how different forces are enacted and effect one another. For example, by presenting a series of events in the MOOC project and linking them to the initial experiment the Origins strand creates a sense of coherence, despite change.

By applying pressure on universities to join the MOOC experiment, the Inevitability of MOOCs strand renders boundaries between two groups: primarily between those universities that participate and those that do not. The Becoming Financially Sustainable strand is expansive with confluences with every other strand. It constructs a networked and hierarchical society and drives the MOOC experiment. The Inevitability of MOOCs strand inscribes us into the mechanics of the social being constructed. Each strand exerts a force that is amplified or modified in conjunction with one another. How this translation works can be seen in the analysis of the passages.

Analysis and Discussion of Three Passages

In the previous section, a passage from each of the three strands was extracted and analyzed through the four ncodes: Agencies, BoundaryFormations, Actions, and ActorsTheories. (Imperative Statements, which was initially an ncode, became the strand Inevitability of MOOCs and so, no longer functioned as an ncode.) The ncodes, which had served as markers when first applied, here functioned as analytical tools; used by the researcher, they allow a more detailed analysis of the mediation of meanings in passages. Each ncode was associated with a compilation of principles extracted from ANT. The following discussion looks at the results that came from enacting the translated ANT approach.

A Passage from Origins

> Many educators saw the move of Udacity to vocational training as an admission of defeat for the idea that online courses would democratize higher education—and confirmation that, at its core, Udacity, a company funded with venture capital, was more interested in profits than in helping to educate underserved students (19:6) (Lewin, 2013, Dec. 12, para. 13).

In passage one, the three Agencies that were identified imply dichotomous or oppositional views: Udacity values profits over helping to educate underserved students; there is an incommensurability between democratic ideals and profit motives; and "many educators" are not on board with the MOOC project. Even when dichotomous viewpoints are indicated, support for only one of those views is expressed. From an ANT position, how does this occur? The "many educators" who represent support for the democratization of higher education remain anonymous and are attributed with only one attribute: they exist as a circulating concept. Udacity, representing the profit-motive, however, has many attributes and is a focus throughout the corpus. In the passage, the "many educators" and Udacity are oppositional but they don't hold the same weight. This imbalance is markedly visible through the detailed analysis that the translated ANT approach provides.

a) Passage-Actors Mediate Social Order.

The Action of the passage is the creation of a dichotomy with "underserved students" and "many educators" on one side and profits and Udacity on the other. The resultant split is a BoundaryFormation. The worldview, or Actor'sTheory, of the "many educators" is that MOOCs (implying Thrun-Udacity) have failed to reach underserved students and democratize education. This worldview is readily "rebutted"[lxiii] in the final statements of the news story when Thrun responds: "I care about education for everyone, not just the elite […] we want to bring high-quality education to everyone, and set up everyone for success. My commitment is unchanged" (Lewin, 2013, Dec. 12, para. 17). The worldview of the many educators briefly interrupts the Thrun-Udacity narrative but has little force; in its easy rebuttal by Thrun-Udacity, it ultimately supports an opposing argument without ever becoming a full argument itself. In this way "many educators" functions as a circulating concept that never reaches the state of being a full-blown

actor with expertise, resources and a voice; it serves a worldview oriented toward the stability of a market while Thrun-Udacity is relinquished from responding to the public debate on the topic of democratizing higher education.

A Passage from Inevitability of MOOCs

While the Agency of media hype is mentioned, it is described as overblown; the greater, "true", Agency is the threat MOOCs pose to the "traditional classroom model of knowledge transmission". Administrators must face "the fact" that MOOCs are going to inevitably change the traditional classroom model; the claim, "to ignore MOOCs is to risk peril", suggests that the only viable choice for universities is to get involved with the MOOC project. This passage shifts the news story from a state of skepticism to one of urgency to engage: MOOCs are already having an impact and they need to be taken seriously.

b) Imperatives Place Limits on the Social.

One BoundaryFormation is time-based, making evident a distinction between the past of higher education—associated with the traditional classroom model of knowledge transmission—and, the future of higher education, which includes MOOCs. Universities are impelled to make a decision now: either engage with the MOOC project and survive or ignore it and be in peril. Adrian Smith, Vice Chancellor of the University of London is positing a view that there is a clear boundary between traditional classroom models of knowledge transmission and MOOCs, but then problematizes that view by stating that the boundary is already being eroded by MOOCs. The Actor's Theory posited is a practical one: there is no time for deliberation on the existence of MOOCs, there is only time to get involved. The only action to take is deciding "how quickly to get involved". It is a matter of time, but, because it is imperative, that time is short.

A Passage from Becoming Financially Sustainable

> 'Georgia Tech is exceptionally important because it's a prestigious institution offering an important degree at very low cost with a direct connection to a Fortune 100 corporation that will use it to fill their pipeline,' said Terry Hartle, senior vice president of the American Council on Education. 'It addresses a lot of the issues about universities that the public cares about. But how good and how transferable it is remain to be seen'. (14:43) (Lewin, 2013, Aug. 10, para. 29)

The Georgia Tech online master's program experiment brings élite education together with élite corporations as a model for cost efficient employment-oriented education that satisfies public concerns. There is some uncertainty about the quality and transferability of that education.

Online education accreditation is aligned with corporations (i.e., private education); and employment is aligned with public interest.

The Action *described* in the passage is the Georgia Tech Master's program experiment. The Action *performed* by the passage is the alignment of public concern with education and corporate partnership and employment.

c) The Passage Itself Becomes a Mediator.

Coming at the end of the news story the passage affirms the possibility that MOOCs could become financially sustainable, but also raises uncertainty about the extent this model can be applied within the university system. The quote by Terry Hartle from the American Council on Education, a non-profit public policy advocacy and research association (https://en.wikipedia.org/wiki/American_Council_on_Education), provides a final but measured endorsement. Will the experiment be successful? To what extent is the model transferable? The

questions offered by Hartle are open-ended, suggesting that there is still a place for the interests of universities (not partaking in the MOOC project) in the passage.

Georgia Tech's Master's program experiment is the model to be watched. It is the concrete experiment by which other administrators are assessing the accreditation of MOOCs. Will it be an economically sustainable model for education? Education in a prestigious university can be affordable, provided the experiment succeeds.

Summary

In the first passage, oppositional forces (Udacity and "many educators") are made evident but one of them, "many educators", a circulating concept, is not attributed the necessary substance to enact change; hence the "many educators" is a weak mediator having minimal effect apart from serving as a minor deflection to the opposing view. "Many educators" is a weak mediator rather than the oppositional force the content first suggests.

The second passage is associated with the Inevitability of MOOCs strand, which consists of imperatives and/or pressure statements compelling universities to join the MOOC experiment, and the Universities fear being left behind substrand. A BoundaryFormation delineates between traditional classroom models of knowledge transmission, which we are moving away from, and MOOCs, which we are moving towards. There is a sense of urgency: there is no turning back, no time for deliberation only time to engage. The pressure statements are forceful due to the emotional references, namely fear and worry, as well as the temporal urgency they express. Those universities that don't adapt will fall behind; those that do must reinvent themselves. The importance of time as a construct in the social becomes evident. The only social that matters are universities that include MOOCs; it is a social with temporal constraints.

The third passage is associated with the Becoming Financially Sustainable strand and the Lowering tuition costs of higher education until the underwriting ends substrand. This strand expresses an economic landscape to which large U.S. universities in the INYT corpus are contributors. In the passage, the public (a circulating concept) functions as the rationale for the alignment between education, corporate investment and corporate employment.

It is within this economic landscape that administrator/educator Hartle raises the question of whether the Georgia Tech experiment will serve the public interest. Hartle, unlike the "many educators" has attributes—he is senior vice-president of the American Council on Education —and speaks. In this one moment, uncertainty about the MOOC project has weight. This demonstrates how, even when a position is presented as oppositional—as with the "many educators" in the first passage—it does not necessarily have force but when a position is attached to a specific network—as with Hartle in the third passage—it can have greater effect. Despite the network of financial interests, Hartle's position and relations to within the network of educators gives authority to the uncertainty produced.

Chapter 6. Conclusion

Purpose of the Chapter

Chapter 6 discusses the importance of the translated ANT methodology: first, to the scholarship on the news coverage of MOOCs; and second, to the study and engagement of ANT in the field of education. Contributions and limitations are explored. Finally, questions are posed and future directions for research are presented.

Significance of the Research

The research for this dissertation deployed ANT principles—as expressed in RAS—for the study of media coverage of MOOCs as expressed in the INYT, in the years 2012 to 2015. A key objective was to translate ANT principles based on RAS (Latour, 2005) into a workable approach for the study of a controversy. The controversy selected was on the topic of the news coverage that followed the launch of Massive open online courses by U.S. elite universities in the early 2010s, a particular moment in time when an educational technology made the popular news and caught the attention of scholars working in the field of education. This research has demonstrated how an ANT-based approach might work by enacting a methodology constituted solely by ANT principles. A chapter-by-chapter review presents the contributions of the translated ANT methodology to the study of the MOOC controversy. What such an approach contributes to the study of MOOCs and in more general terms to the field of education is discussed. Future directions follow.

The translated ANT approach provides a methodology for engaging with text as an assembly of passage-actors. The text is neither a representation of reality, nor is it an instance of the endless deferral of meaning but is an assembly of passages that act within an emergent dynamic network of passage-actors. These passage-actors and their effects can be described and mapped resulting in ontologically based and empirical accounts. As a study of a corpus of text activated by the researcher, the limitations are clear. The study cannot say anything about anything apart from what is stated or enacted by the text and researcher. But in its multiplicity this account offers a rich, nuanced, and dynamic understanding of the MOOC controversy as expressed in the INYT. It provides the evidence against which any claims about the orientation of the news stories can be assessed.

For example, the notion that the INYT privileges an economic rationale for MOOCs can be checked against the diverse ways that economic interests are enacted in the corpus and the relations that they respond and give rise to. In an ANT approach, the text is treated as simultaneously real and constructed. Ncodes, strands, substrands and confluences emerged as conceptual tools in the process of translating ANT principles. Ncodes initially functioned as markers, similar to Latour's clamps for keeping everything on one ontological plane. Later they shifted into analytical tools that allowed for analysis while maintaining the multiplicity and complexity of the data. The Strands of repeated meanings revealed associations and those associations revealed shifts; passages became passage-actors with each having the capacity to do work.

The translated ANT methodology is a demonstration of a methodology based on ANT principles from RAS, that can be used for the analysis of controversies in news media. It draws from Bruno Latour's presentation of ANT without mixing it with ANT approaches that have been developed by others, such as Law and Callon, and without using it to modify an existing textual analysis approach—CDA, topic modelling, content analysis. It supports the claim that ANT is a sensibility that arises, to the researcher at least, through patient and precise engagement of ANT principles with the matter of a controversy.

Contributions, Chapters 2-4

Chapter 2 situates Latour's contribution to ANT in RAS in relation to the work by Michel Callon and John Law, other well-known contributors to ANT, and the critical reception of it. RAS offers an approach that overcomes the impasse of deconstruction versus realism in favour of an approach that allows us to see reality as a continuous composition. In Chapter 3, I use the Scopus and ERIC databases to show that ANT in its varied forms is on the rise in the field of

education; the highest number of peer-reviewed journals emanates from Australia, the United States and Canada, but interest in ANT is expressed internationally. How ANT ideas or principles enter a research design and the strategies for their deployment is reviewed and commented upon in seven studies: ANT principles: inform the theoretical framework to take into account emergent relations (Bisset, Potvin & Daniel, 2013); provide analytical interpretation of data (Habib & Johannesen, 2014); are used strategically for reassembling the social and consequently empowering special needs students in technology use (Tatnall, 2014; Adam & Tatnall, 2010); are integrated with Critical Discourse Analysis providing an example of a hybrid research design (Koyama, 2017); are used methodologically as descriptive/reflective story writing and analyses where the researchers write themselves into the narrative (Hamilton, 2011); are a part of an aggregate of heuristics for the study of technology-in-use (Adams & Thompson, 2011); inform the methodology where the tracing of movements composes a digital infrastructure (Decuypere & Simons, 2014).

Rather than evaluating ANT research, I draw on Latour's (2005) three considerations for the vitality of an ANT text (Chapter 3) as a tool for the analysis and elaboration of the characteristics of an ANT-based study by Decuypere and Simons (2014). In this way, I show how the social is reassembled in the text. In Chapter 4 detailed descriptions of the steps and movements in RAS are provided with an eye towards discerning the components that could be reassembled as a methodology. Based on this, I extrapolate to discuss the role of the researcher in ANT, emphasizing allowing the actors to speak for themselves, recognizing and not interfering with their worldviews, and withholding *a priori* assumptions about what the social consists of so as not to foreclose on the collective.

Contributions, Chapter 5

Chapter 5 is composed in three parts. The first introduced the controversy, setting the stage for media analysis through a review of the literature on media coverage of MOOCs. The review with its focus on methodology beings to differentiate the translated ANT approach from other methodologies on a shared topic of investigation. As suggested early on the translated ANT methodology emphasizes associations and effects. To do this, the ANT researcher must avoid making *a priori* assumptions about the social beforehand, and instead, using an inquiry approach begin by asking, what is there?

In Chapter 5, part 2, ANT principles are extracted from RAS, interpreted and applied to the analysis of the INYT corpus. Based on this, five navigational codes or ncodes are developed as new tools for analyzing passages of text. They include: Agencies, BoundaryFormations, Actions, ActorsTheories and ImperativeStatements. ImperativeStatements was later dropped from the list and formed the basis of a new strand. Each of the four ncodes consists of a cluster of related ANT ideas that emanate from the uncertainties derived from RAS (e.g., nature of groups, nature of actions, and nature of objects). These ncodes, which at first were markers helping the researcher to stay on an ANT track, later become analytical tools. In Chapter 5, part 3, the enactment of the translated approach demonstrates their application to three passages, one from each of the three strands. The ncodes made it possible to analyze passages while maintaining the multiplicity; the tools make it possible to work with complexity.

Strands, substrands and confluences are developed as tools for mapping meaning, not solely as representation but as expression. In ANT terms, the passages of a strand are mediators of meaning, not intermediaries. In other words, the strands have agency; they do things. Seeing them this way is a mental act on the part of the researcher and is what some scholars might mean

when they describe ANT as a sensibility (Fenwick & Edwards, 2010; Law, 2009). Strands are a device that allows the researcher to follow the movement of meanings in a relational way. Substrands are guides to heterogeneous data. They don't add up to the strand; they are aspects of trajectories but not separate from the strand. As Fenwick and Edwards (2010) write, ANT doesn't tell us what it is. ANT can tell us however how it is that things come together. Based on the detailed descriptions of the three strands, five concluding claims are proposed. They include:

1) Descriptive writing of passages in the strands challenges the notion of a one-direction singular story (the repetition of ideas in passages —high student enrollments—not only contributes to the construction of a fact but works to offset opposing forces. For example, the failure of experiments between Udacity and San Jose State University. The number of students counters something else that happens; there is a collapsing of time because the number of students precedes the experiments. But the repetition of the number throughout the corpus, keeps the meaning active; it is continuously being constructed. The question is: what does it continually construct? In the expression of the MOOC controversy in the INYT, it is the initial promise of MOOCs as attributed to the large enrollment numbers that is continuously constructed).

2) Mapping and describing strands makes evident constructs and their effects in the network. For example, in a passage analyzed in the Origins strand, a report on the growth of Udacity from a home office to a medium-sized enterprise is magnified to a prediction that his project will "upend Western academic institutions" in one sentence. This then contributes to the imperative for universities to get on board the MOOC project.

3) Meaning is mediated through repetition (repeated meanings endure—they can even become factual—but they are also modulated through connection). This has implications

methodologically. In thematic approaches to the analysis of text (i.e., open coding), we reduce meaning to the core meaning of a passage, but in the process of doing so, we sever it from its connections with other passages. We end up creating a new theme that we believe characterizes the thematic content of the text.

If we reduce themes to core ideas, we are able to break off potential meaning connections. We no longer see passages as mediators, but simply as conveyors of information. For example, when the Origins strand comes together with the Technology and Becoming Financially Sustainable strand following the failed San Jose experiment, the Origins story shifts towards the creation of private vocational training in technology. The meaning continues but is reoriented and some of the claims that initially adhered to it, fall away, such as democratizing education.

4) Inclusion in the group that matters is a repeated imperative. Repetition of meaning is not simply the repetition of words, in the example provided, repetition of a tone of address that continuously produces pressure.

5) The Movement of small and large amounts of money conveys a rudimentary financial network. Following the Becoming Financially Sustainable strand, what gets constructed is a simple financial network where large amounts of money moves from financiers and universities to private and public consortia and small amounts of money from large numbers of students moves to the consortia, universities and financiers. This produces a sketch of an economy where MOOCs are financially sustained.

These five claims tell us something about how the MOOC controversy is expressed in the INYT by showing us the mechanics and operations of the construction. On the part of the researcher, these results require a sustained commitment to following the actors, empirically.

Responding to the question: What is the social that appears? The ncodes were used analytically to analyze a passage of text derived from each of the three strands. Three claims are proposed:

a) *Passage-actors mediate social orders.*

For example, in the passage from the Origins strand, that is analyzed, the "many educators" is introduced as a concept with little shape. Its attributes are general, making them easy to transfer to other actors, even those, to which the many educators are opposed. In other words, the many educators concept strengthens the opposing view.

b) *Imperatives place limits on the social*

The effective tone of the boundary delineation of the passaging from the Inevitability of MOOCs strand, that was analyzed, reduces the field of options for universities to two possible choices: going with the MOOC project and experiencing success or not going with the MOOC project and risking peril. Further, the passage reinforces a construction of higher education as consisting of elite and non-elite universities with elite universities as the leaders.

c) *The Passage itself becomes a mediator.*

For example, in the passage from the Origins strand, that is analyzed, the content suggests that many educators are in opposition to the profit-motive associated with Udacity. But as a mediator with no attributes the many educators effectively support the opposing view. In a different passage, this one in the Becoming Financially Sustainable strand, that was analyzed, an educator with attributes speaks. What appears to be an endorsement also has the effect of raising questions about and casting doubt on, the privatization of online education or MOOCs, making it an important position on the controversy on MOOCs. Thus, the content that is read, doesn't necessarily align with what the passage is doing in relation to other passages. The disjunct

between content and effect might not be picked up in a thematic approach. Because ANT is focussed on network effects, the translated ANT approach provides an analysis of the passages that is dynamic and relational. The passages in the translated ANT approach are mediators; they are passage-actors making evident not just the relations but the unevenness of those relations and the configurations of power.

Future Directions

The research identified ten strands; three strands were described in detail and three passages were analyzed. A similar approach to the other seven strands would result in a more comprehensive and detailed analysis. Likewise, more than three passages could be analyzed with attention to the confluences and their effects.

New studies could explore controversy in various genres. For example, the coverage of the controversy of MOOCs in educational only news media could be analyzed using the translated ANT approach. What strands might appear in the educational news? What are the confluences? What are the effects? Questions too about the social can be explored: What is the social that is being made to appear in these diverse news sources? A translated ANT approach could be explored for its potential transferability to other controversies in higher education such as the pandemic of Covid 19. It's possible to consider drawing on this detailed approach to compare the actor-networks within news stories and educational policy documents. Another trajectory of research could involve comparison of methodologies of textual analysis: the translated ANT approach, CDA, content analysis, and ethnography (thick description).

The study of ANT is an emergent and exploratory area in education. The strength of the translated ANT approach resides in its ability to produce rich empirical descriptions and analyses, and to show movement, and relations. There are challenges in working with the

abundance of heterogeneous information while trying to maintain the multiplicity; it calls for a slow and detailed accounting and the development of a relational sensitivity. These aspects are possible limitations. However, from an ANT perspective, maintaining the multiplicity and slowing down—not taking shortcuts—are crucial to achieving greater inclusivity. ANT offers us ways to rethink the social in the interest of composing the future common world.

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Appendices

Appendix A

A1 Search Strategy For ANT-based Research in ERIC and SCOPUS Between 1996-2017

Database		**Rationale for Search**	**Keywords**	**Limits/Exclusions**	**Results**
Eric, Scopus, Google Scholar		Background Education research	"actor-network theory" and "education"	Conference papers, literature reviews, books	***5**
ERIC	1996-2017	ANT principles constitute a key role in the research design	"actor-network theory"	Journal articles (research, evaluative, descriptive); peer-reviewed	154
SCOPUS	1997-2017	ANT principles constitute a key role in the research design	"actor-network theory" AND "education"	Journal articles; peer-reviewed	176
ERIC/SCOPUS combined	1996-2017	ANT principles constitute a key role in the research design	"actor-network theory" AND "education"	Journal articles; peer-reviewed	239

Note: *****Literature reviews, books, and conference papers included in final combined totals.

A2 Number of Peer-Reviewed Articles on the Topic of ANT Published in Scopus, ERIC and the Two Sources Combined (N=235)

Years	No. of peer-reviewed articles (*f*)[1] SCOPUS	No. of peer-reviewed articles (*f*)[2] ERIC	No. of peer-reviewed articles (*f*)[3] Combined
2017	19	16	25
2016	19	12	22
2015	26	13	29
2014	14	9	18
2013	12	10	17
2012	16	12	20
2011	23	19	31
2010	16	12	22
2009	7	8	12
2008	3	4	6
2007	7	4	8
2006	3	8	10
2005	0	2	2
2004	2	3	3
2003	3	1	4
2002	0	1	1
2001	0	1	1
2000	0	0	0
1999	1	1	1
1998	1	1	1
1997	1	0	1
1996	0	1	1

	n^1=173	n^2=138	N=235

Appendix B

An Overview of Heuristics for Technology-in-Use Based on Adams & Thomson (2011)

Heuristic	Source(s)*	Description
"Following the actors"	(Latour, 2005)	Identify actors and look for configurations. The researcher is confronted with actors' establishing boundaries.
"Attending to the invitational quality of things"	(Heidegger, Illich, 1996; Lingis, 2004; van Manen, 2007)	Listen to what [modern] objects [of technology] say, rather than do'; be responsive to the things of our world; the following question demonstrates the approach: *What invitation does PowerPoint make of the teacher while they are (using the technology) to compose the next classroom presentation?*
"Discerning the spectrum of human-technology relations"	(Ihde, 1990)	▪ Through embodiment ▪ Through hermeneutics (technology is read for meaning) ▪ Through alterity (a technological artefact is experienced anthropomorphically), and ▪ Through background (technology is taken-for-granted)
"Recognizing the amplification/reduction structure of such relations"	(Ihde, 1990)	Ask what a technology enhances and what it reduces, experientially and hermeneutically.

"Applying the law of media"	(Marshall and Eric McLuhan)	Consider four *laws of media* through the following questions: "What does [this technology or medium] enhance or intensify?" "What does it render obsolete or displace?" "What does it retrieve that was previously obsolesced?" "What does it produce or become when pressed to an extreme?" (McLuhan and McLuhan 1988, 7) See Figure 1, *PowerPoint* tetrad, p. 743 (which demonstrates simultaneous effects)
	(Latour, 2005)	Study accidents or breakdowns in order to see alliances of people and things before they become normalized and invisible.
"Untangling tensions"	(Latour, 2005)	Take note of stabilizations and disruptions.
"Constructing co(a)gents"	(Michael, 2004)	Consider multiple subject / object connections. In ANT, human technology relations are joined by hyphens-making evident bi-directionality; co(a)gents make patterns of connection visible; in phenomenology – "the reciprical insertion and intertwining of one in the other" (Merleau-Ponty, 1968, p. 138) is evident; and in post-phenomenology hyphens and brackets define types of relations (Ihde, 2004)

Note. * For a complete list of sources refer to Adams and Thompson (2011)

Appendix C

A Comparison of News Titles Published by the *International New York Times* and the *New York Times* on Massive Open Online Courses (MOOCs) from 2012 to 2015

International New York Times					***New York Times***		
ID	**Date**	**Source**	**Author**	**Title**	**Date**	**Source**	**Title**
1	18-Jul-12	INHT finance	T. Lewin	Consortium bolsters shift in university education; Prestigious partners join effort to reach millions through online courses	17-Jul-12	NYTF national desk; SECTA	Universities Reshaping Education On the Web
2	05-Nov-12	INHT finance	L. Pappano	Suddenly, millions have started taking U.S. university classes online; Education	04-Nov-2012	NYTF Education Life Supplement; SECTED	The Year of the MOOC
3	08-Jan-13	INHT news	T. Lewin	A rush to reinvent learning; Students flock to Web, but a model that pays the bills remains elusive	07-Jan-2013	NYTF national desk; SECTA	Students Rush to Web Classes, But Profits May Be Much Later
4	16-Jan-13	INHT finance	T. Lewin, J. Markoff	California sees promise in a new model of online education; Collaborative process may reduce dropout rate and ease professors' fears	15-Jan-2013	NYTF Business/Financial Desk; SECTB	California To Give Web Courses A Big Trial
5	28-Jan-13	INHT edit	T. L. Friedman	Revolution hits the universities	27-Jan-2013	NYTF OP-ED COLUMNIST Editorial Desk; SECTSR	Revolution Hits the Universities
6	**28**-Jan-13	INHT finance	A. Smale	Elite forum hears of learning's next wave; Davos 2013	2013-Jan-**28**	NYTF Business/ Financial Desk; ECTB	Davos Forum Considers Learning's Next Wave

7	-Feb-13	INHT news	D.D. Guttenplan	A hit in the U.S., open online courses get a cautious reception in Europe; Skepticsraise concerns about profit motive, but some institutions sign on	2013-Feb-18	NYTF Foreign Desk; SECT	Europeans Take a More Cautious Approach Toward Online Courses
8	2-Feb-13	INHT finance	T. Lewin	Universities around world rush to offer online classes	2013-Feb-21	NYTF National Desk; SECTA	Universities Abroad Join Partnerships On the Web
9	25-Feb-13	INHT news	J. Lau, C. Yang	Universities UK welcomes Indian partnerships; Briefly: Education	2013-Feb-28	BRIEFLY: EDUCATI Foreign Desk; SECT	Universities UK Welcomes Indian Partnerships
10	04-Mar-13	INHT finance	A. Eisenberg	How to stop cheats when test is online; Novelties	2013-Mar-03	NYTF NOVELTIES Money and Business/Financial Desk; SECTBU	Keeping an Eye On Online Test-Takers
11	07-Mar-13	INHT edit	T. L. Friedman	The professors' Big Stage	06-Mar-2013	NYTF OP-ED COLUMNIST Editorial Desk; SECTA	The Professors' Big Stage
12	18-Mar-13	INHT edit	E. Morozov	Open and closed	17-Mar-2013	NYTF OP-ED GUEST COLU Sunday Review Desk; SECTSR	Open And Closed
13	06-Apr-13	INHT news	J. Markoff	Coming to campus: Software to grade essays; Evaluating written work with machines sets off a debate at universities	05-Apr-2013	NYTF National Desk; SECTA	Software Seen Giving Grades On Essay Tests
*31	22-Jul-2013	INHT news	J. Lau	U.S. online course provider tries to enter China market; Briefly: Education	2013-Jul-22	NYTF BRIEFLY: EDUCATI Foreign Desk; SECT	U.S. Online Course Provider Tries to Enter China Market
14	10-Aug-13	INHT news	T. Lewin	Educators planning big leap in online coursework; Elite master's degree at a discount price could upend on-campus model	2013-Aug-18	NYTF VIRTUAL U. National Desk; SECTA	Master's Degree Is New Frontier Of Study Online
15	16-Sep-13	INHT news	L. Pappano	The long path from Mongolia to M.I.T., by way of the Web	2013-Sep-15	NYTF Magazine Desk; SECTMM	The Boy Genius of Ulan Bator

16	23-Sep-13	INHT news	C. F. Schuetze	Another classroom revolution on the Web; Online open courses, often free or low-cost, catch on in Europe	2013-Sep-23	NYTF Foreign Desk; SECT	European Universities Catch an Online Wave
17	26-Sep-13	INHT finance	ALAN Finder	Redefining education on the Web; Tool Kit	2013-Sep-26	NYTF TOOL KIT Personal Tech; SECTB	A Surge in Growth for a New Kind of Online Course
18	15-Oct-13	INHT finance	M. Coleman	College online -- everything but the campus; Special Report: Turning the Page	2013-Oct-15	NYTF SPECIAL REPORT Foreign Desk; SECT	Predictions for Health, Science and Life
19	12-Dec-13	INHT news, International New York Times	T. Lewin	Setbacks force new look at mass web courses; Education	2013-Dec-11	NYTF National Desk; SECTA	After Setbacks, Online Courses Are Rethought
20	2Feb-14	INHT edit, International New York Times	T. L. Friedman	Breakfast before the MOOC	2014-Feb-20	NYTF OP-ED COLUMNIST Editorial Desk; SECTA	Breakfastbefore the MOOC
21	14-Apr-14	INHT news, International New York Times	D.D. Guttenplan	Out in front in taking universities' mission online; International Education	2014-Apr-14	NYTF INTERNATIONAL EDUCATION Foreign Desk; SECT	Out in Front, and Optimistic, About Online Education
22	28-Apr-14	INHT news, International New York Times	C. F. Schuetze	Adapting for the future at European conference; International Education	2014-Apr-28	NYTF INTERNATIONAL EDUCATION Foreign Desk; SECT	Adapting for the Future at European Conference
23	31-May-14	INHT finance, International New York Times	J. Useem	Harvard Business School tests Web waters; Online course that breaks with traditional teaching has divided professors	2014-Jun-01	NYTF Money and Business/Financial Desk; SECTBU	B-School, Disrupted
24	05-Jun-14	INHT finance, International New York Times	K. Eaton	Via tablet or smartphone, MOOCs provide gateway to free education	2014-Jun-05	NYTF APP SMART Personal Tech; SECTB	Via Tablet or Smartphone, Learning With MOOCs
25	19-Jun-14	INHT finance, International New York Times	E. Porter	A smart way to bypass college costs; Economic Scene	2014-Jun-18	NYTF ECONOMIC SCENE Business/Financial Desk; SECTB	A Smart Way to Skip College
26	29-Aug-14	INHT finance, International	M. Wood	Bringing tech culture to the staid campus quad;	2014-Aug-28	NYTF MACHINE LEARNIN	Bringing the Culture of Tech to the Staid College Quad

27	03-Nov-14	INHT finance, International New York Times	J. J. Selingo	After the hype, open online courses finding pitfalls; Education	2014-11-02	NYTF NOTEBOOK | ONLIN EDUCATION Education Life Supplement; SECTED	Demystifying the MOOC
28	17-Sep-15	INHT finance State of the Art, International New York Times	F. Manjoo	Tech training for the masses	2015-Sep-17	NYTF STATE OF THE ART Business/Financial Desk; SECTB	Teaching Tech Skills to Millions, and Fast
29	15-Oct-15	INHT finance, International New York Times	P. Cohen	U.S. to fund nontraditional education programs; Some coding boot camps and online classes may now be eligible for loans	2015-Oct-14	NYTF Business/Financial Desk; SECTB	U.S. Will Approve Some Programs Eligible for Student Funding on Its Own
30	1-Dec-15	INHT finance, International New York Times	J. Markoff	Online courses gain in popularity	2015-Dec-31	INHT	Online courses gain in popularity

*****_Note._ News stories ordered chronologically with the exception of Lau (ID 31) which follows Markoff (ID 14).

Appendix D

Example of a Summary Account of a News Story

Title: Consortium bolsters shift in university education; Prestigious partners join effort to reach millions through online courses
Date: 18 July 2012
Events:
U. of Virgina President Teresa Sullivan ousted by Board of Directors (June 7th)
12 universities join Coursera - > become a part of the consortium
Coursera reaches 1.7 million students (metrics are used as indicators of growth)
The news story itself is an event. Consortium bolsters shift in university education; Prestigious partners join effort to reach millions through online courses
U. of Washington (Coursera partner) plans to offer online courses for credit [DATE: UNKNOWN] (stabilizing)
Udacity: students pay $80 at testing centres operated by Pearson (global education) (stabilizing)
Summary

In this story, three forces of change are identified to account for radical changes in online learning: "greatly improved quality of online delivery platforms, the ability to personalize material and the capacity to analyze huge numbers of student experiences to see which approach works best". These technological advances in the form of massive open online courses are "likely to open higher education to hundreds of millions of people". Massive open online courses serve as a technological figuration, a form or shape that is driven forcefully by the three technological advances. The story is held together by three powerful figurations: seismic shift, tsunami and wave of publicity. The first--"seismic shift"--announces change as a sizeable force. The change is unrefutable when it is a tsunami: "This is the tsunami" stated by Richard DeMillo from Georgia Tech which happens to be a technlogical institute of higher learning. This is coupled with a collecting statement: "[…] it's hard for me to imagine any large research university that wouldn't want to be involved". This is true when referring to a powerful natural phenomena such as a seismic shift or tsunami. Finally, a third reference, "wave of publicity" is made in reference to media attention that Sebastian Thrun's Artificial Intelligence course offered through Stanford University. Three figurations of a related thematic are evoked by the news story working to hold the idea of force throughout the story. Other figurations--"experiment" is referred to by two spokespeople/actors: Richard DeMillo and Molly Corbett Broad. For DeMillo the experiment is so powerful that he can't imagine "any large university that wouldn't want to be involved". For Corbett, the idea of the experiment is occurring at such a substantive scale that we cannot afford not to pursue it. Change led through technological advancement is forceful, of a large scale and experimental. Ultimately, it cannot be resisted. Even the University of Virginia's president, (she was ousted from the university for her "slowness" in adopting online education and later rehired)

has become a Coursera partner. When the resisting Virginia network joins, the Consortium network seems more enduring.

Agencies

Main: technological advancement in online education is forcing change to higher education

Cause: technological advancement (sociology of the social)

n=15 (includes main)

01. (story) slowness in adopting online education (refers to ouster of T.Sullivan, President, U. of Virginia)

02. (ACE, president) there are some bumps, but it is an important experiment at a large scale (American Council on Education, Corbett Broad);

02. (Story) high enrollments, small percentage complete, "but even so, the numbers were staggering"

03. (U. of Washington, provost) no credit, only certificates (David P. Szatmary)

04. (Consortium, Udacity, founder) courses still experimental, rushing, hasn't seen a single study that shows that online learning is better than other learning (Thrun)

05. (Consortium, Coursera) worldwide access is the goal (Daphne Koller)

06. (Consortium, Coursera, founder) universities design and produce their own courses (Daphne Koller)

07. (Consortium, Coursera, founder) self-sustaining not a pressing concern (Daphne Koller)

08. (Michigan, professor) academic have soapbox (Scott E. Page)

09. (Stanford, professor) learning can go deeper (Dan Boneh)

10. (Duke, provost) two or three different relationships [between universities and providers], need flexibility (Peter Lange)

11. (Caltech, professor, Story) cheating problem (right person using the right materials) (Antonio Rangel)

12. grading (Caltech, professor)

13. (Michigan, professor) cannabilzation of university courses (Scott E. Page)

14. (Consortium, Coursera, founder) informal certificates (Daphne Koller)

Actions

Note: Actions taken in relation to an agency

Actions n=4

- (professors) professors rearrange courses
- (students) students pay $80 for exams at Pearson
- (professor) students show they can grade as well as the professor
- (story posits the question to Koller-Coursera) its unknown what to do if a student cannot match the professor's grading

Actions proposed for the near future

-students pay fee, do extra assignments, and work with an instructor
-charging students, or corporate recruiters

BoundaryFormations

WORLD VIEWS COMPETITION

-experts can predict who will emerge as a leader. [there is a race for online education distribution]

GROWTH OF THE RESEARH UNIVERSITIES AND THE CONSORTIA

-research universities are joining the Coursera drawing in millions of students and adult learners globally [growth of the consortium]
-new partners of the consortia are distinguished from old partners of the consortia
-the slow university (U. of Virginia) becomes one of the new partners of the consortia

TECHNOLOGY

-technological advancement versus (implied) non-technological advancement in higher education through online learning; technological advancement is the force of change, otherwise known as massive open online courses.

METRICS connect NEED

-the fact that so many people are so curious about these courses shows the yearning for education
-defining scale: "this is a very important experiment at a very substantial scale.'' [connects size and experimentation]

MOOCS OR ONLINE EDUCATION VS. TRADITIONAL EDUCATION

-MOOCs do not offer credit, only certificates [distinguishes MOOCs from traditional university fee paying programs; MOOCs do not yet meet the standards offered by degree programs]
-informal type of certification is set against traditional diploma (Koller)

COURSES

-most courses are applied sciences, computer & engineering, but medicine, poetry and history are beginning to develop. [with the exception of medicine, delineations are made between humanities and -sciences and applied sciences; it is implied that MOOCs are more amenable to teach online than humanities courses]
-resources are invoked; equity investments [some universities receive resources] for research universities

COMPETING CLAIMS

-"Mr. Thrun, a master of the open online courses, cautioned that for all their promise, the courses were still experimental. 'I think we are rushing this a little bit,' he said. 'I haven't

seen a single study showing that online learning is as good as other learning.' [speaking as an expert; Thrun is part of the *Beginning* story of MOOCs; this may be something education scholars would take issue with as there has been lots of research comparing student learning between online education and lecture classes, although perhaps not specifically with "MOOCs" per se, until years after]

CONTRACTS LEGAL

-relationship between universities and Coursera are defined legally through contracts; the company and universities share revenue streams, but each pay their own costs

Appendix E

Overview of Ten Strands and Substrands

Strand	Sub-strands	Description
Origins The birth story of MOOC platform providers	*Formation of the consortia* *Bringing online courses to the masses* *From college classes to vocational education*	The Origins strand is the birth story of MOOC platform providers. It includes a series of events (largely chronological) starting with the "Introduction to Artificial Intelligence (AI)" course taught by Sebastian Thrun and Peter Norvig through Stanford University (Lewin & Markoff, 2013) which drew 160,000 enrollments. There is some emphasis on Coursera and edX partnerships, but it is the story of Thrun and Udacity that is the driver of events throughout the corpus. Some of these events include: - To the researchers' amazement, Introduction to AI attracts high enrollments - Thrun co-founds Udacity - Thrun quits his day job as a professor at Stanford - Udacity & San Jose State University (SJSU) start a joint pilot project to help increase students' entry grades - the Udacity & SJSU pilot project fails to help students increase their grade scores (initially) - Thrun leaves online and lecture teaching for online vocational teaching of IT courses - Udacity and AT&T join to offer the 'Nanodegree'
Inevitability of MOOCs Bids universities to join the MOOC experiment.	**Universities fear being left behind** *Reinventing learning: universities have to adapt*	This strand consists of a series of pressure statements that bid universities to join or support the MOOC experiment. There are prescribed roles for the university; For example, these roles distinguish between large research universities (leaders) and small universities (followers). Universities are pressured through statements to join the MOOC experiment. For a large research university not to join the MOOC project is to face the fear of being left behind, and to miss out on the opportunities associated with advancing online teaching with MOOCs. The fear of being left behind is not an adequate option for universities as they face many pressures, including staying competitive, generating revenue and being accessible. Regardless, of whether or not a university joins the MOOC experiment, the articulated view is that they will all eventually have to adapt because the scale of the online technology or learning trends require it.

Becoming Financially Sustainable A driver and rationalizer of the MOOC experiment	*Lowering the costs of tuition* *Investing in MOOC providers (the underwriting)* *Investor patience* *Building in revenue*	Becoming Financially Sustainable is the largest(and perhaps most connected) of the three strands. It is a driver and rationalizer of the MOOC experiment. The emphasis is financial sustainability so concerns like lower tuition costs are expressed in economic terms. For example, there is a desire to adopt MOOCs and online education but not at the expense of a university's already incoming revenue. Sustainability is that the forefront of the MOOC project for the large research universities. Various financial models are presented. Investors and universities drive (economically) the MOOC / online project. And while university administrators, MOOC platform providers and even investors appear to come across as patient in terms the need for MOOCs to generate revenue, the push for building in revenue into MOOCs is established from the beginning.

Access (international) Access expands the networks; and, constructs the global.	*The remote village* *Access: theories and matters of concern*	Access expands the networks and constructs the global. The global is tied to the remote village. On the one-hand, the village has access to U.S. elite higher education; on the other hand, the consortia have access to new markets and expanded databases.

Large forces Large forces are figurations of change.	*Technological advancement in online education* *Determining scale* *Completion rates* *Enrolling students*	Large forces is a term given to both stabilizing and destabilizing forces. Taking a variety of forms – "a seismic shift", a "tsunami" or a "wave of publicity" (Lewin, 2012), high student enrollments or upscaling access – Large forces are figurations of disruption or of change. Destabilizing forces – cheating students, MOOC platform competitors, certification without accreditation, [low] completion rates, and disappointment that MOOCs are not attracting students that need access to higher education – are momentary.

Technology Solves agencies (concerns); it creates them too.	*MOOCs vs Traditional higher education (online versus brick & mortar)* *Solving scale*	The new online learning form is contrasted with traditional higher education producing a boundary between these two forms. MOOCs are progressive and forward looking. Traditional education is slow. Howevertraditional education for some universities (e.g. Harvard Business School) remains coveted. Technological progress is not entirely embraced. Pedagogical issues are raised by professors who express concern about continuing to provide quality education to so many students.

Students	*Justifying MOOCs*	Students is a circulating concept; it functions throughout

Metrics, and measures of success.	*Success stories, close-up*	the corpus as a rationalizer of particular worldviews held or actions taken by universities or their administrators. Students come across as the drivers of the MOOC project due to their high enrollment numbers and beneficiaries of MOOCs due to the personal success stories provided in detail. The story of Battushig from Mongolia is one such story. Another is a student, Daniel, who is autistic and speaks directly of his positive experience.

Experiment Stabilizes risk (failure or financial loss). There are safeguards and parameters built into it.	*MOOCs are experimentation* *Varied ambitions for MOOCs* *MOOCs in research: success and failure* *MOOCs for blended learning*	Experiment (19:1) is a strand that endures with many appearances circulating throughout the corpus. As a circulating concept, experiment has different attributes depending on its associations in the corpus. Experiment comes with safeguards and parameters built into it.

Certification (accreditation) Moves to standardize MOOCs.	*Certification and accreditation* *The value of certification for understanding the value of MOOCs (critical)*	Certification is the national and international standard by which MOOCs are measured. Attempts to get accreditation are there, however the focus is certification and providing an alternate, professional, option. The nano-degree is an option that gets around accreditation for entry-level IT employment.

Professors' Speak Professors bring forward their agencies, actions and worldviews.	*Communicating with students at scale* *Grading and humanities* *MOOCs are an experiment that works*	Professors bring forward their agencies/fantasies, actions, and worldviews on the subject of MOOCs, the classroom, economic topics, and their roles as professors; their statements for and against the MOOC experiment are quoted and paraphrased. They, along with organizations serve as the plurality of the constructed social. They serve as justifications for MOOC success. They are often professors of courses provided through the Coursera platform.

Appendix F

Description of Origins Strand

The Forming of the Consortia. The Forming of the consortia substrand consists of a series of passages that together tell the story of the formation of Udacity (1:12), the private MOOC platform enterprise started by Stanford professor Sebastian Thrun. The basic content of the story sets it in the Fall of 2011, when Sebastian Thrun and his colleague teach a free online course, Introduction to Artificial Intelligence (6:3), at Stanford University. The course draws in 160,000 students from 190 countries. In the story, the course is attributed the power of a large force capable of "upend[ing] American and perhaps other Western Academic institutions" (Sebastian Thrun quoted in Lewin & Markoff, 2013). The disruptiveness of the force is connected to the large metrics associated with it--160,000 students in 190 countries. In one telling of the story, the unexpected high enrollments are identified as a "revolution" that has left "higher education gasping" (2:3) (Pappano, 2012). The surprise element is shared by Thrun himself, who watches Udacity grow from "three guys" sitting in "Sebastian's living room" to an enterprise with 40 employees (Pappano, 2012, Nov.5).

Other, less enduring stories in the sub-strand are the formation of Coursera (1:49, 7:18), the private enterprise started by Stanford computer science professors Daphne Koller and Andrew Ng, and the formation of edX, formed by Harvard and the Massachusetts Institute of Technology, a non-profit platform provider (7:16). Together, Udacity, Coursera and edX (1:49) are described as the "consortium" (Lewin, 2012, July 18) and as the "three big names in online learning" (7:16) (Guttenplan, 2013, Feb. 18).

Coursera's large scale is reinforced by the university partnerships it builds upon—Stanford, Princeton, the University of Pennsylvania and the University of Michigan ("the original partners"), and later Yale, Duke, Wisconsin and the University of Chicago, the University of Edinburgh, l'École Polytechnique (France) and the Hong Kong University of Science and Technology (the "new partners")—and by the metrics attributed to its courses: "[s]eventeen months later, Coursera has partnerships with 84 universities and more than 400 courses" (Finder, 2013, Sept. 26). EdX too is attributed large metrics—"'155,000 students from around the world have taken edX's first course: an M.I.T. intro class on circuits'. That is greater

than the total number of M.I.T. alumni in its 150-year history" (Friedman, 2013, Jan. 28). The surprise element continues when Anant Agarwal, formerly the director of MIT's artificial intelligence lab and president of edX at the time of the news story, is quoted as saying that 2012 is the "year of disruption […] and the year is not over yet" (Pappano, 2012, Nov. 5). Revelation attributed to Thrun and colleagues is associated not just with the scale of the online courses but with the speed of their uptake as well.

There are three confluences along this sub-strand, two of which aggregate Origins with Large forces (1:12, 6:3). Large forces is a term given to both stabilizing and destabilizing forces. For example, large forces can be figurations such as a *seismic shift*, a *tsunami* or a *wave of publicity* (Lewin, 2012); they can also take the form of sizeable student enrollments as a disruptive force (Markoff, 2015) or the upscaling of technology to accommodate millions (Manjoo, 2015). Large forces are any figuration of disruption or change. In the Origins strand, '[low] completion rates' is expressed as a concern. Low completion rates matter to Sebastian Thrun, who finds himself troubled by them enough to hire "online mentors to help students stick with the classes" (Lewin, 2013, Dec. 12). Outside of the Origins strand, low completion rates is considered only lightly problematic as expressed by Lewin (2012, July 18): "only a small percentage [of students] completed the course", enrollments have been so high—in the millions—that even the fewer numbers of students who do complete a course is considered, "staggering" (para. 6). The concern for low completion rates is diminished by the magnitude of the enrollment metrics.

Bringing Online Courses to the Masses. A second sub-strand is Bringing online courses to the masses. Again, high number metrics for the first MOOC course are expressed (7:25) and continue to be associated with MOOCs as a revelation**.** In other words, the pace of MOOC growth continues to be fast and surprising; in a news story that covers a European conference organized by the Observatory on Borderless Higher Education, it is reported that "More than 160,000 students from 190 countries signed up, prompting Thrun to quit his day job (as a professor at Stanford University) and start his own online learning company, Udacity" (Guttenplan, 2013, Feb. 18). In the same news story, Thrun is identified as "German", in keeping with the topic of differences between the U.S. and European approaches to online education and MOOCs:

> Ever since the German computer scientist Sebastian Thrun sent out an e-mail in 2011 announcing that his 'Introduction to Artificial Intelligence' course at Stanford University in California would be available free online, the education world has been both enthralled and terrified by the advent of massive open online courses, or MOOCs (para. 1).

The delineation expressed as "enthralled" and "terrified" by the "education world" points to two ideas. First, the emotions—polar opposites—foreshadow the two distinct approaches to the rapid growth of MOOCs: a U.S. that is onboard with MOOCs and a Europe that is deemed more critical and skeptical of them. Second, emotions signal agencies. In this case, emotion-actors are

on full display in this news story: anxiety looms, desperation inhabits, and while interest is widespread, so too is suspicion.

The news story highlights a development at the Georgia Institute of Technology—it has plans to launch an online master's degree in computer science for much less cost—and presents the story of Battushig, a fifteen-year-old boy from Mongolia (14:3) who succeeds in a circuits and electronics MOOC offered through MIT. The figure Battushig appears only briefly in the Origins strand, as the focus is largely on the birth of MOOCs. Finally, the point is made that MOOCs have not lived up to their potential to reshape higher education.

From College Classes to Vocational Education. A third sub-strand, From college classes to vocational education, begins when Thrun steers Udacity away from college classes towards vocational training, supported by and in partnership with corporations, for students willing to pay a fee (19:6). "Many educators" criticize this move, suggesting it valued profit over the project of democratizing education and supporting "underserved students" (Lewin, 2013, Dec. 12). Responding to an article published in Fast Company (FC)[2], Thrun refutes the claim that he had said MOOCs are a "lousy product", "not a good fit" for students and that they couldn't work for any particular group of students (19:35) (Lewin, 2013). He argues that the San Jose State University pilot project he conducted was not the failure it appeared to be: innovations take several iterations to be successful, even with faculty members supporting the pilot project (para. 19). George Siemens, identified as an expert ("a MOOC pioneer and funded researcher"), is quoted as saying, "'Sebastian Thrun put himself out there as a little bit of a lightning rod, […] whether he intended it or not, that article [Fast Company] marks a substantial turning point in the conversation around MOOCs" (19:24) (Lewin, 2013, Dec.12). This shift finds expression in the following quote:

> Two years after a Stanford professor drew 160,000 students from around the globe to a free online course on artificial intelligence, starting what was widely viewed as a revolution in higher education, early results for such large-scale courses are disappointing, forcing a rethinking of how college instruction can best use the Internet. (Lewin, 2013, Dec. 12, para. 2)

The results that are associated with disappointment in this passage are spelled out in the news story: a study from the University of Pennsylvania found that, on average, only half of the students registered for a MOOC course viewed an online lecture and only 4% of enrollees completed the course; a survey from the University of Pennsylvania found that 80% of students taking the course had previously earned a degree (Lewin, 2013, Dec. 12). In a pilot project collaboration between Udacity (via Thrun) and San Jose State University, MOOCs failed to produce significant results—only 25% of students in the project passed; in a subsequent study, only 50% passed, and at lower

[2] See Chafkin, M. (2013, Nov. 14). Udacity's Sebastian Thrun, Godfather of Free Online Education, Changes Course. *Fast Company*. Retrieved 2018, Nov. 22 from https://www.fastcompany.com/3021473/udacity-sebastian-thrun-uphill-climb.

rates than those who participated in similar courses on campus. Following these study results, Thrun turned Udacity away from college classes towards vocational and corporate training, a move that is identified as "emblematic of a reset in the thinking about MOOCs" (19:30) (Lewin, 2013, Dec. 12). These outcomes seemed to push the Origins strand to a new, albeit related, trajectory—a "more humble business model helping companies create MOOCs to train their workers and customers" (Porter, 1914, 2014).

A year later, Thrun is charged with having designed MOOCs in his own image. Selingo summarizes it as follows revealing at the same time a glimpse of the social by the writer:

> 'But what he [Sebastian Thrun] ended up discovering was that he had designed MOOCs for the type of self-motivated, bright students he taught at Stanford, or the college student he was at 18, when he essentially taught himself using books at the library of the University of Bonn in Germany'(Selingo, 2014, Nov. 3, para. 7).

At first glimpse, the passage appears to demonstrate a limited view by Thrun of his students. He sees them as he sees himself—bright and self-motivated. But is this view not really about how the writer sees Thrun?

The news story continues:

> 'The basic MOOC is a great thing for the top 5 percent of the student body, but not a great thing for the bottom 95 percent', Mr. Thrun told me [Selingo] after he decided to shift the focus of his company last fall to concentrate on corporate and vocational training, and to charge a fee for courses. (Selingo, 2014, Nov. 3, doc. 27:7)

The handful of top students constitute a small percentage. The remaining students are the masses.

Udacity is described as a new model, one that is scaled to teach millions of people (28:17). This new trajectory or shift towards the masses, he claims, "will result in vastly lower education costs and wider accessibility" (Manjoo, 2015, Sept. 17). As described, the MOOC experiment has a number of perspectives attached to it: that the new online education would be used to reach students globally; that they would improve the learning of students with a history of not attaining university entry requirements (in California); and that the disadvantaged or underserved would have the chance to get an education and consequently employment. But in the Origins story, it is the research conducted by the universities (University of Pennsylvania and San Jose State University) that appear to be the powerful forces, which, through the results of studies on MOOCs, disrupt the optimistic view that MOOCs can democratize higher education. This concludes a descriptive overview of the Origins strand.

Appendix G

Description of Inevitability of MOOCs Strand

Universities fear being left behind. Inevitability of MOOCs are pressure statements bidding universities to join the MOOC experiment. Passage 1:3 (cited below) is from the first news story published on the topic in the INYT, which establishes MOOCs as an unstoppable force to be reckoned with. Richard A. DeMillo, director of the Center for 21st Century Universities at the Georgia Institute of Technology (Georgia Tech), is quoted as saying:

> 'This is the tsunami, […] it's all so new that everyone's feeling their way around, but the potential upside for this experiment is so big that it's hard for me to imagine any large research university that wouldn't want to be involved' (Lewin, July 18, 2012, para. 4).

In this story, three forces are identified to account for radical changes in online learning: "greatly improved quality of online delivery platforms, the ability to personalize material and the capacity to analyze huge numbers of student experiences to see which approach works best". In the form of MOOCs, these technological advances are "likely to open higher education to hundreds of millions of people". In the news story, the force of the changes is expressed through three figurations: a seismic shift, a tsunami and a wave of publicity. The first figuration, a "seismic shift", announces change as a sizeable force. The second, a tsunami, couples the irrefutability of the change with an imperative statement: "[…] it's hard for me to imagine any large research university that wouldn't want to be involved". Finally, the third figuration, "wave of publicity", made in reference to media attention to Sebastian Thrun's Artificial Intelligence course offered through Stanford University, suggests the popular appeal of change. "Experiment" is a concept referred to in the news story by two spokespeople: Richard DeMillo and Molly Corbett Broad**.** Broad acknowledges that the MOOC project will not be as easy one, but supports it: "this is a very important experiment at a very substantial scale" (para. 6). For DeMillo the experiment is so powerful that he can't imagine "any large university that wouldn't want to be involved". Even the University of Virginia, whose president was ousted from the university for her "slowness" in adopting online education and later rehired, is reported as becoming a Coursera partner. When the resisting Virginia network joins, the Consortium network seems even more irresistible.

The statement, "it's hard for me to imagine any large university that wouldn't want to be involved" is the first of the imperative statements in the corpus. It calls out to large research universities. Together the statements in this strand define the role of the large research university and begin to establish a social order among universities.

Universities and their spokespeople that for various reasons delay getting behind the MOOC project are attributed unappealing characteristics—defensiveness, fear, worry, missing out, confused, and even cynical. Coursera's acquisition of $22 million in venture capital is described as an event that has "created so much buzz that some universities sound a bit defensive

about not leaping onto the bandwagon" (3:4) (Lewin, 2013, Jan. 8). Universities without "their own MOOCs worried about missing the boat" or "missing out on potential talent" (7:18) (Guttenplan, 2013, Feb. 18). The dean of graduate studies at Trinity College Dublin, Dr. Campbell, is quoted directly, "There is a fear of being left behind, so we are considering what to do" (7:34). Even for European universities, "the temptation to jump on the open-course bandwagon has been irresistible" (7:45) (Guttenplan, 2013, Feb. 18). Reiterating this sentiment is William G. Bowen, a former Princeton University president who is quoted as saying,

"One of the characteristics of academia is that nobody wants to be left behind […] There's great promise here, great potential, but we need more careful research, and there has not been sufficient attention to that, partly because a lot of the people creating these courses are missionaries, and missionaries are not, by and large, interested in testing their message" (8:18) (Lewin, 2013, Feb. 22).

And, finally, European Commission spokesperson Dennis Abbot says,

"Normal business is not going to work: universities are going to have to turn to technological innovations to be able to cope with the big increase of numbers [...] There is a revolution out there at the moment; we cannot afford to be left behind" (16:41) (Schuetz, 2013, Sept. 23).

Being left behind or missing out are frequently expressed concerns by large research universities.

Reinventing learning: Universities have to adapt. The second sub-strand in the Inevitability of MOOCs strand is Reinventing learning: Universities have to adapt. This sub-strand consists of imperative statements that add to the idea that large research universities must adapt to a changing learning environment and the technology of MOOCs.

Over the past year, elite U.S. universities have raced to stake out a place in the new world of free online courses—and now, universities around the globe are following suit.

(8:14) (Lewin, 2013, para. 1)

The above passage, 8:14, delineates between the "elite U.S. universities", which are described as leaders of the "new world of free online courses", and all other universities, which are described as "around the globe are following suit". Elite universities advance the MOOC experiment. The non-elite universities follow as consumers of the MOOCs that are produced by the elite universities; they are a source of revenue for the elite universities (Lewin, 2013, Jan. 8, para.12; Smale, 2013, Jan. 28). Smaller or non-elite universities are positioned rather precariously in the INYT—while MOOCs will widen access and make elite education more affordable to smaller universities, they also threaten the economic survival of those very universities. Added are the professors' concerns that MOOCs are an "inadequate replacement for the teaching and support of live professors" (15:21). Whether or not a university decides to join the consortium or the MOOC experiment, they face a risk because they must either "plunge into

the rapidly growing realm of online teaching" and risk a de-valuing of campus education, or "stand pat at the risk of being left behind" (23:1).

Peer pressure seems to play a role when Karl Ulrich, Dean of Innovation at Wharton Business School at the University of Pennsylvania, speaks on behalf of the 'mid-tier' universities, stating that they:

fear that elite business schools will move to gobble up a larger share of a shrinking pie. 'Would you rather watch Kenneth Branagh do 'Henry V' or see it at a community theater? There are going to be some instructors who become more valuable in this new world because they master the new medium. We'd rather be those guys than the people left behind. (23:72)

M.I.T. president L. Rafael Reif provides a different worldview in anticipating the changes to education when he says that once MOOCs are perfected they will "change teaching and learning and the pathway to employment"; he continues, '[t]here is a new world unfolding, and everyone will have to adapt" (5:8) (Friedman, 2013, January 28).

On the changing role of the value of postgraduate education Daphne Koller, Coursera co-founder and Stanford professor believes that the life of a college degree becomes obsolete after 15 years (6:30):

"We have passed the stage in history […] where what you learn in college can last you for a lifetime". After 15 years [after graduation], she added, that learning is "obsolete" (Smale, 2013, Jan. 28, para. 21)

Op-ed writer, Thomas L. Friedman (2013, March 7) offers a related perspective, writing "Institutions of higher learning must move, as the historian Walter Russell Mead puts it, from a model of "time served" to a model of "stuff learned". For Friedman, it matters what we learn and what we learn has to be applicable, relevant and competent:

increasingly the world does not care what you know. Everything is on Google. The world only cares, and will only pay for, what you can do with what you know. [...] We're moving to a more competency-based world where there will be less interest in how you acquired the competency (para. 6).

Friedman continues, stating that graduates will still have to prove that they have mastered the competency of what they have learned "in an online course, at a four-year-college or in a company-administered class" (para. 7). Friedman presents a hybrid view for education. He cites M.I.T. president, L. Rafael Reif, who states that someday even the college degree "will be a concept [...] connected with bricks and mortar—and traditional on-campus experiences […] will increasingly leverage technology and the Internet to enhance classroom and laboratory work" (para. 9**).** Reif continues, "There is a new world unfolding, and everyone will have to adapt" (5:34) (Friedman, 2013, Jan. 28). Finally, European Union Secretary General, Wesley Wilson states: "There are changes in technology and learning expectations —and universities have to change to meet these demands" (22:16) (Schuetze, 2014, April 28).

A further imperative in joining the MOOC experiment is to achieve high student enrollment or face public embarrassment:

"whether […] to broaden access, advertise the quality of its lecturers or identify potential fee-paying students, the appeal of the open courses relies on actually generating a large response. Anything less risks public embarrassment and financial loss —which may be why schools seem to prefer to join existing consortiums". (Guttenplan, 2013, Feb. 18)

The imperative strand presents two principle views: the first suggests that not joining the experiment is to be left behind; the second suggests that universities must adapt to the new learning environment. This strand continues without acknowledgement of the research by the University of Pennsylvania or the San Jose State University experiment. The imperatives expressed seem to override the empirical evidence.

Appendix H

Description of Becoming Financially Sustainable Strand

Lowering tuition costs of higher education until the underwriting ends. The first sub-strand in the Becoming financially sustainable strand is Lowering tuition costs of higher education until the underwriting ends. This sub-strand consists of statements that address the lowering of higher education tuition. There is a concern in the Becoming financially sustainable strand that the new profit-oriented courses (MOOCs) will cannibalize student enrollments at the same universities that produce them (1:34) (Lewin, July 18, 2012). Passage 1:34 is depicted as moving in two directions (Figure 5.12). In the first direction, denoted by the letter A-a., MOOCs represent a new model for education, providing it to students for a lower cost (3:64) (Lewin, 2013, Jan.8); this perspective is expressed by or attributed to Coursera, one of the key platform providers. For universities, however, the lower cost is considered to be a temporary measure. The Sloan Consortium argues that when the underwriting phase ends, "traditional tuition rates" (14:20) (Lewin, 2013, Aug. 10) will need to be reinstated to maintain quality. Udacity's response to lowering costs (28:14-35) is the nanodegree program, which offers IT courses for a monthly fee of $200; it takes an average of five months to complete the program, costing students $1000, half of which is returned to them after completion (28:14-35) (Manjoo, 2015, Sept. 17).

The second direction, denoted by the letter A-b., associates more directly to the issue of cannibalization, a question that all universities considering online education are said to be facing (23:1). The passage (23:1) connects with strands Inevitability of MOOCs and MOOCs and Traditional Education. This confluence raises the question: do universities "plunge into the rapidly growing realm of online teaching", risking "devaluing the on-campus education", or do they fear "being left behind" (23:1) (Useem, 2014, May 31)? Circumventing this concern

(23:33), Harvard Business School (HBS) proposes a different model, a new pre-MBA that doesn't compete with Harvard's already existing high revenue producing programs ($108 million and $146 million for their current MBA and executive streams respectively). HBS professor Jay W. Lorsch comments, "Instead of having two big product lines, we may be on the verge of inventing a third," (23:33) (Useem, 2014, May 31). There is a belief that MOOCs can make education "more affordable and accessible to far more students and eventually provide additional revenue streams for the universities that offer them" (15:31) (Pappano, 2013, Sept. 16).

Udacity and Georgia Tech have partnered together in order to offer an online master's degree in computer science, hoping to attract thousands of students by offering their courses for $6,600 rather than the current $45,000: "We just want to prove that it can be done, to make a high-quality degree program available for low cost" (14:45) (Lewin, 2013, Aug. 10). The Florida Legislature is reported to have given a directive to the University of Florida to offer online bachelor's degrees for $4,700, which is 75% of the cost of on-campus tuition (14:52) (Lewin, 2013, Aug. 10). Apprehension towards rapid adoption is expressed by University of Florida president Bernie Machen who finds Georgia Tech's financial estimates puzzling. The University of Florida earns $75 million from 70 plus graduate degree programs. Machen admits they never entered this project from the service side but rather from the revenue side, claiming that graduate students are an "untapped market" (14:42) (Lewin, 2013, Aug. 10). Passage 14:42 is also associated to the strand Certification. Offering MOOCs for credit is an important stabilizing mechanism; however, the challenge appears to be maintaining or producing revenue while increasing access for students to university programs. There is uncertainty about tuition costs and a desire is expressed to reduce on-campus costs, something that would be supported by the public (Lewin, 2013, Aug. 10). There are questions about *transferability* at such a large scale, making it all the more important to observe the Georgia Tech MOOC experiment. The American Council on Education (ACE) says,

> Georgia Tech is exceptionally important because it's a prestigious institution offering an important degree at very low cost with a direct connection to a Fortune 100 corporation that will use it to fill their pipeline […] It addresses a lot of the issues about universities that the public cares about. But how good and how transferable it is remains to be seen. (Lewin, 2013, Aug. 10, para. 29)

Investing in MOOC providers (the underwriting). The second sub-strand in the Becoming financially sustainable strand is Investing in MOOC providers (the underwriting). Coursera (3:4), an early MOOC platform provider, receives $22 million in venture capital; this is creating a "buzz"; universities that are not on-board sound "a bit defensive about not leaping

onto the bandwagon" (Lewin, 2013, Jan. 8). Coursera also receives $3.7 million (1:5) in equity funding from Caltech (California Institute of Technology) and the University of Pennsylvania. EdX is launched through contributions by Harvard University and the Massachusetts Institute of Technology (M.I.T.) (3:5). Udacity receives $15 million in financing (3:6). Doubt about whether the financial model for the new online courses is sustainable expressed. To date the courses have been offered for free (6:21) (Smale, 2013, Jan. 28). Thrun's use of online outsourcing (28:29) is offered as a successful business strategy (Manjoo, 2015, Sept.17). There is one mention of a state-funded university: San Jose State University receives money from the National Science Foundation to study the effectiveness of online classroom design (4:11). The study was initiated in part when Sebastian Thrun of Udacity responded to a request by California Governor Jerry Brown to help California high school students attain the entry-level grades necessary to access higher education. Internationally, Sarah Gormley, director of distance education at the University of Edinburgh, states that investments seem to be paying off: the cost is "somewhere in six figures—less than seven figures—mostly in faculty time" (7:51) (Guttenplan, 2014 April 14). Prestigious universities speak to the idea of investing and respond to the question about how long it will take to see a return on investments.

Investor patience. The third sub-strand in the Becoming Financially Sustainable strand is Investor patience. From the beginning, Daphne Koller, Coursera co-founder, states that MOOCs will need to be self-sustaining (1:39) but revenue is "not a pressing concern" (1:39) (Lewin, July 18, 2012). Returns do not need to be immediate. Coursera financier Scott Sandell from New Enterprise Associates says, "Monetization" "is not the most important objective" (3:11). Instead it is the accumulation of a "body of high-quality content" that matters, a product that can be sold to universities through licensing. Sandell reaffirms, "We invest with a very long mind-set, and the gestation period of the very best companies is at least 10 years" (Lewin, 2013, Jan. 8). University of Pennsylvania law professor Edward Rock, a senior advisor on open course initiatives, expresses a similar idea: "Part of what Coursera's gotten right is that it makes more sense to build your user base first and then figure out later how to monetize it, than to worry too much at the beginning about how to monetize it" (Lewin, 2013, Jan. 8). Duke University provost Peter Lange says, "We'll make money when Coursera makes money […] I don't think it will be too long down the road. We don't want to make the mistake the newspaper industry did, of giving our product away free online for too long." (Lewin, 2013, Jan. 8).

During an interview NYT journalist D.D. Guttenplan asks Coursera CEO R.C. Levin "how long before returns on investment are being made" (7:51). Levin says the company will be financially viable "within five years" (Guttenplan, 2014 April 14). The idea that expectations and differing partnerships may affect the project's viability is not important. Expressed directly, Levin argues that "relative to the revenue potential, the cost of producing these courses is such that I think this can be viable for most if not all our partners" (Guttenplan, 2014 April 14).

In the first news story published in the INYT, Daphne Koller of Coursera states that MOOCs must be self-sustaining by "charging students for credentials or premium services" or charging "corporate recruiters for access to the best students" (Lewin, 2012, July 18); however,

there is no concern or worry expressed by Coursera about paying back investors or becoming financially sustainable. When the question, "Should Harvard Business School enter the business of online education, and, if so, how?" is posed to the dean of Harvard Business School, Nitin Nohria, two distinct philosophical views that have defined HBS historically and academically are presented (Useem, 2014, May 31). According to the philosophy of Michael Porter the best approach is to "create online courses, but not in a way that undermines the school's existing strategy" (para. 5). According to the philosophy of Clayton Christensen, "the only way that market leaders like Harvard Business School survive 'disruptive innovation' is by disrupting their existing businesses themselves' (para.7). In the end HBS develops a new model—a pre-MBA, called "Credential of Readiness" (CORe) that costs students $1500 to complete. Comprised of three courses, only students with high levels of participation are invited to take the final exam (they don't want *tourists*). The program doesn't threaten Harvard's core courses; instead it opens a new stream of revenue. Investor patience has come full circle as this idea connects to the previous strand which emphasizes new models and lower tuition in a way that doesn't impinge on the other revenue sources or streams of on-campus programming.

Building-in revenue. The fourth sub-strand in the Becoming Financially Sustainable strand is Building-in revenue. Despite the lack of urgency to generate revenue expressed in the Investor patience sub-strand, in the Building in revenue sub-strand there are continuous expressions of revenue generation. Building in revenue crosses nine news stories in the corpus, beginning with the first and ending with the twenty-first. Sub-strands, Investing in MOOC providers (C.), Investor patience (D.) and Building in revenue (E.) associate with passage 1:39, which concerns Daphne Koller's statement that while courses have to be self-sustaining, it is not a pressing concern. From the beginning, Koller asserts that revenue can be generated by asking students to pay $80 to take exams at Pearson testing centres (Lewin, 2012). Passage 3:13 tells the story of increasing revenue: Coursera is already beginning to see "the first trickles of revenue now coming in" (Lewin, 2013, Jan. 8). As an Amazon affiliate (3:19) Coursera makes money every time a student purchases a textbook (Lewin, 2013, Jan. 8); they also license remedial or introductory ("gateway") courses (3:50) that are taken by hundreds of thousands of students per year. Other revenue sources include charging students who complete courses $20 to $50 for certificates of completion (3:57), charging corporations for access to high-performing students in the field of software engineering (3:64), and selling ready-made "courses in a box" or video lectures that students can watch before attending a lecture (Lewin, 2013, Jan. 8). Digital proctoring technologies, such as "Signature track", which matches webcam photographs and pictures with photo IDs and monitors typing habits, also bring in revenue for partners—students pay $30 to $99 per exam. Despite the revenue streams, there is no assurance that Coursera will maintain its competitive position in the "rapidly expanding education technology marketplace" (Lewin, 2013, Jan. 8). Concerns about the market emphasis on MOOCs are expressed. At an international conference, the distinction between a European perspective and a U.S. one is drawn. Although Europeans have been quick to be involved in OpenCourseWare projects, one

critical view suggests that MOOCs “represent a step back from the idealism of open courseware to the values of the marketplace” (7:42) (Guttenplan, 2013, Feb. 18).

Endnotes

[i] See Law (2006) for Traduction / Trahison: notes on ANT.

[ii] See Latour (2005, p. 94, ff 117).

[iii] An actor is made to act by many others, sometimes referred to as actor-networks. In ANT, there is no single identifiable causality. Actors have the capacity to effect other actors while also being affected.

[iv] Strathern, M. (1996). Cutting the Network. *The Journal of the Royal Anthropological Institute. 2* (3), pp. 517-535.

[v] Law, J. & Singleton, V. (2003). *Object lessons*. Centre for Science Studies, Lancaster University, Lancaster (UK), at http://www.comp.lancs.ac.uk/sociology/papers/Law-Singleton-Object-Lessons.pdf

[vi] Roger Charles Louis Guillemin, a French-born American neuroscientist who won the Nobel Prize for medicine in 1977.

[vii] In *Laboratory Life: The Construction of Scientific Facts* (Woolgar & Latour, 1987, pp. 28 – 32).

[viii] In the second edition, the authors removed the word "Social" from the title.

[ix] The centre is located within l'École Nationale Superieure des Mines.

[x] Latour, B. (1996). *Aramis or the Love of Technology.* Harvard University Press. (Original work published 1993).

[xi] Callon, M. (1980). The State and Technical Innovation: A case study of the electrical vehicle in France. *Research Policy. 9*, 358-376.

[xii] According to Harman (2009) Latour offers four metaphysical axioms: all entities share the same ontological plane; no object can be reduced to any other; "[N]othing is a mere intermediary"; and, no actor is inherently weak or strong, instead actors gain strength through alliances" (p. 16). These propositions Harman argues are related to a deeper, more profound philosophical principle: *absolute concreteness*. "There are only actors and all of them are concrete. Truth exists in the series of translations

between actors. Everything has metaphysical equality. Connections between actors require translation. Alliances can be gained or lost" (Harman, 2009).

[xiii] Latour, B. (1993). *We Have Never Been Modern*. Harvard University Press. (Original work published in 1991).

[xiv] The *collective* is a way to rethink and recreate what constitutes the social of associations (Latour, 2005). It is the expansion of the sociology of associations (p. 260). It is not a container or collector in the way that 'Society' is; 'Society' contains, but the *collective* assembles, all contributing to the future common good.

[xv] This is an alignment of Latour's work in poststructuralist terms. ANT departs from the notion of causality.

[xvi] Latour refers to experimental metaphysics as the, "search for what makes up the common world" (Latour, 2004, p. 242).

[xvii] Lather, P. (2016). Top Ten+ List: (Re)Thinking Ontology in (Post)Qualitative Research*).* *Cultural Studies Critical Methodologies*. *16*(2), 125-131. Lather reviews some of the latest feminist or "post-post" approaches describing a number of recent methodological directions all of which further contribute to the undoing of the qualitative/quantitative, sciences/humanities divides. Also see Lather, P. and St. Pierre, D. (2013). Post-qualitative research. *International Journal of Qualitative Studies in Education*, 26(6), pp 629–633. The issue is dedicated to "rethinking humanist ontology after humanist qualitative methodology" (p. 629). The ontological turn asks the researcher to consider reality, not as something fixed and stable but as something in a continual state of flux; in other words, the researcher needs to see things not as they *are* but in what they *are becoming* (Martin & Kamberelis, 2013).

[xviii] See Fenwick, Edwards & Sawchuk (2010) for an overview of several socio-material approaches including cultural historical activity theory (CHAT), actor-network theory (ANT), and spatial theory.

[xix] Patti Lather (2016) refers to Barad (2012) who recalls Latour's "critique of critique": it is "time now to invent, not critique" (p. 126).

[xx] For examples of early ANT-identified research see: Bigum, C. (1997). Teachers and computers: In control or being controlled? *Australian Journal of Education*; Bigum,C. (1998). Solutions in search of educational problems: Speaking for computers in schools, *Educational Policy*; Fountain, R-M. (1999) Socio-scientific issues via actor network theory, *Journal of Curriculum Studies*; Gaskell, J. & Hepburn, G. (1998) The course as token: A construction of/by networks, *Research in Science Education*; Nespor, J. (1994). *Knowledge in Motion: Space, Time and Curriculum in Undergraduate Physics and Management. Knowledge, Identity and School Life Series: 2.* Falmer Press, Taylor & Francis; and, Roth, W. (1996). Knowledge diffusion in a grade 4-5 classroom during a unit on civil engineering: An analysis of a classroom community in terms of its changing resources and practices. *Cognition and Instruction*.

[xxi] Network is defined as "spatially dispersed elements that have been linked together over time." (Nespor, 1994, p. 11).

[xxii] Multiplicity is associated with philosopher and ethnographer Annemarie Mol who gave form to the term in her book *The Body Multiple* (2002). Multiplicities are not singular views within a *homogenous space*, what is often referred to as pluralism, but are realities sometimes found within one another, or at times including the other; "what is 'other'" she writes, "is also within" (Mol, 1999, p. 85). "Multiplicity is about coexistences at a single moment" (Mol & Law, 2002, p. 8).

[xxiii] The new material feminisms is a re-orientation to materiality: matter is no longer relegated to a background; it becomes foregrounded as it becomes implicated in the production of meaning. Matter has agency dislocates human-centred approaches by shifting taken-for-granted categories and making evident gender inequalities (Taylor & Ivenson, 2013).

[xxiv] For more information visit: https://fundaciondialnet.unirioja.es/fundacion-dialnet/quienes-somos/

[xxv] Dialnet results: 275 articles from 2018 were excluded. Another 1300 articles were not relevant to the topic of actor-network theory. The final 1,387 returned results are a search estimate, as it is beyond the scope of the dissertation to review each article for relevance.

[xxvi] Participatory/cooperative was added later by Heron Reason. In the latest Handbook of Qualitative Research, Lincoln, Lynham and Guba (2017) revisit this addition; they propose a number of new or contentious issues that intersect with the paradigmatic axioms.

[xxvii] Actor Network Theory is now mentioned (for the first time) in Denzin, N.K. & Lincoln, Y.S. (2018). *The Sage Handbook of Qualitative Research* (5th ed.). Sage Publications.

[xxviii] A PDA is a personal digital assistant, a handheld mobile device.

[xxix] See chapter 2 of this dissertation for a brief summary. See Callon, M. (1998/1986). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay. In M. Biagioli (Ed.), *The Science Studies Reader* (pp. 67-83). Routledge. For an overview see, Fenwick & Edwards (2010, p. 14) or Fenwick, Edwards, & Sawchuk (2011, p. 100).

[xxx] *Inscription* is an early "ANT" concept described by Latour and Woolgar (1986) as they followed scientists in the laboratory observing and describing how a material entity comes to be transformed into written documents (p. 51).

[xxxi] *Irreversibility* refers to the inability to return to a previous state. In this context, the study by Chen et al. (2003) is already well embedded into the research field. It has established a particular trajectory to which other studies adhere.

[xxxii] *Black boxing* was an expression used by Latour (1987) to denote inputs and outputs, but in the study by Decuypere et al. (2011), it is used to describe the processes and things that recede into the background.

[xxxiii] Chen, Y., Kao, T. & Sheu, J. (2003). A Mobile Learning System for Scaffolding Bird Watching Learning, Journal of Computer Assisted Learning, *19*, 347-359. Doi.org/10.1046/j.0266-4909.2003.00036.x

[xxxiv] Bisset, Potvin and Daniel (2013) use the word agents in a way that connects with the ANT (RAS) concept of *mediators*. Mediators "transform, translate, distort, and modify the meaning or the elements they are supposed to carry" (Latour, 2005, p. 39). In other words mediators trigger other mediators, leading to new and unpredictable situations. In *RAS* mediators are contrasted with intermediaries, something that carries meaning without itself changing. It's not always clear in *RAS* whether perceiving something as a mediator or intermediary resides in the actor one observes or exists in one's own mind as a sensibility.

[xxxv] Habib and Johannesen define generalized symmetry as "an explanatory model" that allows humans and nonhumans to be assessed using the "same terminological [ANT] toolbox" (2014, p. 486). The notion of actant is applied to both human and nonhuman entities.

[xxxvi] This is true of this dissertation which relies on a study of news stories on the topic of MOOCs published in the *International Herald Tribune* and the *International New York Times* from 2012 to 2015.

[xxxvii] As described by Hamilton (2011), Callon's moments of translation include: *problematisation*—actors are defined, what is or is not included in the network is delineated, elements are ordered and categorized; *interressement*—actions taken "impose and stabilize the identity of the other actors through problematisation" and—alliances are interrupted or formed leading to 'obligatory passage points'; *enrollment,* is the "assembling [of] elements and devices, forms of social interactions which will enable the actors to perform the identities required of them within the network"; and *mobilisation*, is the "'black boxing' of previously unstable truths and meanings" (pp. 60-61). This approach has been referred to as the 'sociology of translation', when continuity' is created from 'discontinuity' (Sakari, 2006 as cited in Hamilton, 2011), which, Hamilton argues, is central to ANT and achieved through the moments.

[xxxviii] The International Adult Literacy Survey (IALS) is an initiative of the Organization for Economic Cooperation and Development (OECD) of which many nations are members. The IALS has produced an international table of levels for Adult Literacy in the various member countries.

[xxxix] Standardized literacy tests included in the IALS.

[xl] An actant is an entity that has the capacity to effect other entities while also being affected. Beyond Chapter 3, I have dropped the term actant deciding to use only the term actor which is understood to be a mediator. An "actor is what is made to act by many others" (Latour, 2005, p.71).

[xli] For the concept of multiplicity (referred to also as multiplicities, reality multiples or multiple realities) see Mol, A. (2002). *The Body Multiple: Ontology of Medical Practice.* London: Duke University Press.

[xlii] For feminist contributions—in particular diffraction--see Barad, K. (1999). Agential Realism: Feminist Interventions in Understanding Scientific Practices (1998) in M. Biagioli (Ed). The Science Studies reader (pp. 1-11). New York, NY: Routledge; Haraway, D. (2003). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. In Y.S. Lincoln and N.K. Denzin (Eds). Turning Points in Qualitative Research: Tying Knots in a Handkerchief (pp. 22-46). For materialism see Barad, K. (1996). 'Meeting the universe halfway: realism and social constructivism without contradiction', in Nelson, L.H. and Nelson, J. (eds.) Feminism, Science and the Philosophy of Science, p. 161-194. Dordrecht; Kluwer. Fox, N.J. and Alldred, P. (2014) 'New materialist social inquiry: designs, methods and the research assemblage', International Journal of Social Research Methodology, DOI: 10.1080/13645579.2014.921458. Taylor, C.A. and Ivinson, G. (2013) 'Material feminisms: new directions for education', *Gender and Education*, 25(6), 665-670.

[xliii] ITTD was developed in the 1970s and considered an emancipatory approach with the aim of recouping local knowledge acquired by workers on the job (Nicolini, 2009).

[xliv] Gephi visualizations are often used for social network analyses to produce network graphs. A network has the appearance of nodes (dots or circles) connected by edges (lines connecting the circles). Algorithms are used to help give shape to a network. Gephi networks have no resemblance to actor-network theory, however it is possible to use Gephi as a way to accentuate relations, and to extend analysis.

[xlv] The *International Herald Tribune* was wholly owned by the New York Times Company from December 30, 2002 until October 15, 2013 when it was renamed the *International New York Times* (Wikipedia.com).

[xlvi] Namely, *The Pasteurization of France* (1988), We *Have Never Been Modern* (1991), *Politics of Nature*, and *An inquiry into modes of existence: an anthropology of the moderns* (2013) and *Down to Earth: Politics in the New Climatic Regime* (2017) to name a few.

[xlvii] By f*eeding off of controversies* – tracing how actor-networks align to stabilize those controversies (pp 51-52), the ANT researcher, Latour claims, becomes a better relationalist. The collective is the enduring associations between entities, human and nonhuman.

[xlviii] The three movements are referred to by Latour (2005) as *Localizing the Global, Redistributing the Local* and *Connecting Sites*.

[xlix] Martin Oliver (2011) from the UCL, London Knowledge Lab, Institute of Education grants technological determinism three stances: first, technology is "causal of change"; second, it is "technicist", meaning that the properties of technology "contribut[e] to but [do] not determin[e] the outcome of activity" (p. 378); and third, technological accounts are socially constructed (p. 375). In light of these three positions Oliver suggests that ANT, distinguished by its material semiotic approach, opens our understanding of technology in two ways: it assists us in seeing how technology is "constituted in and helps to constitute practice"; and it helps us to understand the successes and failures of technologies, by showing us how they are engineered. For Oliver, Latour's position approximates the second stance of the three types of technological properties: technology affects but doesn't determine leaving room for uncertainty. It leaves room for composition.

[l] The scare quotes used here are meant to emphasize the idea that news such as the INYT has its own commitment to facts, that is perhaps different from how facts are made in the sciences, the social sciences, and law.

[li] Latour highlights face-to-face interactions as a sociology of the social and argues that even face-to-face interactions if one attends to them long enough will reveal other actors at play (including non-human actors).

[lii] In *The Cosmopolitical Project,* Belgium philosopher of science Isabelle Stengers (2005) asks, "How can we present a proposal intended not to say what is, or what ought to be, but to provoke thought, a proposal that requires no other verification than the way in which it is able to "slow down" reasoning and create an opportunity to arouse a slightly different awareness of the problems and situations mobilizing us?" (p. 994). Stengers is referring to situations that include practitioners. In his defense of the pursuance of knowledge, Martyn Hammersley (2011) speaks of a "necessary slowness of research". Recognizing the importance of "slow thinking" (Pels, 2003; Law, 2004, p. 10 as cited in Hammersley, 2011, p. 8) by acknowledging that more research is necessary, or that research requires difficult judgments, something to consider as the political pressure on academics is felt and the impetus to produce particular forms of knowledge increases.

[liii] The years 2008 through 2011, only three news stories are published on the topic (Kovanović, Joksimović et al., year).

[liv] The use of the word strands by Veletsianos & Shepherdson (2016) should not be confused with strands as defined in this dissertation. Strands related to an ANT-based approach are addressed later in the chapter.

[lv] See Veletsianos & Shepherdson (2016) for more on this subject.

[lvi] Three articles were identified and published before 2012.

[lvii] Topic Modelling is an approach to finding topics in a text based on the co-occurrence of words in documents that contain similar topics. See Zhao, Wayne X., Jiang Jing, Wng Jianshu, He Jing, Lim Ee-Peng, Yan Hongfei and Li Xiaoming. 2011. Comparing Twitter and Traditional Media Using Topic Models. In Advances in Information Retrieval: 33rd European Conference on IR Research, ECIR 2011, Dublin, Ireland, April 18-21, 2011. Proceedings. Berlin: Springer Verlag. Given the emphasis on text

such as blogs, Twitter, RSS feeds, news articles, and more—topic modelling is increasingly being used to extract large data sets of text (see Zhao et al. 2011). Zhao et al.(2011) for example used topic modelling to determine differences that might exist between news covered by Twitter and news covered by *New York Times*. Due to Twitter's short text format, Zhao et al. (2011) in their research on news coverage comparing Twitter to the *New York Times* developed a unique derivation of LDA. Twitter research has tended to aggregate tweets into a single document, not taking into account that one tweet often concerns one topic. The approach used by Zhao and colleagues attempts to take into account the "qualities" or "attributes of a single tweet, in terms of both its form and fluidity of content. In part, the authors conclude that Twitter, "can be a good source of entity-oriented topics that have low coverage in traditional news media. Although Twitter users show relatively low interest in world news, they actively help spread news of important world events" (Zhao, Jiang Jing, He Jing, Lim Ee-Peng, Yan Hongfei & Li Xiaoming. 2011. p. 14). (see also *ff* 12)

[lviii] Business news source publications on MOOCs include: *Business Wire* (62), *Financial Times* (42), *The Wall Street Journal* (38), *The Wall Street Journal Online* (38), and *Silicon V alley/San Jose Business Journal Online* (37) (Kovanović, Joksimović et al., 2015, p. 519)

[lix] 11. Explaining MOOC course structure; 12. MOOC research reports; 13. MOOCs in France; 14. MOOCs and books; 15. MOOCs for training; 16. MOOCs and changes in the educational sector; 17. British Council MOOCs; 18. MOOC market; 19. European MOOC initiatives; and, 20. MOOC conferences. A detailed list can be found in Appendix H.

[lx] Initially the two broad steps can be enacted sequentially—first gathering the multiplicity and second putting the multiplicity gathered from the first in order. When discussing the three movements—"First Move: Localizing the Global", "Second Move: Redistributing the Local", and "Third Move: Connecting Sites", Latour (2005) insists that the first two moves must be done sequentially prior to the third move. It is only when the first two moves are "practiced assiduously that a third phenomenon appears" (Latour, 2005, p. 220).

[lxi] ActorsTheories can be understood as the varied worldviews expressed in the corpus.

[lxii] Up until October 16, 2013, news reports gathered under the *International New York Times* were sourced as the *International Herald Tribune* (*IHT*). At the time The IHT was owned by the New York Times Company but was located in Paris. By October 16, 2013, the IHT formally changed to the *International New York Times* (*INYT*). Because all IHT and INYT news stories for this study fall under the general ownership of the *New York Times*, the corpus extracted for this research will be referred to as the INYT. The IHT (later renamed to INYT) was located in Paris and had sites near London and Zurich. When owned by the Washington Post and the NYT, it had a newsroom in Hong Kong. The IHT published the *International Herald Tribune/Asahi Shimbun,* a combination of the English IHT with the Japanese *Asahi Shimbun*. In 2013, the NYT Company took over the IHT with the aim of developing its international presence: "Efforts to build regional content, move towards online paid subscriptions were part of the shift toward a more internationally competitive direction" (Greenslade, 2013, July 29 [Guardian]).

[lxiii] Rebutted is in quotation marks because Thrun's rebuttal as inserted into the text does not address the democratization of higher education. Thrun's view supports his actions as a corporate entrepreneur who seeks to solve the problem of access to higher education without self-examination.