
Ontologically sound basis for analyzing academia, digitalization and entrepreneurship together: a solution to the sociomaterialistic puzzle of "strong relationality"

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Abstract

I study how academia, digitalization and, to a lesser extent, entrepreneurship can be understood to exist together or how their ontological relationship should be defined. That the sum of all three is something different when they are viewed separately is the presumption

which I elaborate through Wanda J. Orlikowski's concept of sociomateriality and Mathias Decuypere's and Maarten Simons' analysis of professors' academic life. Their analyses are empirically innovative but impaired by ontological vagueness and underdevelopment. I argue for A. N. Whitehead's processualist ontology as a coherent basis for understanding the strong relationality and related empirical studies. The general processualist turn in research looks increasingly attractive in our unfolding epoch, which was fundamentally launched by digitalization.

Introduction

How should research on academia and digitalization with its related entrepreneurship be undertaken? This question is both banal and intriguing. If a person does indeed need models for such a study, she can be referred to rapidly growing research libraries, collections of journal articles etc., in which the named three concepts are theorized and defined in numerous ways, as well as variously combined for the needs of versatile analyses of related empirical phenomena.

Intrigue can come into play when the question is taken as an invitation to consider the matter more generally and in certain holistic ways. This entails taking as a starting point the view that digitalization and entrepreneurship (mainly in the sense of an "entrepreneurial university": see e.g. Slaughter and Leslie, 1997; Etzkowitz and Zhou, 2017) are not just happening in and to academia, but the relationship of the three is becoming mutually constitutive in ways qualitatively different from previously. To define this starting point more precisely, a holistic basis requires the presumption that when academia, digitalization and entrepreneurship converge, they cannot do so without changing themselves in some important respects. I conceptualize and analyze these relationships between the three in terms of what I call *strong relationality*.

New emerging formations also essentially concern, of course, "the outside" of academia, which fact can be shortly illustrated by the somewhat novel phenomenon of Massive Open Online Courses (MOOCs) (e.g. Iniesto et al., 2016; McGrath et al., 2017). Former spatio-temporal certainties and boundaries of academia are clearly being eroded: Universities, with varying innovative spirit and entrepreneurial goals, increasingly use digital technologies to deliver their teaching materials to a population of students that is potentially limitless and free to study whenever and wherever their laptops, pads or cellphones are on.

The reader can hold on to her possibly precise definitions of "academia", "digitalization" and "entrepreneurship" (they probably do not differ radically from each other), because in this chapter my interest lies elsewhere than such elaborately definitional and related efforts. I am interested in reformulating the key conception of strong relationality in the kind of general *ontological* manner that might create ground for new insights into the relationship between digitalization, academia and entrepreneurship, and enable novel and relevant research questions. The ontological viewpoint concerns how the existence of this strong relationality should be understood, but the analysis is not intended to operate only at some abstract

philosophical level. On the contrary, the triad (principally, however, academia and digitalization) is analyzed in its particularity and concreteness to make space for creative changes of perspective concerning these matters.

My starting point is to see academia, digitalization and entrepreneurship as various modes for organizing all kinds of matters and things. Their analysis can therefore be naturally positioned in the field of organization studies. With my holistic interest in what may be termed concrete particulars, I base the discussion on *sociomateriality*, which, as a theoretically vibrant if complex approach, has aroused growing interest among scholars of science and technology studies, information systems and organization studies in the last decade or so. In a manifesto for sociomateriality, Wanda J. Orlikowski specifies the need for a new viewpoint by claiming that "these insights (of organization studies – SP) are limited in large part because the field has traditionally overlooked the ways in which organizing is bound up with the material forms and spaces through which humans act and interact" (Orlikowski, 2007, p. 1435, 2010; Orlikowski and Scott, 2015).

In the light of sociomateriality, the human and material components of organizing in the modes of entrepreneurship, digitalization and academia, for example, should be ontologically understood as converging in a kind of strong relationality. Orlikowski's "material forms and spaces", which usually consist chiefly of various and multiple technological artefacts, must not be seen merely as giving humans a footing or toolbox to operate on and with. Instead, there is an ontologically deeper co-construction or co-creation at play between the human and non-human elements (ibid.).

Although I accept sociomateriality's basic angle for the study of the things which interest me here, I think Orlikowski's formulation of sociomateriality fails to fulfill its true radical potential. This is mainly because Orlikowski adopts her idea of relationality from a rather sketchy source – Karen Barad's "agential realism" (Barad, 2003, 2007). I will argue that the reconceptualization of "sociomateriality", with the help of A. N. Whitehead's processual ontology (Whitehead, 1967, 1971, 1978), can better accomplish the goals of the approach, while eliminating certain criticisms typically aimed at the Orlikowski-Barad view (Faulkner and Runde, 2012; Leonardi, 2013; Mutch, 2013).

Because academia provides the main empirical frame for the analysis, I will next introduce and examine Mathias Decuypere's and Maarten Simon's important empirical studies, which focus precisely on this subject. They apply the broadly Orlokowskian sociomaterial approach and detail, and interpret the kinds of practice and modes of organization of which contemporary academic life essentially consists (Decuypere and Simons, 2014a, 2014b, 2016). I will also address the attention (or its lack) they pay to digitalization and entrepreneurship. The chapter then proceeds to outline a broadly Whiteheadian alternative conceptualization for sociomateriality. I close by recommending a notable change in how such organizational research is undertaken, the need of which digitalization itself bolsters.

Into the sociomaterial texture of professors' life – Decuypere's and Simons' research

In several articles, Mathias Decuypere and Maarten Simons have developed a distinctive sociomaterialist "third way" for studying the remarkable challenges and changes through which universities are going today (Decuypere and Simons, 2014a, 2014b, 2016). They analyze academic practices and the minute composition of academic work in contrast to approaches which, on the one hand, survey individual academics' opinions concerning the changes and, on the other, theorize how such societal processes as neo-liberalization, globalization, marketization and digitalization impact universities and research in general (Decuypere and Simons, 2014a, p. 117).

Decuypere and Simons base their research on the actor-network theory (ANT), which has provided an important analytical approach especially in science and technology studies (STS) in recent decades (e.g. Law, 2004; Latour, 2005). More precisely, they adopt three "sensibilities" from ANT, which they call "heterogeneity", "relationality" and "enactments" (Decuypere and Simons, 2014b, pp. 90-92). First, the heterogenic sensibility aims to take as little as possible for granted before any conduct of a study. This means, for example, that human actors are not prioritized over non-human ones, and that universities are not, as is usual, presupposed to consist of research, education and the third mission. According to ANT, anything that can make a difference to a course of events is an actor, and the research goal is to obtain a detailed grasp of all the different actors and the ways in which they converge, interact and form new actors (ibid.).

Second, ANT carries a strong conception of relationality in the sense that actors are understood to be what they are and do what they do only in their relations with other actors. Decuypere and Simons illustrate this idea with a common printer: a printer is an actor, but its agency is realized and can be comprehended only in its relations with electricity, paper, the repairman, the computer network, files etc. (Decuypere and Simons, 2014b, p. 91). Actors and their webs of relations with other actors, that is certain kinds of network, are considered inseparable, which means that transformations in actors are always seen as transformations in certain networks and vice versa (ibid.).

Third, and concerning the sensibility of enactments, Decupyre and Simons do not conceptualize academic practices as "made things", or as something that has stabilized in time and space with clear boundaries. Instead, they emphasize that the "term 'practice' refers to things that happen and that are made to be happening by several people and by lots of things' (Decuypere and Simons, 2014b, p. 91). The key challenge for ANT research now is to capture academic reality in its dynamic processes of becoming and emerging, where various kinds of actor and network are momentarily enacted before they give way to new assemblages (ibid.).

For the two articles most relevant here, "An Atlas of Academic Practice in Digital Times" (2014a) and "On the Composition of Academic Work in Digital Times" (2014b), Decuypere and Simons interviewed six professors from different countries, universities and fields of research. The professors' outwardly simple task was to explain what they had done during the previous working day. However, Decuypere and Simons were not interested in the actual content of the interviewees' work or their interpretations, feelings etc. concerning it. Instead,

the goal was to obtain as concrete and detailed a picture as possible of all the different actors (in the ANT sense) and interactions a professor was involved in from the moment she woke up until she went to bed after a busy day. If an interviewee said she had used a computer to do something, this was not considered a sufficient description. She was further asked about the program (e.g. Microsoft Word) – and even its repertoire (e.g. sending or receiving an email using Microsoft Outlook) – she had in fact used (Decuypere and Simons, 2014b, p. 94). From the descriptions, Decupyere and Simons could also infer the ways different software programs synchronized as actors, for instance (Decuypere and Simons, 2014a, p. 118).

No professor's workday appeared as a haphazard chain of interactions, but several subnetworks emerged in which actors performed close interactions with each other. This sometimes meant that certain actors in subnetwork *a* had practically nothing to do with some actors who operated intensively in subnetwork *b*. A professor, "Sandra" say, was the key actor who connected a bunch of subnetworks, which Decuypere and Simons in their map-like visualization call "regions". In the course of the analyzed working day Sandra was involved in six different regions, two of which took place in her private sphere. A strict dependence of the analysis results on what interviewees actually talked about is revealed, because Sandra's waking up (in cooperation with actors like a battery, wake alarm and snooze alarm functions) appears as separate from her interaction with her family (in a region populated by actors like daughter, husband, microwave, Skype-function tablet, search engine, schoolbook, chocolate paste) (Decuypere and Simons, 2014a, pp. 118-128, 2014b, pp. 92-97).

One distinct academic practice – a region that involved all six professors – entailed preparation for many kinds of things. Sandra thus spent time preparing educational courses in a region that included e.g. MS Word, notes, paper, printer, colleague (course designer) as actors; "Eugene" prepared for project management with e.g. two colleagues, desk, coffee, Mindmap program (tablet); "Patricia" prepared for a conference presentation in interaction with e.g. beamer, MS PowerPoint, slides, Postdoc, PhD student, conference speakers. Human (colleagues, Postdoc, PhD student, conference speakers) and analogical (paper, notes, desk, coffee) actors participated in the preparation practices. The most noteworthy fact yet is that digital (MS Word, Mindmap program, MS PowerPoint) and digital/analogical (printer, computer screen) actors contributed essentially to all preparation work (Decuypere and Simons, 2014a, pp. 122-136).

Although the professors were from different countries, universities and fields of research, Decuypere's and Simons' analysis shows that digital actors operate not only inside most of the regions that constitute workday maps (the number of regions per professor varies between five and seven). Digital actors also connect different regions in necessary and more or less overlapping ways. For example, Sandra's map includes two regions which can be called "email in/email out" and "Webinar implementation". Enactment of the first region was realized by such actors as tree structure, email headings, delete button, newsgroups, colleague, student, head of department; enactment of the second by e.g. software, microphone, camera, technician, broadcast, MS PowerPoint (Decuypere and Simons, 2014a, pp. 122-136, 2014b, pp. 96-98).

However, at the same time the email in/email out functions of the first region contributed to the planning, actualization and assessment of the second region, i.e. the webinar (all this happened over a period longer than one day). Furthermore, Sandra sent and received work emails (which also interacted with other regions than the Webinar) in her private sphere at home. There she consulted the same web browser she had utilized in communication with her ex-promoters (a distinct region in Sandra's day), while physically staying at her workplace. By turns, the different digital software interacted with the variable analogical properties of PC, laptop, tablet and mobile phone (ibid.).

Decuypere and Simons describe how various co-acted operations (e.g. numerification, delegation, gradation) in different regions (e.g. processing of students) produce multiple operational effects (e.g. value to students) in professors' working days (Decuypere and Simons, 2014b, pp. 99-100). The key point from my perspective is their observation that all kinds of digital actor "form a cloud or a swarm that is spread all over the network and are in that sense *inciting* the network" (ibid., p. 101). Digital actors, for their part, not only constitute different operations but participate in delimiting regions and shaping operational effects.

In addition, there are certain digital "super actors" like email and web browser which in general might be considered even more reliable than human actors, but whose collapse would paralyze a great deal of every region's operations. It is the professor who holds her whole day together, but participation in the essentially digitalized actor-networks entails the two-sided freedom/obligation to do her work at (almost) any time in (almost) any kind of space. Unsurprisingly, constant haste and being at least in "standby mode" characterize the professors' days (Decuypere and Simons, 2014a, pp. 122-140).

Decuypere and Simons conclude that digital actors have become "immanently present in academic work" (Decuypere and Simons, 2014b, p. 103) in ways that make commonplace talk about the digitization of academic professions obsolete (ibid.). Significantly for my goals, they adopt a strong relational view concerning the ontological status of the networks' actors, although they do not elaborate this view in detail. They only state that "it seems not to make much sense anymore to talk about academic practice in terms of humans or non-humans, material or digital etc. It perhaps makes more sense to speak of each actor in the network as being *humandigital*" (Decuypere and Simons, 2014b, p. 103). The pointed co-construction of human and non-human elements thus elaborates the Orlokowskian sociomateriality (altthough "digital" seems to hover somewhere in between "material" and "immaterial"). Yet there emerges the implicit question of the kind of concepts that should grasp the subject in the first place. In the section "From Orlikowski and Barad's strong relationality toward Whiteheadian rethinking of the matter", I introduce ingredients for answering this question by applying the conceptual tools A. N. Whitehead developed in his processual ontology.

The complex question of "entrepreneurship" in Decuypere's and Simons' analysis and other problems

Although Decuypere's and Simons' "purposefully sampled group" (Decuypere and Simons, 2014a, p. 118) is small, and they give little detail of how they ended up interviewing just these six professors, the case they make for the absorption of contemporary academic work in digitalized systems, practices and tools looks plausible. One point that supports their results is the fact that contemporary science is a fundamentally collective effort. Breakthroughs in cutting-edge research are almost always achieved by huge research groups, whose members often come from various specialties and many universities all around the world. Concrete face-to-face interaction in conferences etc. is still considered fairly significant (otherwise, the global business of organizing scientific conferences would no longer exist), but the necessary day-to-day communication and cooperation within research groups have become unthinkable without digital infrastructures.

In the Introduction, I delimited the starting point of this chapter to analyzing academia and digitalization as modes of organizing all kinds of matter with entrepreneurship. The delimitation derives from my interest in the perceived and extensive rise of the "entrepreneurial university" in academia (Ferreira et al., 2018). In the light of this, it is striking that Decuypere and Simons do not use "entrepreneurship" or related terms ("enterprise", "entrepreneur" "entrepreneurial" etc.) *once* in their study of the professors' working days. No literally entrepreneurship-related terms or concepts belong to Decuypere's and Simons' tools of analysis, as they do not conceptualize co-acted operatibelopons such as "entrepreneuring", for example. Furthermore, the empirical materials they present indicate that no professor referred to "entrepreneurship", being "entrepreneurial" etc. in any way in the interviews either. A clear problem for elucidating the tripartite relationship with Decuypere's and Simons' sociomaterialist studies seems to arise here.

It must be noted that the surmised problem that entrepreneurship has been neglected may mean different things, not all of which appear relevant for my effort to understand academia, digitalization and entrepreneurship through a strong ontological relationality. Starting with the obvious, there are numerous professors and other academics all around the world who practice "entre-speak" – especially in business schools – and entrepreneurship as meaningfully defined activity in close association with digital things. For some reason, such professors simply did not seem to be included in Decuypere's and Simons' "purposeful sample" (Decuypere and Simons, 2014a, p. 118)! This can indeed be considered somewhat peculiar, because the concepts and practices of the so-called entrepreneurial university have spread globally in academia in recent decades (Foss and Gibson, 2015; Etzkowitz and Zhou, 2017; Ferreira et al., 2018).

However, solving my theoretical question is not actually hampered by the absence of literal entrepreneurship-related terms and references in Decuypere's and Simons' studies and materials. This is because, in addition to the distinctive illustrative benefits from their focus on digitalization in academia, the key point of departure they offer is their sociomaterialist, ANT-inspired mode of analysis. From the inherent logic of this mode, it is possible to

extrapolate how entrepreneurship might emerge in its involvement with digitalization and academia for a sociomaterialist analysis of the kind described.

For most people, “entrepreneurship” and its cognates do not appear very concrete, but they are taken to refer generally to businesses, taking risks in commercial markets or, where people are concerned, being innovative and having initiative, for example[1]. Decuypere and Simons attempted to get the professors to describe their working days in as concrete and detailed a manner as possible, so it might be the case that the interviewees willfully avoided the kind of abstract accounts to which entrepreneurship-related terms could have contributed. This is clearly possible, although the matter cannot really be solved in either way. Yet Decuypere and Simons emphasize that “every-thing and every-one might possibly be an actor” (Decuypere and Simons, 2014b, p. 94), and, indeed, how the professors elaborated their workdays was their own choice.

Decuypere and Simons group the revealed actors into human (e.g. colleagues, technicians, Postdocs), analogical (e.g. table, pen, paper, whiteboard), digital (e.g. email, web browser, MS PowerPoint) and digital/analogical actors (e.g. printer, computer screen) (Decuypere and Simons, 2014a, pp. 122-136, 2016, pp. 146-149). Nevertheless, when the maps that illustrate each professor’s day are examined more closely, actors occur who fit awkwardly into Decuypere’s and Simons’ grouping. For example, in Max’s map an actor operates that he has named “Theories”, and this actor intensively cooperates with “Enzyme”, “Lab Assistant”, “Slides”, and several “MSc Students” and “PhD Students” (ibid.). From the relational perspective, it is through such interactions and their effects that the nature of theories can be understood, but it should be equally clear that not everything about theories can be reasonably categorized as “human”, “digital” or “analogical”.

As processes and results of abstract thinking for various purposes, theories obviously cannot emerge, exist or affect without relationships to wetware/software/hardware, but this does not mean that theories can simply be reduced to the last of these. Furthermore, it seems quite evident that “entrepreneurship”, at least in its conventional meanings, resembles “theory” in the sense that there is more to entrepreneurship than merely human, digital or analogical actors cooperating in certain ways. Formal models for assessing acceptable risks in launching a new product to market are themselves explicit theories of a certain kind, for example, and constitute a necessary part of many entrepreneurial activities.

Based on my observations, a couple of points can be made. First, as potential “abstract” actors in (at least partly) the mode of theories, things referred to with entrepreneurship-related terms can evidently participate in such academic actor-networks in which various kinds of digital actor govern. However, because the authority concerning what “entrepreneurship” means and how its referents contribute to actor-networks now belongs to the articulate human participants of those networks, an ANT-inspired researcher give no decisive external definition of how the entrepreneurship-related terms/concepts should be understood in such contexts. For example, professor Mary’s map shows connections between actors named “Patent”, “Conference Session company X” and “Gmail 2 (Startup company)”, but, following their methodological ANT principle, Decuypere and Simons refrain from proposing that

"entrepreneuring" or "commercializing" is occurring here. Mary herself does not conceptualize the interactions in this way (Decuypere and Simons, 2014a, pp. 131-135, 2014b, pp. 96-100).

Second, while Decuypere's and Simons' methodological approach liberally guarantees the status of actor for practically anything, it remains unclear how the guiding ontological principle of strong relationality should actually be understood. What are its differences compared with some possible weaker forms of relationality, for example? The picture Decuypere and Simons paint of contemporary academic work's immersion in digital infrastructures and tools indeed looks plausible, but what insight is added by claiming that certain actors in the referenced networks are, in fact, *humandigital* (Decuypere and Simons, 2014b, p. 103)?

For comparison, an academic might claim that it is necessary to her to go hiking regularly in the woods to relieve her work stress, and so, following the implied logic, a *humanwooded* actor would emerge in specific actor-networks. Indeed, Decuypere and Simons seem to tie *ontological* relationality ("strong" but otherwise unclear) too tightly with *empirical* relationality (people can be seen to interact with computers and woods with varying intensity). The significance of Decuypere's and Simon's empirical results is not contradicted by their vague ontological position, but explicit coherence between ontological and empirical starting points looks preferable.

Although Decuypere's and Simons' division of actors into human, digital, analogical and digital/analogical may look crude, from the ANT perspective the division is competently derived from the professors' own conceptualizations, and it usefully maps their workday networks. However, it must be stressed that there is no point in ANT where relationality might cease to exist. A pencil seems a plain analogical actor, for example, but from a fine-grained perspective it reveals itself as a network to which certain raw materials, design work and industrial processes have contributed as actors and enabled it to act as a pencil. The ANT standpoint maintains that the suitable level of particularity in detailing networks is determined by the research questions an analyst has, but the potential number and quality of different actors-as-networks looks limitless (Latour, 2005, pp. 27-42).

Because of the ANT's liberalism toward actors' nature and number, the original ontological question about the strong relationality is specified further: how is it possible that all those apparently *different kinds* of actor can *converge* and perform various strongly relational networks? A professor and email can do things together they cannot do separately, but is it unnatural to call this relationality weak: do not a professor and email hold on to their very different "essential" selves before, during and after the interaction, meaning all talk about "humandigitals" etc. is metaphorical at best? The sociomaterial approach that is tied up with the Orlikowski-Barad conception of strong ontological relationality (see Introduction) cannot, in my view, answer such questions coherently.

From Orlikowski and Barad's strong relationality toward a Whiteheadian rethinking of the matter

Orlikowski's conception of strong relationality originates from the philosopher-theoretical physicist Karen Barad's "agential realism" (e.g. Orlikowski, 2007, p. 1438, 2016, pp. 88-96). There is insufficient space here to elaborate Barad's complex epistemological/ontological theory, but she essentially gives an original philosophical reading of certain core results of modern quantum physics. It is quite easy to grasp what strong relationality is intended to mean when we realize that, at the ultimate level of matter, the seemingly self-evident distinction between the *observer* and *subject of observing* collapses. The observation of e.g. electrons can materialize only via scientific technological apparatuses built for the specific purpose of this observing, but, depending on how an apparatus has been constructed, the same subject of observation in fact behaves differently, either like a wave or a particle. Accordingly, there is no single answer to the question "What is matter fundamentally like in itself?". This is because matter emerges in varying ways in its strongly relational "intra-actions" with different but equally competent apparatuses of observation (Barad, 2003, pp. 801-820, 2007, pp. 97-185).

Orlikowski, both alone and with colleagues, has produced innovative empirical studies to show how various "social" and "material" elements in organizations/organizing are entangled with each other and can be understood only via the kind of strong relationality that denies entities "inherent" properties (cf. Jones, 2014, p. 897). For instance, with Susan V. Scott, she elaborates how the purported anonymity of hotel reviews becomes different things, depending on the material practices involved in producing them. Hence, the Automobile Association's sending of "mystery" guests to inspect hotel rooms produces a disparate anonymity compared with TripAdvisor, which collects and publishes nameless reviews of presumably genuine hotel guests online (Orlikowski and Scott, 2014). Although Orlikowski and Scott do not lean on human actors' own concepts in the same way as Decuypere and Simons (yet they too utilize rich interviews), a strong identical view on ontological relationality as well as ANT-inspired insights are shared by all the authors (Decuypere and Simons, 2014b, pp. 90-103; Orlikowski, 2007, pp. 1437-1439; Orlikowski and Scott, 2014, pp. 877-879).

However, no obvious valid method exists for understanding the entanglements of academics with digital infrastructures or entrepreneurial precepts by reducing them to the level of elementary particles/waves. Furthermore, the strong Orlikowski-Barad relationality has not received unanimous support from organizational researchers. Many promote a more "moderate" understanding of relationality. Thus, although a professor's transition from digitalization-immersed work (humandigital) to a refreshing hike in the woods (humanwooded) might raise interesting research questions, the claim that the professor herself essentially changes from one context to another stretches credibility too far for many researchers. Relationships of the aforementioned kind, when they concern the question of who the professor really *is*, should arguably be considered relatively external and weak when compared with her individual genetic code and upbringing (Faulkner and Runde, 2012, pp.

52-54; Leonardi, 2013, pp. 65-74; Mutch, 2013, pp. 30-37; Cecez-Kecmanovic et al., 2014, pp. 809-810).

Scott and Orlikowski have explicitly replied to the kind of critique outlined above (Scott and Orlikowski, 2013). However, they do not exactly argue for the preferability of their own stance but appeal for tolerance of different theoretical approaches in the field, summarizing that "the challenge and opportunity is to turn unsettled and unsettling ideas into inspiration, and differences into analytic edge for deepening understanding so that we might understand the world anew" (Scott and Orlikowski, 2013, p. 80). By the end of this chapter, I will reformulate, in an unavoidably schematic way, Scott and Orlikowski's explicit challenge from the ontological perspective of A. N. Whitehead's process philosophy.

When assessed critically, a certain awkwardness emerges at the heart of Decuypere/Simons/Orlikowski/Scott's conceptualization of their sociomaterial approach. In my view, this is explained by their underdeveloped ontological framework for understanding reality and its analysis. To begin with, Decuypere's and Simons' goal of getting at the most concrete details of a professor's working day is more ambiguous than they seem to acknowledge. Their strict dependence on the professors' own terms makes, for example, "Software Webinar" and "Conference session company x" appear as unproblematically homogeneous or concrete actors (Decuypere and Simons, 2014a, pp. 128-132). Such a result blurs the manifest differences more than it clarifies them.

On the other hand, Decuypere's and Simons' implied "scale", which presumes a kind of smooth shifting from abstract things to concrete things and back, is itself profoundly misleading. Not only are all *concepts*, whether we think about e.g. "persons", "emails", "startups", "chairs" or "quarks", abstractions, but, and this is a crucial Whiteheadian move, we must also think about *reality itself* as consisting of abstractions (Whitehead, 1978, pp. 7-21; Stengers, 2011, pp. 73-100; Halewood, 2011, pp. 147-149). This is not a theoretical physicist's or other scientist's claim in her field, but a key step in Whitehead's effort to lay a sound philosophical foundation for general ontological thinking.

Figuratively speaking, reality consists of abstractions in the same sense as wine is a result of abstraction from grapes and the fermentation process. This is to say that becoming a distinct entity consists of "pushing" or processing innumerable things to the outside of an entity's relative and transient boundaries. At the same time, to highlight the abstract nature of both terms/concepts and their assumed referents means subscribing to the view that reality is ontologically indivisible. Concepts and material things (as well as emotions, greenness of trees, digital software etc.) accordingly all belong to the equal "plane" of reality in the sense that no such ontologically dissimilar entities exist in between which there would be "gaps" in need of some kind of special "bridging" (Whitehead, 1964, pp. 30-31, 1978, pp. 18-20).

There is a notable coherence between a certain flatness of the Whiteheadian ontology with ANT-inspired efforts to analyze "social" and "material" elements together as equal parts of networks and to displace humans as the only real actors in the world. Nevertheless, and concerning the ANT part of this equation, the striking theoretical distance of Barad's insights

into the behavior of elementary particles/waves from the analyses of sociomaterial/technological organizations is detrimentally reflected in Orlikowski's and Scott's approach. To put it bluntly, Orlikowski and Scott provide no detailed elaboration of what the strong relationality in the inseparable entanglements of social and material elements is supposed to mean beyond claiming that the elements are always strongly related in this manner (Scott and Orlikowski, 2013).

Orlikowski and Scott then stamp an ontological dogma without arguments on their empirical analyses, a move whose apparent problems are highlighted by Paul Leonardi among others. Leonardi observes that (human) actors typically do not perceive their world as inseparable entanglements, but "they can relatively easily point to a hammer or piece of software and say 'this is material' but they would likely have a hard time fathoming that a hammer was in any way social" (Leonardi, 2013, p. 66).

Nevertheless, the introduced empirical analyses and others of their kind can be accepted as innovative and illuminating, while the need for a novel ontological strategy in tackling the constitutive theoretical problem of strong relationality is simultaneously acknowledged. This strategy entails a painstaking effort to distance us from the way things "self-evidently" look (in the way they very much look in Leonardi's example above), or, as Michael Halewood puts it, an aspiration to reject our deeply ingrained "culture of thought" (Halewood, 2011, pp. 1-23).

Neither digitalization nor entrepreneurialism belonged to A. N. Whitehead's (1861-1947) conundrums, but he wanted to replace the classical and still pervasive substance-centered metaphysics with a new processualist ontology (simply put, a move from an ontology of being to an ontology of becoming). Whitehead sees classical metaphysics as the root cause of what he considers the central malaise in modern thinking, that is "the bifurcation of nature" (Whitehead, 1964, pp. 30-31):

> What I am essentially protesting against is the bifurcation of nature into two systems of reality, which in so far as they are real, are real in different senses. One reality would be the entities such as electrons which are the study of speculative physics. This would be the reality which is there for knowledge; although on this theory it is never known. For what is known is the other sort of reality, which is the byplay of mind. Thus there would be two natures, one is the conjecture and the other is the dream. […] Another way of phrasing this theory which I am arguing against is to bifurcate nature into two divisions, namely into the nature apprehended in awareness and the nature which is the cause of awareness.

There are ever-growing volumes of research in e.g. the philosophy of the mind and cognitive science which analyze how (human) consciousness is related to material reality, but Whitehead's aim is not to contribute to such studies. Instead, he rejects the *framing of the question*, which leads us to analyze, among numerous other ontologically related things, what the necessary or sufficient elements for (human) consciousness to emerge into being are – or, to use an adjacent conceptualization, to ponder the kind of strong (intrinsic), in contrast with weak (extrinsic), relationality in between elements which causes (human) consciousness to

come into existence. Whitehead disarms the *general question* of bifurcation (that is, the general bifurcation problem also spreads to the ostensible puzzle of fitting "the social" and "the material" together) by radically reconceptualizing the basis of ontological thinking. With this approach, he goes against our most deep-rooted ideas and intuitions of how reality is put together. In the place of conventionally defined "subjects" (e.g. social actors) and "objects" (e.g. material technology), and "primary" and "secondary" qualities, for example, Whitehead sets *experiences* as the fundamental building material for everything there is (Whitehead, 1978, pp. 160-167).

"Experience" clearly expresses a dynamic relationality, but in Whitehead's treatise, experiences are not limited to the human or even the organic world. A piece of stone or digital software both literally experiences its surroundings and has become a provisional subject ("superject" in Whitehead's original terminology) in a process of numerous experiences becoming together. It is obvious that Whitehead is not confined by what our intuitions or psychological research might say about experiences, because he aims to capture the most general ontological nature of reality. To express this concisely, to Whitehead, reality is an unceasing process of becoming through time, and to ask what a thing in reality *is* – for clearly the world is structured and not merely a formless flow – is to ask *how* that thing came into its fleeting existence (Whitehead, 1978, pp. 23-29, pp. 160-167; Halewood, 2011, pp. 23-32).

A detailed exposition of Whitehead's complex thinking is impossible here, but Table 1 briefly introduces certain key concepts of his theorization. Of particular importance is the second column, created not by Whitehead but by the author, which outlines methodological starting points for rethinking "sociomateriality" and "strong relationality" in organization studies.

Table 1

Concept	Meaning	Methodological relevance

Abstraction	reality is thoroughly constructed, i.e. quarks, tables, selves, social systems, digital infrastructures etc. are abstractions in the sense of being achievements that always leave something out of themselves	no ontologically primary dimensions of e.g. "social", "material" or "digital" exist for study, but the goal is to analyze the processes that bring about such various fleeting abstractions
Experience	process whereby abstraction takes place; experiences constitute both "subjects" (e.g. those who know) and "objects" (e.g. what is known), and are thus primary compared with them	human subject and her social environment/technological tools cannot be starting points for social scientific explanation, because they are achieved unities of experiences in need of explanation
Actual entity	reality does not consist of formless flux and motion, but relatively stubborn facts exist which are actual entities in the sense of being particular processes of becoming	research subjects are typically societies or occasions of actual entities, which deny conventional ontological boundaries between e.g. subject and object, psychological and social, agency and structure
Prehension	an actual entity perishes when its process of becoming ceases, and it turns into prehension, that is a piece of "material" of which new actual entities will be constituted	it is possible to distinguish beginnings and terminations in research subjects and to examine the closing and opening of the "stubborn facts"
Creativity	links "the completed actual entities [i.e. prehensions] which act as data for the concrescences or experiences which constitute novel subjects"[2]	the world can potentially turn in almost infinite ways and is ever-changing, but creativity explains the actual processualist structuration of the world

(Whitehead, 1967, 35-150, 1971, 1-48, 1978, 18-344.)

Conclusion

In this chapter I argue that, although the sociomaterialist approach has achieved important empirical results in studying academia, certain shortcomings in its ontological basis expose sociomaterialism to pertinent criticism. I introduce some tools from A. N. Whitehead's processualist ontology for dismantling the criticism and laying sociomaterialist studies of academia, among other things, on coherent ontological basis.

What advantages might there be in taking Whiteheadian processualism as the general ontological framework? With a theoretical interest in ontological relationships between academia, digitalization and entrepreneurship, I have elaborated the concept of strong

relationality. Orlikowskian sociomateriality defines an influential version of the concept, but I argue that Orlikowski's tying of her sociomateriality to Barad's interpretation of quantum physics is not the best available approach. The problems can be summarized in two statements: 1. The ontological implications of the strong relationality concerning substantial theory and empirical analysis are left without specification. 2. To derive one's ontological outlook from the particular scientific conception entails a complex question of levels: how are the particles/waves related to the more familiar things analyzed in organization studies? Are we talking about some kind of reductive or emergent relationships? Orlikowski does not address such questions (Scott and Orlikowski, 2013).

Whiteheadian processualism actually makes the question of strong relationality a quasi-problem. The reality is not bifurcated into strong and weak relationalities, intrinsic and extrinsic properties, or substances and non-substances. What may appear as strong relationalities or essences are comparably enduring societies of actual entities (i.e. "stubborn facts", see Table 1). The pivotal research interest therefore concerns the ways such societies have become relatively stubborn. When and how did these societies begin to make themselves distinguishable from other societies? How are the "stubborn facts" inexorably changing? For example, a professor of surgery performing an operation with an algorithm-steered medical robot is a rather new kind of society. When and how did such a society begin to emerge as distinctive? Evidently, the standardization of surgical practices met the advancement of certain technological artefacts, but how exactly? What actors/experiences contribute to the relative stubbornness of this society, and what kind of creativity is simultaneously metamorphosing it? Is something involved that should be defined as entrepreneuring?

As for social and organizational research, the symmetry and relationality promoted by the ANT match well with Whiteheadian precepts, although another kind of social research might also be Whiteheadian. Nonetheless, the ANT focus on actors and their assemblages may distract from the crucial question of how such actors come into being, and where the relative openings and closures of their tracks or careers should be pinpointed. For example, concerning the case of Mary in her interactions with "Patent", "Conference Session company X" and "Gmail 2 (Startup company)" – see "The complex question of 'entrepreneurship' in Decuypere's and Simons' analyses and other problems" – attention must be paid to the specific processes of e.g. digitalizing, innovating and entrepreneuring, which together make the particular actors fleetingly emerge and are already turning them into something else.

The Whiteheadian ontological framework does not, by itself, bring novel "empirical" methods of analyzing interrelationships between digitalization, academia and entrepreneurship. Whitehead's (possibly factitious) technical concepts are not intended to replace useful analytical tools of research. Yet as a strategy to contest the prevailing "culture of thought" (Halewood, 2011), the "free and wild creation of concepts" (Stengers, 2011) is a reflection of one great promise of Whitehead's philosophy. Inventing audacious concepts to capture new emerging phenomena and reassess old ones is, of course, part and parcel of all innovative research. The Whiteheadian framework encourages boldness and open-mindedness in constructing research designs and can make conventional boundaries between

theory, methods and empirical materials disappear, for instance (for fascinating examples of broadly processualist entrepreneurship research, see Gartner, 2011; Steyaert, 2012; Hjorth, 2015).

Decuypere's and Simons' studies show how digitalization has become deeply woven into the kudos of academics' daily life. It compresses and stretches academic space and time; enables, realizes and shuts complex networks down; problematizes how a (human) academic actor exists and operates. The emergence and rapid advance of "intelligent" digital infrastructures, commercial algorithms etc. as new actors further complicates the picture. At the same time, concepts like "academia" and "entrepreneurship" are becoming radically ambiguous and difficult to pin down (e.g. Poutanen, 2018). From the Whiteheadian perspective, it seems that digitalization in its manifold dimensions (concerning not just academia and academics, of course) has come to vividly demonstrate the general principles of reality's processualist structuration. This demonstration expands in intensity practically every day and is quite easy to perceive, meaning the accomplishment of a fundamental change in our ontological framework has begun to look increasingly welcome.

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[1] See Poutanen 2018 for more reflection on the matter.
[2] Halewood and Michael, 2008, p. 42.