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ABSTRACT

Something fundamental is changing – or is it? The firms are preoccupied by transformations and disruptions, the scholars are reassessing the validity of old theories, the politicians are wondering where the power is, and the individuals are struggling to understand how to go about making a living tomorrow. Has this always been the normal, or are we evidencing an era that can rightfully be called a New Normal?

This research is an attempt to synthetize knowledge from several rich sources in order to understand the drivers of the changes emerging from the phenomenon labelled digitalization. The research quandary of this conceptual monograph is the impact of digitalization – as a sociotechnical trinity of digital technological systems, humans and perceptions – on strategizing, the individual level actions and decisions tackling the fundamental uncertainty of anything future-oriented, subsequently coalescing into collective level outcomes.

This research explores the constitutions of strategizing, uncertainty and digitalization in order to understand the impact of the drivers of digitalization on the constitution of uncertainty dealt with in strategizing, and the subsequent changes therefore reflected on strategizing. Tracing these ripples requires reconceptualizing uncertainty as consisting of three dimensions: lack of knowledge, difficulty of choosing between diverse standards of desirability, and the infathomability of the meaning making mechanisms that underpin the creation of those standards of desirability.

As findings, this dissertation presents three theses: first, digitalization obliterates one type of uncertainty, while changing and enforcing other types; secondly, digitalization erodes the boundaries of extant entities and creates new boundary forming mechanisms; and thirdly, digitalization changes the shape and impact of what we take for granted, consider normal – the doxa. These findings have implications for both the theorists and the practitioners.

As scholars, we need to redefine such units of analysis, as heretofore captured by concepts like the firm, market or nation. As practitioners, we need to cherish such rationalities that do not compete with the algorithmic intelligence, to emphasize such creative thinking a machine cannot do. As individuals, we need to understand how many of our actions are grounded on the unreflective acceptance of what we take for granted, and how susceptible our notion of normal is to manipulation. Together, we need to understand that the digital representation of reality, being constructed today to give the shape for our tomorrow, reflects not only the physical entities datafied and digitized, but also our values and preferences – whether we reflectively acknowledge them or not.

Keywords: Digitalization, uncertainty, strategizing, doxa

TIIVISTELMÄ

Elämme perustavanlaatuisen muutoksen aikaa – vai elämmekö? Yritykset keskittyvät disruptioihin ja muutoksiin, tutkijat arvioivat vanhojen teorioiden kykyä selittää uusia ilmiöitä, poliitikot pohtivat vallan uusia muotoja ja yksilöt taistelevat huomisen toimeentulon kanssa. Onko tämä ollut aina yhtä normaalia, vai elämmekö aikaa, jota voimme rehellisesti kutsua uudeksi normaaliksi?

Tämä tutkimus pyrkii yhdistämään rikasta, olemassaolevaa tietoa monista lähteistä luodakseen ymmärrystä digitalisaatioksi kutsutun ilmiön synnyttämien muutosten ajureista. Tämän teoreettisen monografian tutkimusalue on digitalisaation – digitaalisten teknologisten systeemien, ihmisten ja oletusten muodostaman sosioteknisen kolmiyhteyden – vaikutus strategiointiin, eli tulevaisuuteen elimellisesti liittyvän epävarmuuden käsittelyyn sellaisella yksilötason toiminnalla ja päätöksenteolla, joka yhdistyy kollektiivisen tason lopputuloksiksi.

Tämä tutkimus perehtyy strategioinnin, epävarmuuden ja digitalisaation luonteeseen selvittääkseen digitalisaation ajurien vaikutusta strategioinnissa käsiteltävään epävarmuuteen, ja siitä syntyviin muutoksiin strategioinnissa. Tämän vaikutusketjun ymmärtäminen vaatii epävarmuuden uutta konseptualisointia: epävarmuus muodostuu kolmesta ulottuvuudesta, jotka ovat tiedon puute, eri arvoskaalojen välillä valitsemisen vaikeus, sekä niiden merkityksen muodostamismekanismien hahmottomuus, joista arvoskaalamme kumpuavat.

Tämän kirjan tulokset muodostavat kolme väitöstä: ensinnäkin, digitalisaatio tuhoaa yhden epävarmuuden tyypin ja muuttaa sekä vahvistaa muita; toiseksi, digitalisaatio haurastuttaa olemassa olevien entiteettien rajoja ja synnyttää uusia rajanmuodostusmekanismeja; ja kolmanneksi, digitalisaatio muuttaa itsestäänselvänä ja normaalina pitämiemme asioiden muotoa ja vaikutusta. Näillä tuloksilla on niin teoreettisia kuin käytännönkin vaikutuksia.

Tutkijoina meidän on uudelleen määriteltävä sellaisia analyysin yksiköitä kuten yritys, markkina tai valtio. Yritystoiminnan harjoittajina meidän on vaalittava sellaista rationaalisuutta, mihin algoritminen äly ei kykene, painotettava luovaa ajattelua. Yksilöinä meidän on ymmärrettävä miten iso osa toiminnastamme perustuu itsestäänselvyyksinä pitämiimme asioihin ja miten helposti käsitystämme normaalista voidaan manipuloida. Yhdessä, meidän on ymmärrettävä, että tänään muodostumassa oleva, huomistamme muovaava digitaalinen todellisuuden representaatio heijastelee, paitsi fyysisen maailman digitaaliseksi dataksi muunnettuja entiteettejä, myös arvojamme ja preferenssejämme – riippumatta siitä, tiedostammeko ja tunnistammeko ne vai emme.

Avainsanat: Digitalisaatio, epävarmuus, strategiointi, doxa, normaali

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*"The wind was not the beginning. There are neither beginnings nor endings to the turning of the Wheel of Time. But it was **a** beginning."*
(Robert Jordan: Wheel of Time)

One of the things the writing of this book revealed to me about myself was my inability to perceive boundaries: I find it difficult to identify the beginning and the end, to bracket a phenomenon feeling secure that this is its shape, nothing more, nothing less. This applies equally to the actual emergence of this book. Where did it start?

Could I say that its seeds were sown when my maternal grandmother taught me not only to read, but to think and discuss the worlds revealed through the ink on paper? Could I trace its beginning to having a family of my own, to children who taught me the ultimate skills of time and energy management? Or should I state that it begun when my supervisor-to-be, Peter Zettinig, first introduced me to the wonderful world of academic wisdom, and encouraged my very first efforts at scholarly thinking? All of these moments have the feel of a beginning.

But just as difficult it is to name the beginning, it is to name all the threads in the form of human connections that contributed to the existence of this book. However, I will try to point out and thank a few of you, without whom this book would not exist.

Thank you Peter for your open and versatile mind, and your endless supply of encouragement: you have the uncanny ability to offer constructive criticism in a way that makes one feel proud for trying, not a fool for not knowing. Without you, my life would most likely have taken a different turn a few years back, and I would have never found this realm of my true ikigai. Our email correspondence before the formal beginning of this journey was important in so many ways: you saw a tiny bud of a scholar somewhere deep within me, one I was not even aware of myself, and nurtured it patiently and wisely until I grasped its potential myself, and could seize it with the passion subsequently resulting in this dissertation.

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us as we are, trust us, and support us no matter what. You are a treasure: few people can handle the professorial existence in between the rock and a hard place as gracefully – and with your sense of humour and kindness intact – as you.

Thank you my fellow TSElosophers. Kari Lukka, your thoughts, texts and our discussions acted as bellows, feeding my kindling interest in philosophy of science, resulting in the furnace evidenced in this book. (Though I can now confess that you are the very only professor to ever give me the grade 1 in an exam.) Otto Rosendahl, you took a passing thought, and made it happen – without the likes of you, no idea ever becomes real. Jonathan Van Mumford, Katja Einola, Joonas Uotinen, Eriikka Paavilainen-Mäntymäki, I have enjoyed our discussions not only for their contents, but also for the opportunity of engaging in meaningful discussions, even debates, with, if not kindred spirits, at least with people sharing a passion.

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On a more formal note, none of this would not have been practically possible without the support of UTUGS, nor would this book be in print if not for the aid of Turku School of Economics Association. The very practical help by Jenni Heervä, Auli Rahkala-Toivonen and Sanna Kuusjärvi at various stages of this journey is also warmly appreciated.

Naturally, these words on the following pages would have remained as mere ramblings, if not for the invaluable contributions of my esteemed pre-examiners. Jay Barney, your review made my day – and several thereafter. Peter Liesch, I take it you find this dissertation a bit different? Thank you for seeing the value in it despite – or because of – its "personality". I have read and reread both of your comments many times, and am each time filled with awe and gratitude: it seems this is a dissertation after all.

As I am writing this, my two children are vying for attention – a familiar occurrence during the past few years. As contradictory as it seems, even with the interruptions, demands of focus, energy, care ("Mommy, I'm hungryyYY!"), and always too little time, it is only because of my family that I got this book written. Without the stabilizing and loving presence of my beloved husband Olli, the awe-inspiring example of endurance made flesh in my mother-in-law Anneli, or the repeated lessons about the things that truly matter in life provided by my children Nea and Oliver, I would not be the version of me that was able to write a book. The same thanks goes to the best sister and brother anyone could ever have, Elisa and Petteri, thank you for being you – you know I would not have made it this far without you. Riitta, you were invaluable during my formative years. I love you all, with the love I have gotten from the most loving person I know, my mum.

Finally, a few words of thanks to ones no longer reading them. Sirkka-mummi, you taught me that one is never, ever too old to do what one loves. Dad, you showed me how to get up and continue onwards – time and time again. Mami, in big part I am what I am because of you.

Turku 12.9.2018
Milla Wirén

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1 INTRODUCTION

"In short, if something can happen, it will happen – regardless of what governments, or societies as a whole, might think about it. That's the natural way of human curiosity and inventiveness. And no amount of political bombast or hand-wringing morality is going to change that state of affairs."
(John Casti: X-events – The Collapse of Everything)

Since pre-historical times, humanity has strived to create technology as means to reach whatever goals were at any given time in any given context deemed worth pursuing. The first steps were few and far apart, however the past centuries and especially decades have witnessed how the stumbling toddler of humanity has grown up to become a sprinter, leaping over the hurdles in accelerating to a nigh super-human speed.

The most recent technological transformation is driven by digitalization, expected to transform our society on par with such game changers as the shift to agriculture, introduction of the spinning jenny, and the diffusion of electricity. It is the aim of this research to explore what digitalization ultimately means, what does it change, how those changes unfold and what does that mean for the agents in global economy, be they firms, nations or individuals.

This introductory chapter opens with a view at the New Normal, the somehow perceivable era of transformations we quite cannot grasp, outlining the backdrop of this research. The second subchapter is a guide to this book, introducing the research quandary, key themes and premises, and the structure of this theoretical monograph. However, even before these onsets, some expectation management might be in order: while the contents of this book constitute a dissertation, the template of the book is not typical for a dissertation – for reasons that will hopefully become clear in the unfolding of the book.

1.1 Digitalization and the New Normal: the background

We know a lot. Never before has humanity possessed the sheer quantity of quality data we now have at our fingertips. So why then does it feel that uncertainty reigns

supreme? Globalization seemed like an irreversible deal, but somehow we ended up with Brexit and Trump. MNCs were by all our theoretical knowledge destined to become transnationals (Bartlett and Ghoshal, 1999), but the tide is changing (Economist, 2017). For the first time in generations, the income of the children will not outgrow that of their parents (Siltala, 2016). What happened?

Since the horrors of the World Wars I and II, the intertwined drivers of scientific advances in both technology and business, peace-seeking coalition-creating efforts among the so called developed nations, financial innovations enabling investments in the always better future, and freeing trade diffusing the fruits of human ingenuity, seemed to succeed in forging an unforeseen era of ever-increasing wealth spread more evenly than ever in the history of humanity – in addition to the longest peaceful era in the history of the Western civilizations (Pinker and Mack, 2014). It briefly seemed as if the humanity had finally hit the philosopher's stone of everlasting progress and prosperity for all[1].

Then the pieces started to crumble. Technological and business advances raped the environment. Introverted tribal sentiments began to overrule the social integration efforts. Sophisticated financial inventions turned out to be built on legs of clay. Free trade revealed its victims in the less than well-to-do pockets of our global village, which seem to exist not only "out there" in the so called developing nations, but also in our neighborhood, wearing the desperate face of our unemployed friend.

With everything we now know about everything, why does everything seem more uncertain than ever? Is it only the other side of the coin of accumulating knowledge revealing always more about what we don't know? Is it maybe the fault of contemporary communications channels, broadcasting the negative news as flash fires, distorting our view of the good and beautiful? Or is there a dimension to uncertainty we are yet to identify, and as such, yet to understand and address? Where does digitalization come in to play – is the imminent technological paradigm change prophesying the salvation or the doom of the humanity?

Future, by most definitions, is something that has not happened yet. Therefore, while we can debate about the accuracy and validity of our knowledge about events past, we can with certainty say that of the future events, we have none. While we can be relatively certain that some of the things that happened yesterday will also happen tomorrow (most likely the sun will rise, because if it didn't there would be no tomorrow to worry about), most of the actions we take today are essentially grounded in

[1] With the turbulence of 1970's yet to cast shadows of doubt, the remark by Steiner writing in 1969 captures the sentiments quite aptly: "*Much remains to be done, but one thing is clear: the area of unpredictable events is rapidly narrowing.*"(Steiner, 1969, p. 207), quoted in Mascarenhas (1982, p. 87).

fundamental uncertainty about how they will play out tomorrow. Therefore, with little exaggeration, it can be said that most of our decisions, conscious or subconscious, prospective or retrospective, guised as mundane or framed as strategic, are based on dealing with uncertainty. I would even go as far as to suggest that most of our actions are grounded on the attempt to diminish that inherent uncertainty we are immersed in.

Interestingly, the key point of the discussion of the ethics and morality of artificial intelligence is the revelation it makes about how we humans now go about making decisions under that uncertainty. The difficulty in defining ethical action in terms a machine could understand shows how much our actions and decisions are guided by something that cannot be bent to rules or models, processed by algorithms. In essence, with all the accumulated knowledge of humanity, we are still unable to create a formula for making good decisions when faced with the inherent uncertainty of even the most imminent future. Ultimately this boils down to the problem of actually being able to define a "good" decision (Hastie, 2001).

It is this nebulous nature of a "good" decision that makes the ethical programming of artificial intelligence nigh impossible (Bostrom and Yudkowsky, 2014, Yampolskiy, 2013). Decisions are seldom universally "good", as each decision triggers chains of actions and events that can at some future point in time be deemed as beneficial by some standards and harmful by others. These standards of good or bad in turn are dependent on the underlying structures of meaning we use when allocating the valence to the outcomes: from whose perspective, in what context and based on what is something good or not? Let's take child labor as an example: not too long ago it was perceived as a good thing that children could be employed in a factory because it increased the number of bread-winners of a household in times of sustenance scarcity. Now a CEO making a decision that leads to increasing the child labor in Asia makes, according to most western people, a bad decision. But if on the level of the individual child the alternatives are either child prostitution, starvation or working at a sewing factory, the decision that creates the third option of child labor, can be also defined as beneficial[2].

[2] This example highlight also the issue of the scope of the decision: it can be argued that the CEO of the example would be instead making a good decision if instead of opening a factory utilizing child labor, he were to open a school for the children in the region, thus contributing both to the society and to the future work force development he can later utilize in the region. However the activity of opening up the school is, both in terms of time and scope, an answer to a different problem (long-term resource building and social contribution) than the one he is solving (short-term need for production capabilities) by contemplating the opening of a new factory in the current reality.

So, where do the meaning structures come from? Are there some fundamental principles we could unearth that would enable defining good and bad, well, for good? In my view, ultimately the meaning structures cannot be subjected to reduction that would somehow unveil the core principles by removing the contexts and human beliefs, emotions, values, cognitive idiosyncrasies, because the meaning structures emerge and are constituted by exactly these contexts, beliefs, emotions, values and cognitive structures. However, these meaning structures are the glue that binds the ultimately random singular actions resulting from our decisions into a coherent and sometimes even purposeful whole. They contribute to our notion of normal, what we can take for granted and build our actions on before engaging in reflective thinking.

But what is the meaning of this discussion of meaning in the context of this dissertation? It is the claim of this book that the most pivotal impact of digitalization is the change in the nature of uncertainty we need to deal with, both within the sphere of strategizing, and on the wider level of the whole society. Therefore this dissertation highlights how uncertainty is not only about what we don't know, but also constituted by the impossibility of creating universal meaning structures, and how this dimension of uncertainty impacts strategizing. Furthermore, this dissertation also shows that as the primary way with which we deal with uncertainty is by relying on the foundations of what we consider to be normal, the changes in the nature of what we take for granted impact our dealing with uncertainty and strategizing in ways we don't reflect.

At the core of this inquiry is the same quest that defines the attempts to find the approaches to instill the artificial intelligence with guidelines for ethical action. Since the Enlightenment, a big portion (at least if estimated based on impact, not sheer number of populace) of humanity has been driven by the meaning structure of faith in the everlasting progress through the scientific method geared towards increasing knowledge – relying on the faith that addressing the lack of knowledge is enough in guiding our actions towards creating a better world. But now, with both the positive and negative outcomes of this drive evident, we are beginning to see the limits of data.

The concept of New Normal in the title of this dissertation refers to both the exogenous and endogenous changes we are currently living through. The exogenous changes are evident in the human-wrought upheavals consisting of the convergence of radical technological advances (Linturi, Kuusi and Ahlqvist, 2014), geopolitical and socio-economic turbulence (Kobrin, 2015, 2017a) and global environmental calamities (Wilenius and Casti, 2015). In turn, the endogenous changes emerge from the way these exogenous drivers shape our perceptions of normal, of what we take for

granted and ground our actions on. The loop closes with the impact of these endogenous changes on the subsequent trajectories of the exogenous changes.

To finish in order to start, we are seeing technological developments that make it feasible to think that it might actually be possible to have wielders of full computational rationality accessing and processing all knowledge acquired by humanity amongst us[3]. But when we have all the data in the world, and possess the computational power to process it any way we choose, is it enough to guide us in making wise decisions?

I don't think so, and this book argues why.

1.2 The purpose, key themes and the structure of this thesis

1.2.1 Research quandary and the structure of this book

The backdrop of intangible uncertainty and a vague sense of an era of transformation conveyed through traditional media, discussed at coffee tables, and analyzed in diverse online channels of various dispositions outlined before, is vague and amorphous. However, many of the threads of these sentiments pivot around technological advances, captured by the buzzword of digitalization. While the scholarly definitions of the concept of digitalization are all but unanimous, as a concept it still captures an integral part of what seems to be partially driving the turbulence we are experiencing.

Therefore, digitalization (explained shortly in some detail, and even later in nuanced detail) is in this dissertation perceived as the independent variable that induces change. This leads to the question of what is it then that it changes, what is the dependent variable? In this dissertation that entity is captured by the concept of strategizing, also explained in more detail subsequently. However, as one of the premises (explained also in more detail shortly) in this dissertation is that strategizing is primarily dealing with uncertainty, it is here perceived that the changes in strategizing

[3] Artificial intelligence will be discussed more later in this book, however for the hasty reader, a few hints: while typing the words artificial intelligence to any search engine yields the interested a cornucopia of insights, debates, facts and questions, World Economic Forum (www.weforum.org) or the EFF portal (https://www.eff.org/issues/ai) are good sources for following the most relevant recent outbreaks and their implications. A nice overview of AI from 2015 can be found in the blog Wait But Why? (Urban, 2015), but in short, artificial intelligence refers to an advanced algorithm, a program code, that instead of needing to be pre-programmed by humans to carry out a specific task, utilizes so called machine learning, ie. "teaches" itself (develops its own code) based on an initial algorithm programmed to learn (by identifying patterns) through massive data sets.

emerging from the influences of digitalization are mediated through uncertainty. The following figure explicates the connections of the three key concepts of this research.

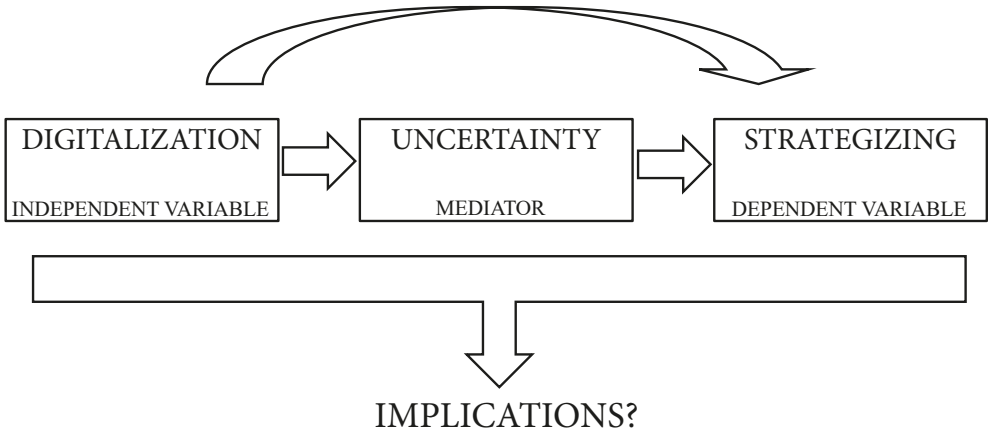


Figure 1: Key concepts and their relationships

The main research question of this dissertation is **How does digitalization impact strategizing?** This is answered through three types of outcomes: the changes emerging from the direct interaction of digitalization and strategizing, the changes mediated through the changes in the uncertainty, and the implications thereof emerging.

In order to answer the main research question, some additional questions are needed. The first subquestion is "**how does digitalization change the constitution of uncertainty?**" and in order to answer that, it is necessary to first zoom in to the constitutions of uncertainty (chapter 4) and digitalization (chapter 5), before being able to present some tentative answers (chapter 6).

The second necessary subquestion is "**how are those changes in the uncertainty reflected in strategizing?**" and again, this needs to be preceded by an understanding of strategizing (explicated in chapter 3), before discussing in chapter 7. The third subquestion pertains to the implications: "**what are the theoretical and practical implications emerging from the changes in uncertainty and subsequently strategizing?**" and these are also discussed in the chapter 7, and even further in chapter 8.

The conceptual goals of this dissertation seek to form integrative knowledge, defined by MacInnis (2011) as seeing "*previously distinct pieces… in terms of a unified whole whose meaning is different from its constituent parts.*" (MacInnis, 2011, p. 138). In order to do that, it is necessary to draw insights from diverse sources, even across paradigmatic or science philosophical divides. The argumentation for utilizing logi-

cally such knowledge, stemming from diverse philosophical roots, and the supporting philosophical choices of this dissertation are explained in the second chapter.

To recapitulate, this dissertation unfolds as follows. After this introductory chapter, the chapter two explicates the foundations of knowledge seeking in this dissertation by identifying diverse ontological choices in social sciences, and explaining and arguing for the use of knowledge from different philosophical underpinnings in this dissertation. The following two chapters synthesize an integrative framework of strategizing (in chapter 3) and an integrative conceptualization of uncertainty (in chapter 4). The chapter on digitalization (chapter 5) is grounded on some of the extant conceptualizations of digitalization, however the focus is on defining and understanding the concept as necessary for the research purpose of this dissertation.

Chapter 6 is the first element of the discursive part of this dissertation and answers the first subquestion (how does digitalization change the constitution of uncertainty). The continuing discussions in the chapter 7 in turn propose answers to the other subquestions in addition to outlining the answers to the main research question. These discussions are then summarized and scrutinized in terms of their potential contributions and limitations in chapter 8, before finalizing the book with the introduction of potential future research avenues.

1.2.2 Key concepts and premises: on digitalization, uncertainty and strategizing

The key concepts in this dissertation are strategizing, uncertainty and digitalization, in that order addressed in the following chapters. While the chapters will delve the concepts in detail, some preunderstandings are however beneficial already at this stage in order for the reader to follow the overarching narrative of this book. This applies equally to the three key premises, argued more thoroughly throughout the book, but also taken as the starting points for weaving the fabric of this thesis.

The first premise is simultaneously the definition of strategizing as understood in this book. Strategizing means the individual level actions and decisions, fused together in social action that aggregate into collective level outcomes within the realm of economic action. As such, the perspective fuses together the philosophically divergent streams of research on microfoundations (Barney and Felin, 2013, Felin and Foss, 2005, Felin, Foss and Ployhart, 2015) and research on strategy-as-practice (Paula Jarzabkowski, Balogun and Seidl, 2007, Paula Jarzabkowski, 2008, Vaara and Whittington, 2012, Whittington, 1996). The differences of the approaches will be later discussed, however the mutual element they share is at the core of the definition of strategizing in this dissertation: there are no macro level causalities, but all collective

level outcomes emerge from the actions and interactions on the micro level of an individual, shaped by and further shaping the collective level influences.

The second premise of this book is that strategizing is mainly about dealing with uncertainty. Uncertainty is used in this thesis as an umbrella term covering the cornucopia of concepts like risk, normal and Knightian uncertainty (Knight, 1921), ambiguity and Marchian ambiguity (Ellsberg, 1961, March, 1978, 1982), isotropy (Sarasvathy, 2001), equivocality (Weick, 1979, 1995) in addition to typologies such as weak and strong uncertainty (Dequech, 2004, 2011), substantive and procedural uncertainty (Dosi and Egidi, 1991), and state, effect and response uncertainty (Milliken, 1987). Based on existing literature, uncertainty is in this thesis reconceptualized as consisting of three dimensions: lack of knowledge (consisting of open and closed sets of options and outcomes as discussed by Packard, Clark and Klein (2017)), difficulty of choosing between diverse standards of desirability (March, 1982, Thompson, 1967), and the impossibility of objectively deducting the non-objective, constructed nature of the meaning making mechanisms that underpin the creation of those standards of desirability in the first place.

The third premise of this book underlies also the definition of the buzzword-like concept of digitalization. Digitalization is in this book understood as a sociotechnical entity (Geels, 2004, 2010, Geels and Schot, 2007, Leonardi, 2012) that consists of three dimensions as discussed by Tilson, Lyytinen and Sörensen (2010a, 2010b). The first component is technological, and includes datafying entities from the objective (physical), subjective and intersubjective (explained in more detail later) realms, giving that data a digital form (digitizing) and subsequently storing, processing and transferring that digital data. The second component are the humans as users and shapers of technology, sources of data, and as subjects and objects of collective level change, and the third component are the perceptions of the humans as guiding the use and developmental trajectories of technology, and as subjects and objects of individual level change.

As such, the use of the concept of digitalization requires a caveat. Like mentioned, there is no scholarly agreement on the definition of the concept, and the discussions of digitalization often pertain to some sets of technological developments or to an organizational transformation ensuing from adopting new technologies. The technological components may entail such enablers as the increase in computational capacity (with increasing ease of access through eg. cloud computing and decreasing prices), the advances in telecommunication technologies, diffusion of mobile digital devices, sensor technology, or applications such as digital platforms, internet-of-things

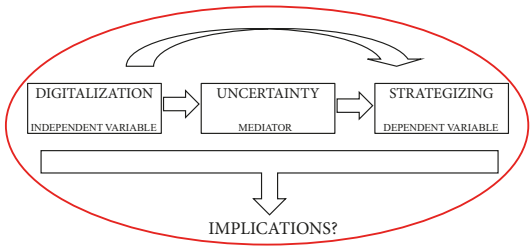
(or of-everything), or even the school of quantified self, transhumanism[4]. However, the focus in this dissertation is not on scrutinizing any of the individual technological advances, but on trying to pin down the drivers of the changes ensuing from the convergence of these different technological developments, and the enmeshed interplay of technology and humans. As such, the adopted viewpoint adheres to the sociotechnical school of research on technology,

In this dissertation digitalization is perceived as an ongoing phenomenon not dependent on any of the individual technological enablers or applications – somewhat similar to how the adoption of electrical technology was not dependent on any single technological innovation: once the ability to harness electricity was created, the individual advances in both the technology and its use by humans converged in creating the contemporary society where electricity is taken for granted to the extent of nigh invisibility.

As mentioned, all of these key themes will be discussed in more detail in their own chapters, but hopefully these early revelations will aid the reader in holding on to the red thread of the overarching quandary of this research. Next it is time to tip one's toes into the ocean of philosophy, and to explicate the knowledge building mechanisms of this thesis.

[4] This refers to individuals who use developing sensor technology and science to monitor their bodily functions in order to enhance their physical form, a sort of preliminary phase on the way towards fusing humans and machines into cyborgian entities.

2 ON KNOWLEDGE



"Reality is that which, when you stop believing in it, doesn't go away."
(Philip K. Dick: How to Build a Universe that
Doesn't Fall Apart Two Days Later)

Conducting social science requires addressing a set of ontological questions that underpin the epistemological and methodological choices – while having constituted the core of philosophical ponderings throughout human history, the nature of reality is still far from undebated. This is evident in the constellation of our scholarly knowledge: our knowledge of a given object on inquiry constitutes of several, sometimes complementary, at other times contradicting insights grounded on the specific perspective from which the given object has been observed.

Two of the three focal concepts of this dissertation, strategizing and uncertainty, are widely and deeply researched objects of inquiry. However, the fact that most of the past endeavors are grounded on specific philosophical underpinnings has resulted in somewhat disjointed knowledge. Most acutely this pertains to the threefold conceptualization of uncertainty in this thesis: the two first types of uncertainty have been researched from different philosophical vantages than the third type.

This means that in order to understand and conceptualize the objects of enquiry in this dissertation, I need to be able to utilize insights emerging from different philosophical perspectives. This chapter explicates the logic and argumentation with which I attempt to do that. The first subchapter is a brief detour to my personal history, necessary in explaining the constitution of the research tool of this dissertation, me. The second subchapter outlines the plural choices of the social scientist as grounded on the diverse ontological choices, and the third chapter outlines the choices on which this dissertation is grounded.

2.1 Developments of the research instrument

It is inescapable that we see things through our own eyes and make sense of them through our very own experiences. In communicating an idea, the key desire there-

fore becomes to make what is seen through my eyes visible also to another set of eyes. While I cannot influence the experiences of the reader, I can try to make myself more understandable by sharing some of the experiences that have played an integral role in making me see what I see the way I see it.

It has never been easy for me to quite capture what is normal. As a child, I spent a lot of time with my maternal grandmother and her thirteen siblings. In going to school I found out that what was considered normal in my family, was not normal in the new setting. With the malleability of the young, I soon learned to mimic normal in both settings.

I started playing French horn quite young, first as a hobby, but quite soon as a serious hobby in a national youth symphony orchestra, with devout teenagers of which most subsequently became professional musicians. Again, what had been normal in the school setting in a small town, was not normal in the setting of ardent youths from across the country, brought together by their passion of pursuing a life of a musician. This normal became the most natural normal to me as I also ended up studying music professionally in the Sibelius Academy (the only music university of my country), then working as a symphony orchestra musician, spending the majority of my formative years being socialized into the world of professional classical musicians.

However, life twists and turns, and after ten years of being a professional musician, I became a radio journalist, and ended up hosting a morning show at a Christian radio channel. Again, what had before been normal, no longer applied. Being a journalist led me to doing communications, becoming an entrepreneur and ending up producing events such as the sponsorship village of the Eurovision Song Contest held (once) in Finland – in short being entangled in the entertainment industry, familiarizing myself with both the glitter and the gutter of the industry. Needless to say, little of what had been normal, applied. A brief return to the world of art, this time as the communications manager of the contemporary art museum Kiasma, brought me into the middle of an ongoing power shift within the museum, introducing me two types of normal, neither of which resonated with my previous encounters of what should be taken for granted.

Then I got married and moved from the capitol to a small village of 3000 inhabitants, to a house in between the sea and the forest, with 10km to the only grocery store of the village, and had two children. Becoming a mother changes the normal quite dramatically, but so did the encounters with the local people, who perceived all my past lives as quite abnormal. I took up the hobby of bowhunting, and yet again encountered a group of people with their own distinct understanding of what can be

taken for granted. In addition, I got involved in the municipal politics, yet again a learning experience.

With kids growing, I needed to figure out a livelihood and launched a communications agency, specializing in the needs of the small and medium sized firms in the region, and learned to know the hard life of an SME entrepreneur through both my own experiences and through the problems of my clients. In order to gain a better understanding of the business and the economy, I started to pursue the degree of executive Master of Business Administration, eMBA. Through the studies I met yet another group of people I had not previously closely known, the middle managers of large companies, with their sense of normal born out of having been involved in the corporate life throughout their whole career, mostly spanning over two decades by the time of eMBA studies. Becoming a board member, and subsequently the chair of the board of a board members association showed me yet another facet of the sphere of business.

It came with little surprise that when I became a full time doctoral candidate, an employee of the university, I was yet again revealed a new notion of normal. One of the many moments of revelation accompanying this choice of career was the introduction to the philosophy of science, with its vocabulary to capture the experiences of my past lives. I have all my life been hopping from one set of doxa[5] to another, and through intimate experience understand how powerful the notion of normal is – while at the same time, how elusive, contextual, path dependent, fundamentally non-objective and constructed that normal is.

So, I still don't know what is normal, but have learned to sense enough of any given normal of a context, to pass as normal (mostly). This developed sensitivity is also present whenever I read something – I cannot help trying to read in between the lines, to understand the notion of normal through which a given text is written. In the scholarly realm this pertains to the philosophical underpinnings of the re-

[5] The concept of doxa will be discussed later more extensively, however a brief definition is already here in order. Doxa, as re-introduced by Bourdieu, refers to a zone of taken-for-granted within a specific social group. Like my lived experience shows, it is more fine-grained than culture or informal institutions (as all my experiences were from within a same national culture, reigned in majority by the same informal institutions), while it bears some connection points to the bottom level of basic assumptions in the cultural pyramid of Schein (1985). Further along this book, I will use doxa to define the notion of normal, the unreflected area through which we make sense of the events unfolding around us – we become conscious of things only after they have passed the zone of doxa. Behaving against a doxa of a specific group creates an unease, an instant intuition of someone not being "one of us", however identifying the exact nature of that behavior that goes against a doxa is difficult, because the taken-for-grantedness is highly nuanced, and difficult to grasp exactly because it delineates what is taken for granted and as such, not reflected.

searchers. Subsequently, I find it difficult to commit to any given perspective, as the truthfulness of any understanding doesn't depend on the chosen underpinnings, is merely tinted by them.

A tree may remain the same even if we view it from different sides and thus see a different picture, zoom in to explore the branches and leaves, or zoom out to understand its relationship to the forest. We can debate the existence of the tree beyond any of these experientially gained impressions, argue whether the tree is the same when endowed with different meanings by people with different experiences about trees, but ultimately, all of these discussions and perspectives increase our understanding about what the tree is, is not, could or could not be, and as such have value in the pursuit of knowledge and understanding.

I cherish and value the scientific mechanism of accumulation of knowledge; the incremental additions of the ever deepening insights of minutiae detail, built on the specific foundations of previous insights from that specific vantage. However, with my background I find it difficult, if not impossible, to stay zoomed in in the scrutiny of the one leaf, but need to have the possibility of walking around the tree, wandering to the tree line to admire other trees, to return back to marvel the exquisiteness of the details of that one leaf, and to embark in questioning the existence of the tree or to discuss its meaning.

I don't know if the academia of today has use for my type of wandering and pondering individual, but this book is an attempt of illustrating the value of also this type of knowledge and understanding creation. In the next subchapter I trace and identify six fundamental questions that underpin the choices we as social scientists are required to make in our pursuit of knowledge and its definition, because recognizing them is necessary in the ensuing pursuit of knowledge in this book.

While the philosophical discussions have roots as old as man, some point of departure is however necessary, and in this book a question posed and to an extent answered by Kant serves as the springboard from which to dive into the ocean of philosophy.

2.2 Six ontological questions

What can I know? This famous question Immanuel Kant (1724-1804) devoted a remarkable part of his remarkable life (IEP Jankowiak, N/A)[6] pondering, has by no means lost its relevance to the contemporary scholar. Kant makes three claims that

[6] The references denoted by IEP, lacking publication years, are sourced from the peer-reviewed Internet Encyclopedia of Philosophy that doesn't share the dates of the published articles.

resonate firmly in all the subsequent branches of philosophy of science: the first is the distinction of things into two categories, the ones we can experience through our senses (eg. a cat), and the ones we can only conceptualize (eg. God, to use Kant's own example). The second distinction is vital, and has since triggered volumes of philosophical debates: regarding the entities that we can through the senses experience, Kant shows that the nature of those entities in themselves is a different thing from the appearances of those entities, which is essentially all that we can through our senses (or contemporary scientific devices) grasp. The third key insight is that in regards to the entities we can experience, our knowledge of those things consists of both the phenomenal part of the specific sensory input of the specific object of our observation, and the noumenal[7] part of the general concepts we have about those objects of observation.

In essence, Kant claims that ultimately we can only have knowledge about things that can be understood through both phenomenal and noumenal input, which means that regarding the things lacking a physical appearance (eg. God), we cannot have knowledge, only faith. What furthermore intrigued Kant was the question of which part of this duality of knowledge comes first, the noumenal imaginable concepts, or the phenomenal experience input we glean through focusing our perceptions towards the specific entity we are observing. This question is interesting in the light of the contemporary "science wars" between the constructionist and realist schools, because fundamentally it deals with the dilemma of whether the entity we experience is first formulated in the noumenal realm as a fabrication of the observer resulting in the bracketing of the sensory inputs in the form of experience we then continue to gain knowledge about, or whether the noumenal generalisations, concepts, emerge after the observer has been subjected to the experience through sensory inputs.

In "*Critique of Pure Reason*" (1781) Kant argues for his "Copernican" view (IEP Jankowiak, N/A): as he had previously come to the conclusion that knowledge pertains to entities with both phenomenal and noumenal existence (thus ruling out the

[7] Kant furthermore distinguishes noumena into positive and negative. The positive noumena is the intelligible understanding of an object that has also the phenomenal appearance, whereas the negative noumena is something intelligible without an object of experiental reference. The latter kind of noumena is however moot, because as noumena refers to the intelligible, not sensible part of the in-themselves-partness of an object, and as that in-themselves part of an object is unreachable but through the possibility of the experiences it yields, the noumenal understanding can never actually depict that which it sets out to do, namely the concept of the thing in-themselves, without the reference point of the phenomenal part of the equation of knowledge. From this insight follows the claim that Kant makes about there being no possibility of having knowledge about the entities lacking sensible (eg. experiencable) appearance – instead of knowledge, we can only rely on faith (Kant, 2004, p. 132-138). However, this is where the pragmatic maxim of Pearce comes in to suggest some help – more about this later.

possibility of us having knowledge about God, for example), and having distinguished between the objects in themselves and our experiences about them, he claims that as all that we have for building knowledge is based on these phenomenal appearances of our experiences (because we can never reach the objects in themselves, as all we have is the realm of experience), we can focus on all the possible experiences we can conceive to have and based on those, create *synthetic a priori* knowledge about entities we are yet to experience: *"All principles of the pure understanding are nothing more than a priori principles of the possibility of experience, and to experience alone do all a priori synthetical propositions apply and relate."* (Kant, 2004, p. 132)

This notion has a deep impact on the subsequent evolution of pragmatism, especially in the pragmatic maxim as coined by Peirce, and also on the rise of the social constructionism even later (Berger and Luckmann, 1967). Kant states that while we cannot possess a priori knowledge about entities in themselves, we can and do have a priori knowledge about the possible experiences those entities provide, which means that essentially, this kind of a priori noumenal part of knowledge plays a role in shaping the simultaneous or subsequent phenomenal part of knowledge, which combined becomes the knowledge we can possess about the entity. To put it very simply, our noumenal concepts impact our phenomenal experiences. This has major implications for the faith in the possibility of pure objectivity.

These distinctions between the nature of the entities in themselves, our phenomenal intuitions about their appearances and the noumenal concepts we subjectively can come up with still resonate vibrantly in the contemporary philosophy of science. The natural scientist can happily claim to being in the business of knowledge-building, as the objects of his study have a physical representation by senses (and nowadays by sophisticated tools) observable. However even he is subject to making a stand about Kant's suggestion of the ontology of things, which, extremely simplified, comes down to four basic onto-epistemological alternatives.

He can dismiss Kant and claim that the objects of his observation have a real existence that can be reached through the tools of observation – the entities are real and can be truthfully known about through science. This is the stance of naïve realism and positivist empiricism, leading to and based on what Popper calls "the bucket theory of thinking" (Popper, 1974, p.554-555). In this worldview the knowledge flows into us from the real external sources through our senses, and the best way to avoid mistakes is to try to be as passive as possible in the process of receiving the knowledge. Objectivity is equated with as little interference as possible with the externally originated information, with the role of the researcher limited to the recipient of as unfiltered knowledge as possible.

The second alternative is to interpret Kant's statement as a distinction between ontology and epistemology as advocated in the realm of scientific realism. This "one-world" understanding (IEP Jankowiak, N/A) states that ontologically the entities are realities consisting of both the entities in-themselves and their appearances, but due to the fallibility and imperfection of our tools of observation we can never quite capture the truth of the entities through the appearances, which are the only aspects of the entities we can reach – however, with the advances of science and ever developing epistemological understandings, we can continuously in our studies get closer to understanding the real nature of the entities as they are in themselves (Niiniluoto, 1999, Niiniluoto and Saarinen, 2002). This interpretation underlies also for example Popperian falsification theory of truth (Popper, 1974), which states that while we can never prove anything true in the full sense of the correspondence theory of truth[8], we can however progress in science through falsifying previous theories, thus continuously creeping towards the ultimate truth of an entity.

The third alternative is to take the transcendental idealism as the ontological foundation: ultimately the entities in themselves and their appearances are ontologically different (the "two-worlds" interpretation), meaning that the objects of our observations, the appearances don't ontologically correspond to the entities as they in themselves are[9]. However, some of the features of the entities as they are in themselves may have influence on the entities as appearances, which in contemporary philosophies is for example the foundation of Bhaskar's (1998) critical realism: the middle layer between the real and the empirical[10], the layer of generative mechanisms and affor-

[8] Correspondence theory of truth defines "true" as a full correspondence between a statement of an entity and the real existence of that entity. This is problematic for a few reasons: 1) it requires faith in the underlying reality to which something can correspond, 2) "correspondence" in itself is a difficult concept, the nature of which can be debated, as ultimately in forming a statement we utilize different material (abstractions like words, mathematics) than the materials that assumed reality consists of (eg. atoms, quarks in the physical realm), which means that as the mechanisms through which the two types of entities (statements and reality) come in to being are different (language by collective choices, nature not by our choices), the one can never fully accurately depict the another, and 3) even if we were to dismiss the ontological differences between the statements and the "real" entities, as all we have to go by are the statements, theories, even the most foundational theories are subject to change because the "real" can always surprise us when we come up with more and more sophisticated methods of examining the entities – we can never know if the theory we hold true in this sense actually captures the full extent of the entity in question.

[9] Emphasizing Kant's notion that a) as the appearances exist in the world of time and space, and b) our noumenal conceptions do not exist in the same world but point to c) the things in-themselves beyond their phenomenal representation in the world of time and space, would suggest that this two-worlds understanding is quite close to what Kant actually meant.

[10] For a compact and nicely comprehensive overview of the principles of critical realism I recommend (Volkoff and Strong, 2013)

dances is the realm that mediates between the unknowable entities in themselves and the appearances of them we can reach.

The fourth alternative is to take the most extreme notions of Kant beyond his critical idealism by dismissing any ontologically real existence of entities in themselves. This line of thinking leads to, what has since Edmund Husserl (1859-1938), become known as phenomenological philosophy (IEP Sawicki, N/A). While the branches of it are quite diverse (enter Heidegger, Derrida and the postmodernists), ultimately the ontological disposition is to deny or ignore the existence of any such realities that we cannot through our phenomenal experience of them conceive: in its most radical stance, solipsism, this means that there is nothing but my individual perceptions of the world around me, no realities but for the ones of my own making. While no serious philosophers have professed to adopting a solipsist view (IEP Thornton, N/A), as an ultimate example of the impossibility of proving any philosophical perspective wrong[11], it warrants mentioning, especially as we move on to the additional problems that the social scientists face.

Remember the natural scientist some sentences back? As he works in the realm of physical entities, it is likely that he has chosen an ontologically realist philosophy, even while his epistemological viewpoint may take several forms depending on how close does he consider the entities in-themselves and our attainable perceptions of them to be – essentially, whether it is possible to reach an ultimate or merely a proximate understanding of the objects of the study. However, we, in the social sciences are presented by a plethora of additional philosophical issues as the objects of our observations have no physical existence – even though it can be argued that they do provide other kinds of experiences.

To begin with, while even the natural science may be engaged in the discussion of whether entities can be treated as substances or processes (as ultimately, everything undergoes change when encountering time), the nature of social phenomena brings the debate familiar already to the Greek philosophers Parmenides and Heraclitus (Langley and Tsoukas, 2010, Rescher, 1996) to the fore. So, in addition to questioning the ontological realness of the entities of our observations, we need to take a stand in

[11] In his aptly named book "The handbook of everything" (Kaiken käsikirja), astrophysicist Esko Valtaoja (2012, p.8-10) illustrates the elusive nature of reality by at length pondering the impossibility of proving the solipsist, (*solus ipse* translates roughly to *I alone*), view wrong: as our neural networks are essentially responsible for creating any of the perceptions we receive through external signals, and capable of simulating those perceptions even without any external signals, there really is no way of proving to me that there is anything beyond my individual imaginings. There are no signals we can receive from the outer realm that would not be processed by the same mechanisms fully capable of creating the experience of those signals without those signals.

regards to whether we view the objects of our study as processes or substances: is for example an organization a fixed structure or a flow of "*choices looking for problems, issues and feeling looking for decision situations in which they might be aired, solutions looking for issues to which they might be an answer, and decision makers looking for work*."(Cohen, March and Olsen, 1972, p. 1)[12] Do we for example view change as an event in a static background, or do we view changing as the natural state of everything? Making the first choice we can zoom into the event we've identified, whereas choosing the latter perspective requires us to fathom completely different ways of delineating the object of our observation from its background. However, like most things in life, this is also not a fully black and white choice, but can be also seen as a duality (Farjoun, 2010). For example, we can conceptualize a social phenomenon as a video, which we through our senses experience as a process, yet which simultaneously is constituted by individual pictures having a more static, substance-like nature. Then the ontological question translates into an epistemological choice underpinned by what we want to observe – the storyline of the stream of those individual snapshots, or the snapshots in themselves?

Another question, strongly influenced by Kant's questions about the sequence in which we acquire the phenomenal and noumenal parts of knowledge, concerns the origins of the phenomena we observe: what is the role of our process of observation in the construction of the objects (be they substances or processes) of our study? The classic Eutrypho problem by Plato hits this nail on the head: do we consider an object as valuable, because it has inherent value, or does it have value because we consider it to be valuable?[13] Or in yet another terms: are there real social phenomena independent of our observations or are we as observers responsible for constructing the phenomena by for example the use of language (Derrida, 1976), or by the brackets we draw to distill the phenomena from the background (Chia, 1994, Hines, 1988, Weick, 1979)? Additionally, even if we were to adopt the constructionist viewpoint in regards to the origins of the phenomena, for example by choosing to zoom in to the genealogy (Foucault, 1978) of those emergence processes, what does that mean in terms of the ontological reality of those phenomena – can they still be considered to have gained a sense of realness (meaning independent, not observer-dependent existence) *ex post* their socially constructed origins? Are they like houses that remain

[12] While the authors did not explicitly profess to the process philosophy, which has gained foothold in the management studies only relatively recently, this snippet is however quite illustrative of the notion as later on in the seminal paper the authors explicitly deal with the variables they mention as functions of time (p.3).

[13] Originally Plato stated the problem in regards to piety (is something pious because gods love it or do gods love it because it is pious?), however this more contemporary rendition by Jezzi (N/A) was chosen here, as it is quite fitting in regards to the context of this book.

standing maintaining their realness after the builders have left the site, or are they like drawings on the water, vanishing the moment the surface is left untouched – the phenomenon unobserved?

Talking about social phenomena also evokes the question of the location of those entities we observe: considering that they can be conceived as substances or processes, to have come into being either by construction or by having somehow independently gained realist existence, what is the realm of their existence in relationship to the observer? Are they objective in the sense that they have such appearances that can be experienced more or less similarly by a set of observers independent of each other? Are they subjective in the sense that their appearances can be experienced only by a singular individual? Or are they intersubjective, meaning that their appearances are experienced in the interaction between two or more human beings (Cantwell, 2003, Davidson, 2001)? Karl Popper discusses this theme in his Tanner lectures (Popper, 1979), and argues that indeed, all these three worlds exist and need to be taken into consideration in social sciences. He names the worlds 1, 2 and 3, with the first referring to the physical entities (a book as a physical object of paper and ink), the second to the psychological processes within an individual (the thinking that drives the writing of the book), and the third to the shared outcomes of those psychological processes, having potentially a representation in the first world, but gaining its meaning through its existence in the third world (the story of the book, which can be printed in several similar or different books, exist in digital form, or be verbally narrated, maybe play-acted, continuing to exist independently even when the author is dead and no-one is reading the book).

Yet another choice warrants mentioning: the role of free will. In looking at human action, do we consider it to be driven by the causalities reducible to social and ultimately biological drivers, the structures, or are we free agents who can swim against the tide of structures if we just so choose? Mead (IEP Cronk, N/A, Mead, 1934) looked at the issue on the individual level, identifying the dual nature of myself he named me and I (Joas, 1997, Kuusela, 2001). Me is the part of me shaped by and responding to the social stimuli, the part responsible for fitting in the social realm and acting driven by the social structures, whereas I is the part of myself capable of creativity, free will and surprises. Taking the discussion to the collective level, Giddens (1984) explored the constitution of society (in the book of the same name) and came to the conclusion that agency and structure are an inseparable duality, where agency creates the structures which in turn shape agency. In some social theorizing agency is emphasized, in some structure (see eg. a nice illustration of entrepreneurship literature as seeking Romeo and strategic management liter-

ature as assessing the balcony in (Venkataraman and Sarasvathy, 2001)), whereas yet others see these as a duality, and the phenomenologists deny the whole distinction between the two.

From these ontological quandaries we can move along to several epistemological directions posing problems for the social scientists. While the ontology deals with the question of the nature of entities, epistemology asks the question of how we can claim to know something about those entities. The two questions are intertwined because depending on our faith in the nature of the reality of the entities we study, the approaches we can take to find something about them differ. To simplify this issue breeding volumes and volumes of alternative understandings and choices, I will next summarize the previous discussion into categories of ontological choices that each spawn a plethora of logically following epistemological and subsequently methodological options.

Ultimately the ontological choices can be categorized into six underlying big questions (see Table 1). The first question asks simply is there an independent reality, and it can be answered in three ways: yes, no, and yes, but what it is, is unknowable. The next question focuses on the third alternative, and probes further: if we believe that there is an independent reality we cannot fully know about, are those things we can know about it appendices of the underlying truth (ontologically same) or is that knowledge a distinct entity (ontologically different)? This time we have two choices (while naturally, this being philosophy, attempts have been made to negotiate a solution in between) that have major impact on the subsequent epistemological and methodical approaches.

The third question is independent of our answers to the previous two questions, meaning that we can ask it whichever answer we gave to the first one because it focuses on the ontology of our focus of analysis. If we believe in real entities, the question pertains to their nature, but if we doubt the existence of such, the question is directly pointed at the nature of the specific entity of our focus, the object of our enquiry given to us through and shaped by the phenomenal experiencing of it. The question therefore has two forms: is reality a process or a substance, and is this focus of my observation a process or a substance?

Also answering the fourth question allows us to have alternative views about the existence of reality as essentially it deals with the mechanism through which the entities we observe have come into being. This is most likely the most divisive question in the sphere of social sciences, and can be written as a reduction of the Eutrypho question: do we see these entities because they are, or are they because we see them (Berger and Luckmann, 1967)? The alternative answers to this question, depending

on the view on reality, are: 1) the entities are real, and that is why we see them, 2) the entities are real, but have become so after enough seeing, 3) there may be real entities but all we can see are the things we by seeing create, and 4) there are no real entities, only the seeing. Each of these answers has their staunch supporters and critics, enough so to merit the concept of "science wars".

The fifth question has ignited somewhat less heat, however as it deals also with the reducibility of social sciences into natural sciences, it needs to be asked in the context of social science: do the entities we study exist in the objective realm (which would mean that it might be possible to reduce also the social phenomena into physics), in subjective realm (remember solipsism?) or in the intersubjective realm, meaning the interaction between individuals and collectives? Popper (1979) proposed the three-world approach: there are objectively real entities, with a physical representation, subjectively real entities residing within the individual, and intersubjective entities existing only in the collective, intersubjective sphere. While Popper professed to being a realist in regards to all realms, however there are firm voices acknowledging only one or two of these potential locations of the reality.

This discussion becomes even more relevant when we consider the relationship between the individual and the collective within the social sciences, the structure-agency duality, constituting the final question. If the entities reside in the realm of subjective, the agency of an individual is emphasized, but if the entities were to exist in the objective realm, the individual level agency could be quite inconsequential as fundamentally everything could be reductively traced down the analytical levels of biology, chemistry, physics – and ultimately mathematics. Positioning the social entities into the intersubjective enables the impact of both structure and agency, as it is within that realm where by the collective aggregation of individual level actions, guided by collective level structures, those structures form, are maintained, change and cease. However, adopting the most extreme phenomenological position blurs the distinction between the two: there is no agency/structure issue, as all attempts to categorize anything are ultimately just semiotic choices – agency and structure are just artificial boundaries with which the overarching flow of everything is bracketed.

While some of the choices along these six dimensions are logically incompatible, there are however myriad ways to create logical philosophical vantages based on diverse selections of these key questions. Additionally, some philosophical avenues zoom firmly into one or some of the aspects, allowing notable variance along other dimensions, whereas others form more comprehensive doctrines where answering in a specific way to one question requires a specific set of subsequent answers. The next

table is a summary of these ontological choices, each set of answers leading towards one or more distinct epistemological and methodological choices.

Table 1: Framework for ontological choices

Six questions	Ontological choices	
Is there an independent reality?	Yes	
	Yes, but it's different from its appearances	
	No	
If reality and its appearance are distinct, are they ontologically same?	Yes	
	No	
Is reality process or substance?	Substance	
	Process	
Is reality given or constructed?	Given	And we can see it
		But we can't see it
	Constructed	But it becomes given afterwards
		Nothing but the process of construction exists
Where is reality?	In the objective realm	
	In the subjective realm	
	In the intersubjective realm	
	In all of the above	
How do agency and structure intertwine?	Agency dominates	
	Structure dominates	
	They constitute a duality: agency shapes and is shaped by the structure in which it is embedded	
	There is no distinction between the two as all categories are artificial	

While the most encountered debate in social science philosophies pivots around the question of reality as observer-independent or as constructed, the table 1 is an attempt to show that the ontological underpinnings do actually not fall into a nice continuum between those perceived ends (Morgan and Smircich, 1980). In their pivotal book about sociological paradigms, Burrell and Morgan (1979) created a matrix between subjectivism and objectivism as one axis, and regulation and radical change as another. The first axis refers to scientific approaches and the second to the perceptions about the society. Forgetting the latter, let us consider the first dimension in order to highlight some insights that follow from refraining to adopt the ubiquitous division of objective-subjective categorizing of the ontological foundations.

Burrell and Morgan define this dimension through four perspectives: ontology, epistemology, human nature view, and methodology. Within ontology, they create a dichotomy between nominalism and realism, defining the first as "*assumption that the social world external to individual cognition is made up of nothing more than names, concepts and labels which are used to structure reality*", and the latter as a postulation "*that the social world external to individual cognition is a real world made up of hard, tangible and relatively immutable structures*"(Burrell and Morgan, 1979, p.4). However, as we can see from table 1, the choices are not quite as black and white, especially if we remember the foundational insight of Kant about the distinction between the things in themselves and their experience-based appearances. One can quite easily believe in the existence of an independent reality while still professing that their researchable appearances are constructed in the realm of both subjective and intersubjective (Lukka and Modell, 2010). Or one can believe that once the social entities have been intersubjectively constructed, they gain in a sense an observer-independent state of reality, which to an extent even resides in the realm of objective (which is for example the ontological foundation underlying the institutional theory (Scott, 1987, 2008)).

Looking at the nuances of these ontological possibilities, the epistemological distinction by Burrell and Morgan becomes even shallower (Tsoukas, 2000). As several of the contemporary philosophical underpinnings of social science put less emphasis on the ontological debates and more on the diverse epistemological choices, one can easily have a fundamentally realist outlook and still see the value in zooming in to the process of construction through methods geared towards understanding instead of validating. For example a pragmatist or a critical realist can easily believe in the existence of an independent reality while acknowledging that as it can never be fully reached, it is more feasible to study the processes of construction reliant on the sphere of the experiences requiring such methods that Burrell and Morgan term "*idiographic*", the getting inside of the unfolding of the entity constituting the object of the study (Burrell and Morgan, 1979, p.6).

Interestingly, also zooming in the epistemology of the two approaches of naïve realism based empirical positivism and phenomenology (Niiniluoto and Saarinen, 2002) reveals similarities between the approaches often treated as representing the ultimate ends of a continuum: both approaches believe that only by focusing on the immediately gleanable inputs of sensory signals can we gain knowledge. The only, in itself naturally a vast difference is actually the location of the object of our inquiry: for a phenomenologist the entities reside in the realm of the subjective, whereas for the positivist they exist in the realm of the objective. However epistemologically the distinction is nigh negligible.

To address the last perspective, human nature, it seems that even Burrell and Morgan struggle to show the connection between the notion of an individual as an agent of free will or as a creature driven by structures, predetermination, and their continuum of subjective-objective: "*…they must incline implicitly or explicitly to one of the other of these points of view or adopt an intermediate standpoint…*"(Burrell and Morgan, 1979, p. 6). Essentially they are saying that there are different approaches, which do not exclude one another, presenting little arguments as to why would a subjectively oriented scholar be inclined to take one view over the other while the objectivist would automatically choose the other. The faith in an independent reality can just as easily accommodate the perception of an individual as a free agent (like for example Kant and Hegel profess (Popper, 1974, p.555)), as can the notion of an individual as a victim of structures follow from the worldview of nihilist constructionism (like Nietsche and Foucault ultimately argue (Ahonen, 2001)). Burrell and Morgan also completely miss the phenomenological interpretation of there existing no predefined categories such as "agency" or "structure".

This point was further illustrated by Leonardi and Barley (2012, p.33-34) in discussion pertaining to the ontological assumptions in the constructivist sociotechnical research. The diverse approaches within the field are positioned along two orthogonal continuums, the first stretching between determinism and voluntarism (the first endowing structure, technology, with the agentic power, the latter the individuals, humans), and the second between materialism (physical entities shape human action) and idealism (ideas, beliefs, norms shape human action). Leonardi and Barley point out that while determinism and materialism, and respectively voluntarism and idealism are often joined, there are no logical obstacles to conducting research based on deterministic idealism or voluntary materialism, as ample examples from these types of research can within their chosen context be found.

To summarize the discussion in this chapter, yes, ontological choices matter, but no, they cannot be put into a continuum between objective and subjective. Additionally, as each set of ontological choices can be logically followed with several different epistemological, and subsequently methodological choices, a scholar is ultimately presented with a cornucopia of alternatives. This dissertation is not about listing all the possibilities, as that would be an undertaking basically covering the whole of western philosophy, however what is next discussed are the choices I made in the context of this particular endeavor, and how the acknowledgment of these diverse choices is essential in the knowledge building effort of this thesis.

2.3 Pragmatist credo[14]

The approach of this thesis heeds the notion expressed already half a century ago by Bernard Forscher (1963), who lamented that the focus of science had undergone a shift from building edifices into building more and more elaborate bricks. Essentially this means that the contribution of this dissertation is to synthesize (MacInnis, 2011) existing dots of knowledge into a new picture; instead of digging deep into a brick of one theory, this is an attempt to connect a set of bricks into a bigger edifice.

As this dissertation views the impacts of digitalization on strategizing through uncertainty, both strategizing and uncertainty extensively discussed by scholars and practitioners alike throughout times, the approach taken is grounded on the attempt to understand our knowledge about the issues, not on specific theoretical vantages. Theories are in the context of this book perceived as lenses through which a phenomenon is viewed, each focused on yielding some insights while bracketing out a set of others. It is the ambitious aim of this dissertation to try to stitch together a selection of theories, which combined give us a more comprehensive view on the phenomena regarded, than would be possible by committing to a specific perspective.

However, as any attempt at knowledge-creation rests on the specific ontological and epistemological foundations of the emerging knowledge, also this approach requires philosophical grounding. After a lengthy philosophical search[15], the encounter with the pragmatic maxim (Peirce, 1878) seemed to provide an avenue for proceeding with the undertaking at hand. The much-debated maxim was originally coined by Charles Peirce (1838-1914) as follows:

"*Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object."*(Peirce, 1878, p. 293 in the original)

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[14] From my immersion in the realm of philosophy of science with its deeply convincing and completely contradictory discussions, it seems clear that a scholar has two options when seeking for the foundations of her knowledge claims: either to become a philosopher herself and spend the rest of her days seeking for the ultimate understanding of reality, truth and knowing, or to just adopt a set of beliefs (without claiming them to be the ultimate ones), which enable trying to find out something of relevance about something of interest. Hence credo: this chapter is about the choices I made about the philosophical beliefs that seemed to a) provide fruitful logical avenues to exploring the issue at hand, and b) concur somewhat with my admittedly subjective and fully personal belief-systems already adopted in the course of my existence so far.

[15] In addition to a set of individual books, articles and even blog postings, the Internet Encyclopedia of Philosophy (IEP Fieser and Dowden, N/A) has turned out to be an invaluable source in drafting an overarching understanding of the philosophical themes. As already previously mentioned, the citations beginning with the acronym IEP refer to the specific pages within the Encyclopedia, and as the site doesn't give the actual dates of the updates, the years in the references are marked N/A.

This requires some explaining. As the corner stone of pragmatism (IEP McDermit, N/A, Ormerod, 2006), essentially the point of the maxim is that what we can know about something is dependent on the effects we can perceive that something having. We know that a stone is hard, because it scratches, affecting an indenture in an element we subsequently can deem soft in its effect to stone. In other words, we don't need to try to pinpoint the ontologically real properties of an entity (the stone), because we can deduce at least some of its elements through observing the effects it has (the scratch on my car). While the contours of pragmatism can hardly be drawn precisely (see e.g. Ulrich, 2007), it however provides a philosophical foundation for a metatheoretical analysis as it focuses not on the ontological nature of an entity (e.g. a theory), but analyses the entity through the perceivable effects the entity can be conceived to affect. As such, the early pragmatism of Peirce, William James (1842-1910) and John Dewey (1859-1952), complemented by the thoughts of Herbert Mead (1863-1931), is an ancestor of the contemporary philosophical streams[16] highlighting the intertwined nature of ontology and epistemology, the onto-epistemological view highlighting the inseparability of the focus of observation (ie. the entity lending itself to the knowledge-building efforts) from the existence of the process of observation creating the observation providing the material for the further processing of that material by for example theorizing.

So, what does this approach mean in the context of the knowledge-building attempt of this dissertation? First of all, it is not the aim nor claim of this book to provide an account of the ontologically and ultimately true nature of digitalization, uncertainty, or strategizing. Instead I adopt a perspective of moderate realism and moderate constructionism (Kakkuri-Knuuttila, Lukka and Kuorikoski, 2008, Lukka and Modell, 2010, Popper, 1974, 1979) allowed by pragmatism: I choose to believe in the ontological reality of the three worlds (objective, subjective and intersubjective), however while acknowledging the impact of the world three objects, namely the role of our perceptions in constructing the social reality, I do not believe in a given, pre-existing, independent reality of those social constructs. This doesn't mean that the social constructs are inconsequential, quite the contrary: as the reality claims of pragmatism rely on the observable effects of the entities of enquiry, the world three constructs are indeed real as judged by their effects on the perceptions, actions and outcomes unfolding in and impacting the society.

[16] The 20th century was prolific also in terms of seeding a diversity of philosophies. Some of the most contemporary versions of this onto-epistemological take include process philosophy (Rescher, 1996), turn-to-practise approaches (Feldman and Orlikowski, 2011), which follow in the wake of reflexive sociology (Bourdieu and Wacquant, 1992) and of course social constructionism (Berger and Luckmann, 1967). Neither should one forget the impact of this pragmatist notion on the French post-modernists like Foucault, Latour, Lyotard and Derrida.

In addition, this pragmatist perspective allows me to observe diverse insights from different philosophical origins as effects of certain knowledge building efforts growing from diverse soils, and to focus more on those effects of created knowledge than on aligning my knowledge building efforts with any given sets of origins. I acknowledge and value the origins, but as already mentioned, try to focus on unveiling the object of enquiry through several vantages, as each has yielded invaluable knowledge that when synthetized, can advance our understanding even more. However, I also try to stay true in the sense of highlighting the different origins and discussing the ensuing incompatibilities – in short try to avoid the sin of building a set of arguments on such foundations from which they cannot be argued from.

The heritage of pragmatism is heeded also in another way. The forefathers of pragmatism shared a strong social conscience. The historical context of the origins of the school of thought was USA still reeling from the devastation of the Civil War (1861-1865). Influenced deeply by Kant, the polymath Charles Peirce set out to construct a philosophical system furthering Kantian thinking; the "critical common-sensism" (Ormerod, 2006, p.896). James and Dewey took this normative tint even further, with the latter for example contributing immensely to educational insights.

In essence, the major difference between the early pragmatists and their late 20th century offsprings (eg. the French post-modernists) was the desire to provide foundations and methodologies for such science that could be used in inducing changes for the better. While what constitutes "better" is always open for debate, this sincerity resonates freshly with the contemporary reader immersed in the deconstructing, demystifying, decomposing and even destructive ponderings of the post-modern cynics (Ahonen, 2001). For example viewing Lyotard's (1984) scepticism about the metanarratives through the lenses of pragmatism begs the question of which theoretical-philosophical groundings have effected more "good" for the humanity: the Judeo-Christian faith in personal God and mercy, the Enlightenment driven faith in the omnipotence of science, the grand narratives of money (Ali, 2014), or the post-modern unraveling of all metanarratives ultimately resulting in the contemporary blurring of the distinction between a fact and an opinion?

When we turn our questioning gaze away from the ultimate revelation of the nature of truth and reality, and focus on the instrumental effects of any philosophical underpinnings, the question about the meaning of these meanings emerges: considering the physical boundaries of our globe, within which the individuals constituting the humanity so far need to co-exist, what kinds of shared understandings, world three social constructs, affect in what ways our ability and aptitude for doing so?

To pursue the theoretical aims of this dissertation within the onto-epistemological underpinnings of pragmatism, a suitable methodological choice is essential. Hermeneutics, especially in its pre-ontological form (IEP Botts, N/A) shaped by Dilthey (1833-1911), described by Alvesson and Sköldberg (2009) as objectivist, provides a logical avenue in its lineage to Kant, and by that detour also to pragmatism. Essentially, hermeneutics is about trying to understand an output through understanding the entity responsible for that output and the context in which the output was created, and through reflecting this knowledge (output, entity creating it, context of its emergence) against the inner reality of the interpreter to create a synthetic understanding constituting of both what the output creating entity, and the interpreting entity bring to the emerging understanding. This process was conceptualized as the hermeneutic circle by a German philologist Friedrich Ast in his work dating back to 1808 (IEP Botts, N/A), after him prominently discussed and further developed by Dilthey through the influence of Schleiermacher, a disciple of Ast and a teacher of Dilthey. Originally hermeneutics related to theological endeavors attempting to understand the word of God, however with the emerging insights about the process of social construction of diverse social phenomena, it has since gained a firm foothold in the interpretive social studies.

The quest upon which Dilthey embarked to address the "*need to get away from the reductionist and mechanistic perspective of the natural sciences, and to find an approach adequate to the fullness of (social) phenomena*" (Palmer, 1969, p.100) resonates still vibrantly in the contemporary pursuits of social science. While being impressed by Kant, Dilthey however felt that it was necessary to further develop Kant's thoughts to better accommodate the needs of social science, which became his ambition. So, Dilthey separated the mechanisms required to create understandings in social sciences ("productive nexus of history") from the mechanisms creating knowledge in natural sciences ("causal nexus of nature"). The hermeneutic circle oriented towards the productive nexus of history flows through three tiers of what Dilthey called "life-manifestations", each yielding the interpreter different insights she then processes through her own inner reality and reflects again against the outer sensory experiences (Makkreel, 2016). The life-manifestations consist of the level of general concepts the utterings of which tell nothing about the utterer (eg. two plus two equals four), the level of actions suggesting some insights about the intentions of the actor (eg. picking up a hammer), and the level of expressions with the outright aim to exclaim something about the one doing the expressing (eg. writing a poem – or, indeed, a dissertation).

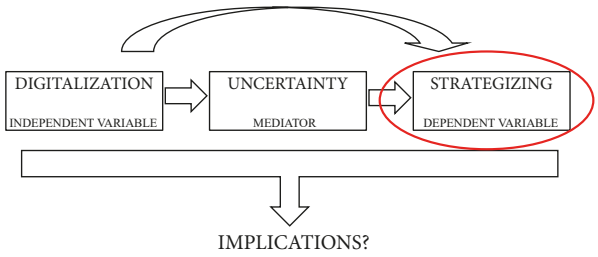
Essentially what this approach enables is identifying the social phenomena residing in the third world of Popper (1979), namely the realm of intersubjectivity. While

the acts of utterance (stating a calculus, picking up a hammer, writing a poem) are born from impulses within the subjective realm and can be observed in the objective realm, our knowledge about the significance of the act of picking up the hammer, or the experiences evoked through reading a poem reside in the realm of the intersubjective. We share a set of socially constructed codes that enable us to give significance to the act of a lifted hammer, or to appreciate the poetic expression. Without the intersubjectively constructed meaning mechanism, both the act of picking up a hammer or perusing a poem are empty – their meaning cannot be deduced from their objective representation.

In this research, objective hermeneutics is used in deciphering the socially constructed intersubjective realm that endows our actions with meaning. It is the Meadian mirror in which my actions are reflected in your actions – the quintessential mechanism that allows us to make enough sense of the actions of others that co-existence is possible.

These building blocks constitute the analytical approach of this thesis. This book is a hermeneutical and metatheoretical analysis about digitalization, uncertainty and strategizing conducted through the lenses of pragmatism about the constitutions and effects of our understandings of uncertainty and strategizing, and a reflexive discussion of the emergence, existence and utility of the meaning structures that construct the scales of values we use when trying to define the valence of the options and outcomes emerging from the ongoing phenomenon here labelled digitalization.

3 STRATEGIZING



"All wisdom grows / from curiousity seeds /
planted in pots / full of ignorance."
(Sheri Tepper: The Waters Rising)

Decision-making, strategic decision-making, strategies and strategizing are richly researched from several scholarly perspectives underpinned by a plethora of philosophical approaches. The aim of this chapter is to synthetize a set of established insights into an integrative framework of strategizing, and in doing so, both provide one corner stone for the overarching theorizing of this thesis and to make a theoretical contribution on its own.

In short, in this dissertation strategizing is interaction with uncertainty, consisting of individual level actions and decisions – fused together by social forces – that have aggregated, collective level outcomes in the sphere of economic action. This conceptualization is argued next.

3.1 Some general(ization) problems

All social sciences share one problem: considering the seeming haphazardness of human action, how can we create knowledge about how humans behave in general? MacIntyre (2013) widens the scope of the problem beyond the scientific realm by highlighting a paradox embedded in us individuals: in order for any of us to go about our daily lives with any sense of meaning, we need to rely on generalized predictions about how other people act. At the same time, in order to hold on to the freedom and creativity that makes us humans, we need to reserve for ourselves the ability to act unpredictably. The same phenomenon was also identified by Mead (1934), however where MacIntyre talks about the inherent needs of us humans, Mead discusses the nature of the self-identity: our sense of ourselves is a duality consisting of the parts "I" and "me". According to Mead, "I" is the agentic, subjective part capable of making creative decisions that go against the social expectations, whereas "me" is the socially

constructed object part, constantly reflecting the expectations of the social environment, the generalized understanding how a person such as myself should in a given setting be and act (Dionysiou and Tsoukas, 2013, Joas, 1997, Kuusela, 2001).

Sharing the problem, the diverse social scientific approaches differ on the level of emphasis on either side of this duality of an individual. In social sciences seeking to create macro level knowledge, it seems necessary to reduce individuals into sets of "mes", to seek the dimensions of predictability. This quest is essentially what drives the famous "as if" theorizing of Milton Friedman[17], underpinning the majority of economic research aimed at creating statistical generalizations through dismissing the individual level behavioral variations as negligible counter examples. Considering the Robbins definition of economics as the science exploring human behavior in between ends and scarce means (Backhouse and Medema, 2009, Robbins, 1932), the behavior explored consists therefore of the behavior of the "me" objects, which surrender to prediction and statistical generalizations.

At the very far end of the spectrum we find such leadership (Williams, 2004) or entrepreneurship (Foss *et al.*, 2008, Kirzner, 1997, Shane, 2003, Schumpeter, 1934, Venkataraman and Sarasvathy, 2001) studies that highlight the idiosyncratic abilities of the creative visionaries, essentially zooming in to the features of the "I". While contrasting with the more systemic views of for example creativity (Amabile, 2012, Csikszentmihalyi, 2014b), these approaches enjoy popularity (as seen in the plethora of popular management books biographing the successful individuals or listing a number of boxes to tick for the ambitious ladder climbers) potentially exactly because they appeal to the potential of the "I" in doing the unexpected, in holding on to the freedom of will.

The decision-making research reflects this division between the "I" and "me" duality, further enhanced by the plurality of philosophical underpinnings prevalent in the social sciences. When the philosophical choices have guided the social scientists to emulate the natural scientists, we are in the realm of the assumptions that have guided mainstream economics (and its applied offsprings) for the last century: human beings are reduced to rational beings seeking financial self-interest – the development in the assumptions rendering the original notion of full rationality and self-interest maximizing into boundedly rational self-interest satisficing, however with the underlying mechanism intact (Aharoni, Tihanyi and Connelly, 2011, Eisenhardt and Zbaracki, 1992). On the other hand, when the philosophical under-

[17] "*…the relevant question to ask about the "assumptions" of a theory is not whether they are descriptively "realistic," for they never are, but whether they are sufficiently good approximations for the purpose in hand.*" (Friedman, 1953, p.153).

pinnings have evolved in the post-modern sphere[18], the whole notion of decision is dissolved: human beings are seen as dwelling in the stream of actions, circumstances, contexts, path-dependencies, social forces, desires, emotions and intuitions, at most engaging in bracketing and retrospective sensemaking endowing the unfolding of the events with a semblance of intentionality (Chia, 1994, Chia and Holt, 2006).

Aligned with my pragmatist choices, the viewpoint adopted in this dissertation doesn't rely on identifying the "correct" way of perceiving reality or individual, but instead looks at the accumulated insights diverse perspectives have yielded about how human beings act. However, some personal opinions are warranted, as the discussions in different research streams are to such extent at odds, as to render some alternative viewpoints incompatible. My argumentation is grounded on my personal philosophical choices[19], which allow for the desire to create generalized knowledge in addition to viewing the idiosyncratic features inherent to human action.

It is not the aim of this chapter (nor of the dissertation) to present a comprehensive review about the extensive and exhaustive research done on decisions, decision-making, strategies and strategizing. Instead, in the next subchapters I outline a synthetic theory of strategizing by first trying to pin down what is known about decisions and their makers in general, and secondly by trying to understand this activity in the context of a firm.

3.2 Pinning down a decision

If one enters the word "decision" into an image search engine (eg. Shutterstock, Google images), the results yield a cornucopia of pictures depicting an individual at a crossroads. This illustrates nicely the prevalent notion of the concept: a decision is a deliberate choice between different paths an individual may embark on, an event where the agency reigns over structure, free will over predetermination. However taking a look at the scholarly discussions about the nature of a decision blurs this intuitive notion dramatically.

First of all, do decisions exist in the ontological sense? Is decision a conscious or a subconscious choice? Is decision really a representation of the free will, or merely an

[18] I'm using the notions of natural science emulators and post-modernists as overarching definitions of different scholarly approaches based on diverging answers to the six philosophical questions outlined in chapter 2. The key distinctions in this context emerge from different answers to the Eutrypho question, and to the substance-process question. The natural science aspirants see reality as given and substance, whereas the post-modernists see reality as constructed and process.

[19] Extensively discussed in chapter 2.

act driven by circumstances and prior conditioning – a placebo we choose to believe in, in order to hold on to our sense of individuality? Are decisions made prospectively, or do we construct them retrospectively? Is decision an act of an individual, or the result of the symbolic interactionism inherent in any collective?

The next subchapters are an attempt to draw from existing knowledge some insights to sketch some answers to those questions.

3.2.1 The ontology of decision

In the fertile field of strategic decision-making research, decisions could well be written with a capital D. These Decisions are distinct entities, made at a specific point of time, by specific individuals (Eisenhardt and Zbaracki, 1992). Dismissing for now the context of firm (the "strategic" part) and zooming in to the conceptualization of Decision in this perspective, these entities are envisioned as ontologically real actualities, and the research focused on these distinct entities has two lineages, decision-making and judgement (Goldstein and Hogarth, 1997). Both lineages can be traced to the 1940-1950's when the experimental psychology was emerging.

Decision-making literature asks the questions familiar in economics and its offsprings, grouped by Goldstein and Hogarth (1997) as follows: "*How do people decide on a course of action? How do people choose what to do next, especially in the face of uncertain consequences and conflicting goals? Do people make decisions rationally? If not, by what psychological processes do people make decisions, and can decision-making be improved?*" (p.4) The emergent insights in this stream led to the developments of expected utility theory (Von Neumann and Morgenstern, 1945, Savage, 1954), its critique in the studies by the Carnegie School scholars (Cohen *et al.*, 1972, March and Simon, 1958, Simon, 1947) and prospect theory (Kahneman and Tversky, 1979), all still vibrantly reverberating in the decision-making studies within economics and its applied descendants, including international business studies.

On the other hand, the judgement literature is interested in answering a slightly different set of questions: "*How do people integrate multiple, probabilistic, potentially conflicting cues to arrive at an understanding of the situation, a judgement? How accurate are people's judgements? Does judgement improve with training? How do people identify relevant cues and the proper weights to assign to them? How does the task environment affect learning and performance?*" (p.4) The early proponents of this stream of research were Meehl (1954) and Brunswik (1956) who contributed to the understandings of the importance of adaptation and learning, subsequently more explored in for example research on ethical judgement (Graham *et al.*, 2013, Kohlberg, 1969, Treviño, Weaver and Reynolds, 2006) or in the conceptual change stud-

ies (Vosniadou, 2009) explicitly focused on the (un-)learning processes among both adults and children.

These two streams have at times been more distant, at times more close (Hastie, 2001), however what they have shared throughout their existence are the science philosophical underpinnings: both approaches view decisions as distinct entities (though in the judgement approach, this entity is more influenced by diverse forces and contexts) that can be explored with experimentation drawing its strength from the natural scientific methodology. As such, these approaches align well with such business studies that have positivist underpinnings.

However, in the business studies emerging from alternative philosophical choices, the questions asked in these positivist streams of decision-making and judgement, have been questioned. Building on the emergent questioning of the taken-for-granted notion of decision-making as the core activity of a firm (March, 1988, Mintzberg and Waters, 1990), Chia (1994), dug deeper into the philosophical groundings of Derrida and Whitehead, to deconstruct the notion of decision. He opened the discussion by pointing out that even though Minztberg and Waters indeed recognize the futility of trying to pinpoint a Decision from the flow of actions[20], they do not go deep enough to question the ontology of decision. March's approach of looking at causes as effects of effects, and ambiguities as positive enablers instead warrants praise from Chia, however March's framing of the inquiry of decision into the realm of organizations and individuals within, does not go far enough in Chia's view.

Ultimately Chia states that: "*Decision-making is the ontological act of cutting and partitioning off a version of reality from what has hitherto been indistinguishable and the subsequently presenting the former as representative of the latter… Making 'incisions', ex-cising or cutting-out a part from the whole of our phenomenal experiences and then finally making that part 'stand for' the whole: this is the essential ontological character of decision-making.*"(Chia, 1994, p.800). This perspective is subsequently elaborated in the process philosophical studies of organization (Tsoukas and Chia, 2002, Chia and Holt, 2006), where there isn't an observer-independent reality that would yield itself to piecemeal studying, but only the phenomenal experience constructed reality coming into being through the perceptions and experiences of the observer. This phenomenal experience is then bracketed and labelled in ways that make it easier for the observer to process – one of those partitioning endeavors being

[20] Mintzberg and Waters (1990) list a number of events from their empirical studies in the context of strategy in which trying to pin down the decision is futile. More about their discussions follows in the subsequent subchapters, as the questions they raise pertain to also other dimensions of decision than its ontology.

the naming of some parcels of phenomenal experience as decisions. Viewed this way, all of the concepts we use are but labels attached on random parts of the overwhelming phenomenal experience, and as such carry little explanatory value beyond the mechanism that requires their use in making life more tolerable for us. Understood such, there are no real entities called decisions.

At this stage this leaves me with a choice to subscribe to either school – do I see a decision as a real entity worthy of attention, or do I see it as a random bracketing of the unfolding phenomenal experience? Here I must turn to view my choice of pragmatist philosophical groundings. It may well be that underlying our phenomenal experience of the unfolding process of life there is no observer-independent reality to be with ultimate assurance researched. On the other hand, such reality may also exist, but in that case all that we can about it know is conveyed to us through our phenomenal experiences. However, as it is somewhat futile to try to assess the reality as it is in the scope of human life, it is more beneficial to engage in scholarly activities aimed at contributing to the accumulated knowledge that may potentially be used to improve our ability to co-exist on this planet, to continue our phenomenal experiences of life unfolding. Therefore the act of bracketing a decision as a focus of analysis is beneficial, as irrespective of its truth value as a realist entity, we human beings engage in that act of endowing the parcel of experience named decision with explanatory power while trying to navigate our way.

So, to summarize this subchapter, in this dissertation an entity conceptualized as a decision is considered to exist with enough tangibility to render itself as an object of enquiry.

3.2.2 Witting or unwitting?

At least since the groundbreaking work of Kahneman and Tversky in the 1970's[21], there has been a growing acknowledgment that human beings make most of their decisions with something else than a reflective full rationality. In the vocabulary of Kahneman, our brains have two different operating modes, the fast system one, and the slow system two (Kahneman, 2011). In order to conserve energy, we are equipped

[21] The influence of Kahneman and Tversky has been most notable in the mainstream economics, however in the sphere of management studies their insights were by no means surprising. For example the work by Herbert Simon already in the 1940's or the subsequent rise of the Carnegie School was firmly grounded on the notion of bounded cognition – in essence the questioning of the full rationality assumption inherited from the economics.

with heuristics and biases[22] that rule our mundane actions – in essence the system one is a kind of an autopilot taking care of snap judgements and such decisions we don't stop to ponder.

Neuroscience backs up this distinction in more detail: we indeed function by creating models in our brains about what we expect and use them in filtering out unnecessary signals (ie. random noise that disturbs our focus) from our consciousness (Berti and Schröger, 2003). This is elemental in enabling us to direct our voluntary attention towards issues we deem relevant, without being drowned in paying attention to such issues that can be taken for granted: a failure in this mechanism is for example one cause and effect of burnout (Sokka *et al.*, 2016).

Furthermore, the impact of the automated brain doesn't stop at the boundary between witting and unwitting decision-making, voluntary and involuntary attention – we are prone to systematic judgement errors even in our reflective decisions (Benartzi and Thaler, 2007, Thaler and Sunstein, 2008). Engaging the slower system two requires a reason, energy and effort – the more the more counterintuitive the subsequent outcomes of those thinking processes prove out to be. This means that while the brain mechanisms that provide us with the models of what can be not paid attention to (in order to enable saving that energy into paying attention to issues deemed more worthy) are elemental in keeping an individual functioning, the efficiency of our brain in finding out what can be taken for granted and thus not reflected upon is such, that it has the tendency of categorizing also a part of such signals that should be paid attention to into the category of assumptions.

While these insights drawn from the fields of experimental psychology and cognitive sciences have been well acknowledged in organizational theory, it is only relatively recently that the stream of behavioral economics (Akerlof, 2002), grounded on these findings, has gained a mainstream position, evident in the economic Nobel prizes granted to the representatives of the field (Kahneman 2002 and Thaler 2017). This behavioral turn in the economics is reflective of the need to induce the macro level knowledge building efforts with the knowledge emerging from the lower levels of analysis: essentially the question within the economics being that to what extent can the "as if" formulation of "*Homo economicus*" (fully rational self-interest max-

[22] As it doesn't fall into the scope of this dissertation to discuss the diverse cognitive biases extensively researched and recognized, I'd like to direct the interested reader to Wikipedia for a comprehensive overview, including a listing and an infographic of the current update of the known biases (Wikipedia, 2017). Additionally, a nice attempt to understand the biases through four different drivers responsible for creating those biases can be found in Benson's blog (Benson, 2016).

imizer) assumption be stretched without the connection to the underlying reality being depicted being rendered too thin to result in any meaningful explanations.

Essentially the label "behavioral" is most often attached to research streams within the natural science emulating approaches, even when the fields of the enquiry include social phenomena, like behavioral strategy (Powell, Lovallo and Fox, 2011). The early examples of behavioral research include studies that explore the trigger-response behaviors of animals (we've all heard of the Pavlovian dogs), subsequently encompassing also psychological experiments on humans. Therefore the philosophical assumptions underpinning behavioral approaches emerge from the philosophical groundings of natural sciences, being often tinted with positivism and anti-constructivism.

In the anti-positivist, constructivist and idealist spheres of social sciences, the "hard" findings of the behavioral scholars have been less than groundbreaking: in that realm it has been long taken for granted that the human beings are all but fully rational, their actions being driven by a plethora of assumptions, heuristics, goals, intuitions, biases, social forces and emotions that may sometimes even include self-utility maximizing. The trigger-response approach is seen as reductionist and too mechanistic to capture the nuances of human action and interaction (Weick, 1979).

In this loosely delineated sphere of research, underpinned by more constructivist ontology and epistemology, decision-making isn't an isolated incident, but a nexus of both social and psychological forces and drivers (Mintzberg and Waters, 1990). In the more constructivist realm, a singular decision-making event reflects the social and individual level antecedents (eg. organizational culture and its basic assumptions (Schein, 1985), and individual perceptions, competencies, capabilities and expectations (Weick, Sutcliffe and Obstfeld, 2005) to the extent of it becoming relevant to ask whether anything is actually decided in any specific event, or if what follows is more or less an extension of what was and is. Do decisions exist in any defining sense, or are they truly just effects of effects (March, 1988)? These questions underlie the diverse approaches to strategy: is it deliberate, guided through conscious decisions, or emergent, resulting from ongoing actions without conscious decisions (Mintzberg, 1978) – or to adapt the process philosophical viewpoint, are strategies built (through conscious decisions) or do they emerge through dwelling shaped by both individual and collective forces and their interplay (Chia and Holt, 2006)?

Interestingly, this distinction is also a focal theme in the research stream of behavioral ethics (Treviño *et al.*, 2006). A widely adopted understanding of an ethical decision is grounded on a four-stage framework introduced by Rest (1986): moral awareness, moral judgement, moral motivation and moral behavior. The two first

stages hinge first on conscious identification of an ethical issue, and secondly on the cognitive processing of a potential decision in regards to the issue. However, as Jones (1991) pointed out, acknowledgement of an ethical issue is closely related to its moral proximity, meaning that we are more likely to identify a potential ethical dilemma when it concerns for example our family than when it concerns a set of strangers.

This relates also to the third and fourth stages of moral motivation: awareness and the ability to construct a potential ethical decision require a will to act morally, and the ability to actually carry out the moral actions. These stages also depend on the moral proximity of the ethical issue, especially as research has also shown that the awareness and reflective processing of an ethical issue are decoupled from the realized ethical behavior – moral actions are often highly intuitive (Graham *et al.*, 2013, Haidt, 2001). Furthermore, we employ different standards of morality when ethical issues concern what we consider "us" than when they concern what we deem "them" (Opotow, 1990).

In short, ethical decision-making is only partially underpinned by moral awareness and witting judgement: instead, also our ethical decisions are grounded on subconscious processes highly influenced by the social settings enveloping the individuals. Based on Kohlberg's theory of moral development (1969), where in the first stages morality is understood only as direct personal consequences of a decision (ie. if I will do this I will be punished), a research found that only less than 20% of the American adults had reached such a level of moral development where they actually could reflect on the morality of a decision based on reflecting the principles of some universal norms (Rest, Thoma and Bebeau, 1999).

So, to build bridges between the philosophically plural viewpoints on decision, one shared theme emerges: humans do indeed make most decisions, including the ethical ones, unwittingly, without reflection. An example in the more post-modern worldview comes from Bourdieu who explored the impact of doxa[23]: the socially constructed realm of taken-for-grantedness through which all signals are processed (Eagleton and Bourdieu, 1992). Essentially the human action is bounded by the diverse doxic structures constraining our ability to reflect on our actions – only after breaking out from the sphere of doxa can we engage in reflection (Myles, 2004). It falls out of the scope of this dissertation to dive deeper into Bourdieu, however the example of the notion doxa serves to highlight that through both the vantage of post-modern

[23] Bourdieu gives an example of doxa in France: *"When you ask a sample of individuals what are the main factors of achievement at school, the further you go down the social scale…the more they believe that those who are successful are naturally endowed with intellectual capacities. And the more they accept their own exclusion, the more they believe they are stupid..."*.(Eagleton and Bourdieu, 1992)

sociology, and the vantage of positivist behavioral economics, the decision-making of a human being is first and foremost unwitting, influenced both by the cognitive features and the social forces.

Here a quick remark on the different approaches towards the dominance of the unwitting part of the decision-making is in order. While both Bourdieu and Thaler, from their very different vantages, recognize the impact of unwitting decision-making, their viewpoints as to what should be done about that highlight clearly the very different undertones in the sociological and economic worldviews[24]. Bourdieu is concerned about removing the veil of doxa in order to give the people more power to reflect on the societal structures in which they are embedded – ultimately he sees the doxa as sophisticated means of dominance, difficult to fight against as long as it is invisible in its taken-for-granted role (Calhoun, LiPuma and Postone, 1993, Vaara and Fay, 2011). On the other hand, Thaler proposes utilizing the behavioral insights to "nudge" people towards making better decisions: the aim is not to help people become aware of their heuristics and biases, but to arm the policy makers with knowledge about how to exploit the cognitive biases in ways that would change individual behavior – of course towards the improvement (as judged by some criteria defined by the nudgers) of the quality of life of those individuals (Leonard, 2008).

A further defining caveat is however here in order: for Bourdieu, the concept of doxa is primarily a social, collective phenomenon, gaining its strength from the prevalent social forces and assumptions of any given setting, diffused within that specific social setting. In contrast, the cognitive studies vanguarded by for example Kahneman and Thaler are primarily viewing the intraindividual, psychological mechanisms employed in reaching decisions, with little emphasis given to the social forces, except as situation-specific influences on a given act of decision. While acknowledging the incompatibility of these approaches, in this dissertation I'm adopting the concept of doxa to describe the zone of taken-for-granted in general, irrespective of whether the origins of what an individual takes for granted and unwittingly processes can be traced to external institutional biographies and social forces, or to internal psychological mechanisms.

[24] Of course I am not claiming that Bourdieu or Thaler would represent their respective fields of study in totality, with both fields occupied by myriad warring viewpoints. However I am here using them as archetypes in order to illustrate the impact of the very different and incompatible perceptions of human overarching the whole realm of social sciences. Fundamentally this is a normative discussion underpinning also such applied fields as international business research, which is why drawing attention to these different meaning structures is in my view merited.

So, both the positivists and anti-positivists agree on the impact of the unwitting decision-making, however the diverse views cannot be made compatible when looking at the ontological nature of the entity decision. For the sake and purpose of this dissertation therefore it is assumed that while decisions exist, most of them are made unwittingly, which renders the efforts of pinning down the exact causal relationships between an individual event of decision and its potential outcomes somewhat impossible. This sphere of unwitting decision-making is in this dissertation referred to as doxa.

On the other hand, there are also decisions made wittingly, through reflection, especially when it is the Meadian "I" who is making those decisions. While even the processes of making reflective decisions are subject to heuristics and biases, I do believe, and therefore ground my subsequent argumentation on, that there are instances where we human beings can actually engage in reflective thinking and unbiased analyses – even when the issues are complex ethical dilemmas. While we humans excel in saving cognitive effort and absorb the unspoken normative social assumptions, ultimately we are not mere puppets.

3.2.3 Enter time: prospective and retrospective decision-making

After one summer holiday a colleague of mine was quite exasperated. He had spent the summer reading Karl Weick and reached a conclusion that there is little Weick left for the rest of us scholars to unveil, as he had so convincingly captured a lot of the organizational phenomena. Indeed the contributions of Karl Weick are extensive, the least of which isn't his insight about retrospective sensemaking.

Prevalently, the conceptualization of the sequence of decisions and actions pivots around the notion that decisions precede actions. This is natural, as most of the traditional decision-making research has been interested in how people could make better decisions about what to do next: decisions are envisioned as the interface between the past and present influences and future outcomes. However, in his seminal book "The Social Psychology of Organizing", Weick (1979) reverses this commonsensical notion.

Essentially his insights are captured in the sequence of enactment-selection-retention together constituting what has since been known as retrospective sensemaking. The underlying worldview is kin to the flow of phenomenal experience discussed previously in connection to Chia, however Weick grounds his arguments on the pragmatist philosophy of William James (1890), and the symbolic interactionism introduced by Charles Mead. Weick envisions life as flowing and equivocal, constituted of chaos given to us through our senses; a chaos we subsequently try to make

sense of. In contrast to the phenomenological approach of Chia[25], Weick however refutes the possibility of an experience preceding action: "*Passive reception of a shower of inputs is not synonymous with having an experience…Experience is a consequence of activity.*" (p.148). In Weick's view only through our actions of bracketing, interacting, sorting, ignoring, attending, relating and responding to certain stimuli, do we gain the experience of that stimuli. This activity through which the shower of inputs becomes experience we can subsequently cognitively process Weick gives the name of enactment.

So, in Weick's world, there is no imposed, pre-existing order to deal with, but a flow of elements agents are subjected to. When perceived, these elements are equivocal, meaning that there are several ways of making sense of them. In order for us to make sense of those equivocal elements, we draw from our past, from such causal maps we have previously constructed. Constructing those maps emerges from the realization that actions and events constitute systems, which can be more or less loose – the looser the system, the less strict are the causal relationships between the different nodes, however backcasting from the effects we can deduce that some causes have existed, even when those causes were unidentifiable.

At any given moment we are therefore equipped with certain causal maps we have previously used to make sense of the "shower of inputs". When something changes in the environment, we engage in an attempt to reduce the equivocality of that change by doing something that would create such changes that would give us more clues to explain the original change: this is called enactment[26]. From those emerging changes and clues we then select some and fit them into the existing causal maps we then position onto the novel perceptions of changes to see if that reduces the equivocality: this is called selection. If the chosen set of enacted clues and the resulting elaboration of the previously existing causal map succeeds in aiding us to make sense of the

[25] The difference between Chia and Weick reflects the difference between phenomenological and constructivist philosophical underpinnings. While both views share the notion of life as an unfolding stream of chaotic signals human being are subjected to, in the phenomenological realm the boundary between an agentic experiencer of those signals and the external life constituting of those signals is non-existing, meaning that the cognitive processing of any signals is just another input of elements into the chaotic flow of randomness. On the other hand, in the social constructivism, the distinction between the agent constructing sense of the randomness and the external "shower of inputs" is clear: through the agentic powers of the actor, the stream of chaos becomes constructed into shapes, which subsequently provide the actor with the ability to deal with the unfolding life.

[26] "*The manager literally wades into the swarm of "events" that surround him and actively tries to unrandomize them and impose some order. The manager acts physically in the environment, attends to some of it, ignores most of it, talks to other people about what they see and are doing. As a result the surroundings get sorted into variables and linkages and appear more orderly.*" (Weick 1979, p.148)

changes, we store the successful explanation as a new causal map we can later use: this is called retention.

This process Weick summarizes with the sentence: "How can I know what I think before I see what I say?" To open up the sentence, saying refers to the process of enactment in which the agent engages in activities that create more clues for the knowing (sensemaking). Seeing refers to selection, which has two inputs, the retained prior knowledge (causal maps) and the results of saying, enactment. For Weick, decisions reside in the selection phase of this process, and constitute of the choices of which cues to select from both the existing explanations and the enacted clues pertinent in the present situation.

Therefore for Weick, the decisions are retrospective, as they are made after the enactment (which feeds into them) and the retention (of older explanations). In addition, not only are the decisions retrospective, but also aimed at sensemaking (knowing and thinking). This means that in making a decision, we are actually not making a decision about a future course of action, but choosing such actions which contribute to making sense about what has happened before and is happening now.

This sensemaking perspective as since become a fruitful stream of research (Maitlis and Christianson, 2014, Maitlis and Sonenshein, 2010, Weick, 1988, Weick *et al.*, 2005) in the organization studies, rich with empirical findings (Brown, 2000, Gioia and Thomas, 1996, Kaplan, 2008, Sonenshein, 2007). Therefore it is safe to assume that at least a part of what are labelled as decisions are retrospective in the sense that instead of opening the set of outcomes following from decisions to include completely new avenues, decisions are grounded on the previous paths and used as validating the already chosen outcomes[27].

The interesting question therefore is, are there genuinely prospective decisions? One way of viewing Weick's insights is to reflect them against the notion of doxa, discussed in the previous subchapter. While Weick explicates the mechanism of how our actions emerge as effects of effects (as discussed elsewhere by March), ultimately the sensemaking approach is but a detailed analysis of one mechanism embedded in the doxic realm of our decision-making. As such, Weick seems to perceive the creative agency of the Meadian "I" to be limited to rationalizing, having little faith in the ability of us humans to engage in genuine prospective and reflective decision-making

[27] Interestingly the "sunk cost" bias deals with exactly this tendency in decision-making. When we have invested a lot in following a certain path, even when we are presented with evidence of the badness of that path, we prefer to invest even more in following that path instead of finishing following that path. This is a familiar phenomenon in R&D departments: when there has been heavy investments in a certain development, even when faced with the outcome that the results will not be what has been expected, instead of "killing" that line of pursuit, more money is poured in to the project in the hope of salvaging what has already been so heavily invested in.

preceding any potential action. What follows is yet again the question of my fundamental view of humans: to what extent do I believe in the possibility of reflective creativity, the latter being understood here as the ability of a human to come up with something previously non-existing, to add something new to the chaotic flow of events, assumptions and ripple effects?

This is a crucial point in the subsequent discussion of the impacts of digitalization, and for the sake of the overall theses of this book, I choose to believe in the creative agency of the Meadian "I" – and therefore also in the possibility of genuinely prospective decisions.

3.2.4 Individual and collective decision-making

Looking at the decision-making and the firms requires a specifying question: are we looking at the decision-making in the firms, or the decision-making of the firms – or are they maybe the same? If we choose to focus on the first question, the summary by Elinor Ostrom is a good starting point: "*For all of the work, empirical findings have not yet been integrated into a revised theory of collective action. Thirty-five years of extensive empirical research could be summarized with the weak statement that 'some groups do and some groups do not succeed in overcoming social dilemmas to achieve collective action.*'"(Ostrom, 2000, p. 1-2).

Of course, this statement needs to be contextualized into its proper background: while knowledge about collective action viewed through the lenses of economics is narrowed due to the underlying perception of humans as Meadian "me"s, we do have ample knowledge of collective action when shifting the vista to encompass sociology and several management research streams. The context for the statement is the discussion about the generalizability of human behavior, the same discussion already touched upon in this thesis, ie. essentially the question of whether we can assume one set of behavior (self-interest optimizing full rationality) to describe adequately (in the "as if" world) the behavior of individuals as an aggregated collective. Ostrom's point is essentially the same Bowles (1998) makes, however where Bowles discusses the impact of extant institutions in shaping endogenous preferences, Ostrom draws from evolutionary theorizing and neurosciences to highlight the impact of diverse learning and socialization paths in endowing individuals with different types of behavior. In short, grounding decision-making research on one single behavioral assumption cannot work even in the "as if" world, as people simply are too different[28].

[28] This doesn't stop Ostrom from instead trying to categorize humans into some behavioral types to try to see if replacing one set of assumptions with several stereotyped assumptions would help in trying to explicate collective behavior.

However, if we relinquish the "as if" assumption of treating collectives as groups of uniform (by some chosen standard) individuals, and instead zoom into the collectives as entities both consisting of diverse individuals and shaped by social forces emerging in interaction, we can say something about collective action, including its elusive aspect of decision-making. In essence, this requires turning towards the more sociologically oriented insights emerging in organizational theory (Tsoukas and Knudsen, 2005), consisting of research streams each zooming in to a specific part of organizational, collective action.

We know that organizational routines constitute such collective capabilities that impact the outcomes of firm level activities (Nelson and Winter, 1982, 2002, 2009, Zbaracki and Bergen, 2010), and we even know what constitutes a routine (Feldman and Pentland, 2003), and how they form, endure and change (Dionysiou and Tsoukas, 2013, Miller, Choi and Pentland, 2014, Parmigiani and Howard-Grenville, 2011, Pentland, Hærem and Hillison, 2011). Routines are not merely sources of organizational stability, but play equally a role in driving endogenous changes within a collective (Rerup and Feldman, 2011), as such being an invisible component in guiding the collective action without the explicit moments of Decisions.

We know that organizational identity plays a major role in organizational decisions and actions (Albert and Whetten, 1985, Gioia and Thomas, 1996, Gioia *et al.*, 2013, Pratt *et al.*, 2016, Ravasi and Schultz, 2006), and understand the impact of sensemaking (Maitlis and Sonenshein, 2010, Maitlis and Christianson, 2014, Sonenshein, 2007, Weick, 1988). Organizations have schemata (Rerup and Feldman, 2011), a collectively sensemade understanding of the core, enduring and distinctive features of identity that contribute to the emergent (Mintzberg and Waters, 1985) actions, to the shaping of the mode of dwelling (Chia and Holt, 2006) delineating the sphere of acceptable and desirable actions and behaviors. In addition, we know that there are sensegivers in the organization (Gioia *et al.*, 2013, Monin *et al.*, 2013), leaders, managers or influencers who guide the collective actions through the power of narratives (Boje, Haley and Saylors, 2016, Vaara, Soneshein and Boje, 2016), influencing both the actions and institutional contexts of strategizing (Jarzabkowski, 2008).

There is also ample knowledge for example about organizational culture, and the interaction of and within teams (Edmondson, 1999, Jarvenpaa and Leidner, 1999, Schein, 1985, Zander, Mockaitis and Butler, 2012), each contributing pieces to the puzzle of collective action. In addition, the rich and diverse streams of research explicitly focused on the interface of strategic decision-making and organizational tendencies (Alvesson and Spicer, 2012, Brunsson, 1985, Cohen *et al.*, 1972, Cyert and

March, 1963, Dean and Sharfman, 1996, Eisenhardt and Zbaracki, 1992, Elbanna, Child and Dayan, 2013, Hough and White, 2003, Lindblom, 1959, March, 2006, Simon, 1947, Sund, Galavan and Huff, 2016, Vecchiato, 2012), enriched further by top management team research (Hambrick and Mason, 1984) has explored and contrasted the interplay of the actions of the designated Decision-makers and the overall unfolding of actions and decisions within an organization.

In sum, zooming in to view decision-making in the firms, we know that people make decisions differently as a part of a collective than individually: not only do people have multiple selves (ie. a ruthless murderer can be a loving mother, or less dramatically, a CEO firing without a twinge thousands of people can be the most generous donator to the soup kitchen feeding homeless; people can have a different professional and domestic persona), but making a decision within a group brings to the table both the different explicit perspectives, assumptions and aims, and the implicit social mechanisms and power constructs influencing the interaction of the individuals present, further muddled by the intertwining doxic elements present both within the group and within each constitutive individual. Referring again to the neurosciences, we simply are hardwired into forming our opinions based on the social forces surrounding us (Izuma, 2013, Wood, 2000, Wu, Luo and Feng, 2016).

This means that the decision-making in a firm is different from individual decision-making even though some features of the individual decision-making processes travel also between different contexts. So, the key question in strategic decision-making studies is, to what extent can we treat the decision-making of the firms (as judged by the outcomes of firm level activities) as a reflection of the decision-making in the firms? And furthermore, to what extent can we reduce the collective decision-making into the decision-making processes and actions of the individuals constituting the collective – be the individuals the designated Decision-makers, middle managers or operative employees?

The rising turn to practice in management research further emphasizes this distinction: from that perspective the collective decision-making is less about the constitution of the individuals making the decision than about the social forces emerging in the in-between – the decision-making events are populated not only by the individuals and their baggage, but also predominantly by such social forces, made flesh in practices, that emerge out of human interaction, exist in the Popperian world three. This is for example the focus of analysis in the strategy-as-practice (Vaara and Whittington, 2012) research stream (discussed more shortly), which is more interested in how events unfold within the collective setting, than in the firm level outcomes in terms of firm actions and for example performance. As such, it not only severs the

link between the decisions in and of the firm, but also the link between individual and collective decision-making processes.

However, a popular choice in the strategic management research has been to black box the messy interplay of individuals and social forces, and instead shift the locus of agency into the level of the firm. The focal actor is the firm, irrespective of how its actions and decisions emerge. It is the firm that makes decisions and has a strategy. This viewpoint is exemplified in for example the well-known Porterian approach to strategy (Porter, 1980a, 1980b): the firm, as the focal actor, faces different exogenous forces in regards to which it needs to position itself. This view was nicely contrasted with the prevalent choices in entrepreneurship research using the metaphor of Romeo and balcony: Venkataraman and Sarasvathy (2001) highlighted how the (majority of) research on entrepreneurship is focused on the agency of Romeo, neglecting the essential backdrop of the balcony, whereas the (majority of) strategic management literature dismisses the role of Romeo in paying more attention to the positions of the props and other players.

So, in regards to decisions and firms, where is the agency: within the individual level or within the collective level of the firm? Ultimately the choice comes down to the set of philosophical lenses through which this question is explored, and the unit of analysis (human behavior, outcome of firm action) focused on. The microfoundational perspective (discussed more deeply later) suggests that the agency is and will always be on the level of the individual, however both the aggregated outcomes of agentic action and other collective level forces impact the agency in ways that cannot be dismissed in the analysis.

In other words, we can talk about firm performance as a distinct entity, detached from the direct individual level actions and decisions, because it is not only the actions and decisions of the individuals that are responsible for the firm performance, but also the amorphous processes and practices emerging in-between the individuals have a major impact. A firm is constituted by more than its individual constituents. Therefore it is not illogical to talk about firm as an agent, with its decision-making detached from the decisions of the individuals within. However at the same time, it is illogical to discuss the actions and decisions of the firm without accounting for the myriad individual and intra-individual processes ultimately responsible for those aggregated outcomes expressed in firm level actions and decisions. There are no causalities on the collective level, like soon discussed in more detail.

To summarize this subchapter as a building block for further theory construction, collective decision-making constitutes of more than the sum of its constituent individual's decision-making processes. The collective decisions and actions within

an organization are an amalgam of 1) idiosyncratic individual features, 2) collective practices such as routines, and 3) collective forces, such as identity, power, culture, and normative and regulative institutions. Due to these myriad forces present in the setting of collective decision-making, the aggregated outcome can be expressed as the notion of an agentic firm – while the firm doesn't exist (and as such, does not "act") but as a collection of individuals and agreements, due to the impossibility of reducing the firm actions into the actions of its components, the firm can be perceived as having agency.

3.3 Cursory overview of strategy: from content, process and practice to strategizing

Strategy is one of the concepts so diffused in both scholarly and practitioner parlance that defining it comprehensively and parsimoniously is quite difficult. Originally a military term, now even the most peace-loving organizations pursue diverse strategies (as evidenced by the recent appearance of our university's strategy on my desk). To begin with the concepts of strategy and strategizing, strategy is a noun and refers to an entity consisting of priorities, plans, implementations, analyses, and outcomes, to name a few components. In turn, strategizing, a verb, refers to the activities undertaken within the context of the strategizing entity, most often an organization, spanning the actors from the top management to the bottom level of the collective.

Research on strategy has traditionally been interested in the firm performance and the relationship between strategy-as-noun and the resulting outcomes. In his entertaining and informative book "Good Strategy / Bad Strategy"(Rumelt, 2011) one of the leading strategy scholars, Richard Rumelt laments on the widely spread misuse and misunderstanding of the concept, and through illustrating a good strategy draws attention to bad strategy, which is both a lack of strategy and a misguided understanding of the whole notion.

According to Rumelt, strategy is about applying strength to weakness. Essentially this means that a good strategy consists of an honest analysis of both endogenous and exogenous elements and forces, and an insight about how to exploit the endogenous strengths to reap the benefits emerging from the exogenous circumstances. This strategy content view consists of two established approaches, the industry-based view (Porter, 1980a, 2008), which seeks to explain the firm performance through different exogenous forces and the position of the firm, and the resource-based view (Barney, 1991, Penrose, 1959, Teece, Pisano and Shuen, 1997), which looks at the role of the endogenous capabilities of the firm in explaining performance. Additionally, a third

proposition has been made to include the impact of institutions in the explanations, to add the institution-based view as the third leg of the strategy tripod (Peng, Wang and Jiang, 2008, Peng *et al.*, 2009). While the institutional approach (Dimaggio and Powell, 1983, North, 1990, Scott, 1987, 2008) in itself isn't new, its identification as a distinct strategy perspective is: institutions are formal (regulative) or informal (normative, cognitive) collective level social constructs that shape (enable and restrict) individual level perceptions and actions, and as such influence the strategic, collective level outcomes.

In parallel of, and even preceding the rise of the resource-based view, another realization emerged: the strategy is not only a content, but also a process (Bourgeois, 1980) – a stream of actions and decisions (Eisenhardt and Zbaracki, 1992, Mintzberg, 1990, Pettigrew, 1992, Rumelt, Schendel and Teece, 1994). This process view of strategy consists of a diversity of approaches[29] zooming in to the diverse strategic decisions made within the firm, most notably by the top management team (Hambrick and Mason, 1984). However, like for example Minztberg and Waters already early on noted (Mintzberg, 1978, Mintzberg and Waters, 1985, 1990), looking at the strategy process as a linear evolution from one clear cut strategic decision to another, renders the far more unstructured unfolding of the actual process too simple to capture the messiness of real life. This realization led to understanding that the strategies can be either emergent or deliberate.

With the rise of turn-to-practice worldview within the social sciences (Feldman and Orlikowski, 2011), the research of the strategy processes took also another turn, guided by the adoption of a more constructivist philosophy: the strategy-as-practice approach (Whittington, 1996). While the strategy process view is also interested in the actions of the individuals within the firm, there are two major differences between the process and the practice approaches.

The process view tries to unveil how the diverse decisions and actions of the individuals contribute to the firm performance – the unit of analysis being the relationship between the endogenous elements of the firm and its business performance:

[29] In their widely referenced paper, Eisenhardt and Zbaracki (1992) juxtaposition three strategic decision-making approaches they name paradigms: the rationality-bounded rationality orientation, the power and politics approach, and the garbage can model. The first "paradigm" gains its explanatory power from the discussions of how the individual rationalities impact decision-making within the firm, the second views the impact of the political forces within the firm, and the third approach zooms in on the happenstances (Cohen *et al.*, 1972). All of these approaches can be considered to belong to the strategy process stream, with the philosophical underpinnings of a more positivist kind: in those views decisions are ontologically real and prospective, made wittingly with a bounded rationality influenced by the political power relationships and sometimes contingencies. Quite rightly Eisenhardt and Zbaracki conclude that the differences between the approaches are quite negligible.

the question being how actions explain performance. In contrast, the practice view isn't interested in the performance outcomes of the decisions and actions, but instead wants to understand the actual unfolding of the events within the firm, the focus of analysis being the actions and activities in themselves: the question being how to understand the actions of people in the organization (which can be a firm or a non-profit organization). As hinted by the chosen words of "explain" and "understand", the second difference results from the different philosophical underpinnings of the approaches.

The worldview of the strategy process view consists of a given singular reality, which can be parceled into variables and their interactions. In contrast, strategy-as-practice view subscribes to a constructivist worldview (and increasingly to process philosophy (Chia and Holt, 2006)), where the organizational realities are constructed in action and interpreted in diverse ways.

Vaara and Whittington (2011) further analyze the strategy-as-practice approach and identify three different levels of analysis, sharing the same philosophical underpinnings: practices and protocols (eg. what kinds of meetings, attended by whom are in place), praxis (how action and interaction unfolds in microevents), and practitioners (how individuals act). As such, strategy-as-practice view comes close to the organizational studies interested in routines from the practice perspective (Dionysiou and Tsoukas, 2013, Feldman and Pentland, 2003, Howard-Grenville and Rerup, 2015, Pentland and Hærem, 2015, Pentland *et al.*, 2011), whereas the capability view on organizational routines (Felin *et al.*, 2012, Barreto, 2010, Eggers and Kaplan, 2013, Winter, 2003, Zollo and Winter, 2002) shares the heritage of the strategy process approach (Parmigiani and Howard-Grenville, 2011).

While the concept of strategizing is most widely used in the strategy-as-practise perspective (Denis, Langley and Rouleau, 2007, Jarzabkowski *et al.*, 2007, Samra-Fredericks, 2003, Whittington, 2003), following also from Karl Weick's constructionism-based insight about the essentiality of -ing in the context of organizational phenomena (organizing, managing, sensemaking, strategizing), in this dissertation the concept is extended to include also the linkage to the firm performance. This is achieved through discussing the differences and similarities of the strategy-as-practice and microfoundational perspectives in the next subchapter, however before digging deeper, a short clarification of my position in the field of strategy and strategizing is necessary.

Summarizing, the industry-based strategy (Porter, 1980b, 2008) views strategy as positioning the firm, resource-based view emphasizes the firm-specific capabilities and advantages (Barney, 1991, Penrose, 1959), including the microfoundation-

al perspective of the individual underpinnings of such capabilities, and the institution-based view explores the fit between the strategic choices and the environmental institutions in which the firms are embedded (Peng *et al.*, 2008, Peng *et al.*, 2009). In turn, the strategy-as-practice, or strategizing view focuses on explicating the events and mechanisms between the individual level perceptions (shaped both by exogenous and endogenous elements) and individual level actions, further complemented by intersubjectively emergent phenomena within an organizational setting – however without a keen interest on the subsequent firm level outcomes.

As such, the approaches differ in their levels (and units) of analysis. A diagram by the sociologist James Coleman highlights the relationships between diverse levels of analysis and will be discussed more in the following subchapter, however in order to position my research in the wider context, the "Coleman's tub" is introduced already now, with the diverse approaches positioned according to their respective areas of analysis.

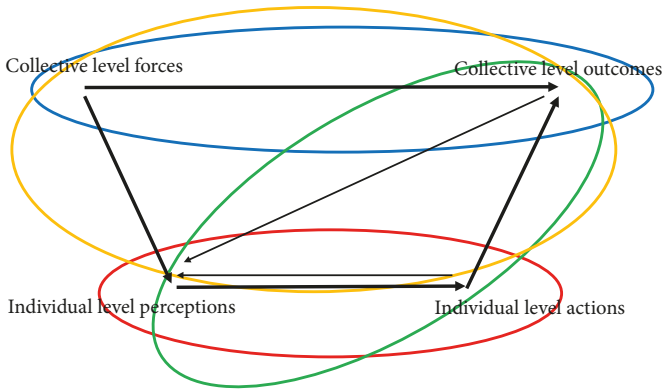


Figure 2: Areas of strategy-related analysis, diagram adapted from Coleman

While this figure is naturally a dramatic simplification, it however helps to position the discussions of this thesis. The macro level strategic management research, especially as evidenced in the industry-based literature, explores the firm level responses to the exogenous conditions, and the subsequent outcomes as firm level performance. The resource-based view is interested in the impact of the individual level actions represented as routines, capabilities, competencies and firm-specific advantages, on the firm level performance. The additional contribution of the microfoundational perspective, originating in the field of resource-based view, is evidenced in

the interest of tracing the individual level actions backwards to the perceptions and collective level influences.

The institutional approach explores strategic choices from the perspective of an institutional fit: do the aggregated individual level actions create such collective level outcomes that fit the institutional setting in which they are embedded? Finally, the strategy-as-practice, or strategizing view focuses on explicating the events and mechanisms between the individual level perceptions (shaped both by exogenous and endogenous elements) and individual level actions, further complemented by intersubjectively emergent phenomena within an organizational setting – however without a keen interest on the subsequent firm level outcomes.

This research is positioned on the bottom of the tub. The chosen perspective is an attempt to negotiate the interests within the strategizing approach with the interests expressed in the microfoundational viewpoint, both viewing the actions and unfoldings surrounding the nodes of individual perceptions and actions. However, while the level of analysis and the fields of interest are similar, the microfoundational approach and the strategizing perspective differ in their philosophical underpinnings. These contradictions and my subsequent choices are addressed in the next subchapter.

3.4 Microfoundations and strategizing: same interests, different lenses

Business and management research is an offspring of two warring families, namely the economics and sociology[30]. This is a strong simplification, and while the paradigmatic tensions underlying the field can be discussed infinitely (see for example the highly sophisticated dissertation of Ari Ahonen (2001) identifying four overarching paradigmatic tones), ultimately many objects of management research are explored with approaches rooted in either one or the other line of heritage.

Without rendering economics into a strawman, it can be said that most approaches within firm and management studies descending from that branch have realist underpinnings. A similar simplification, with the same caveat, can be made about how the approaches with more sociological forefathers often have a more constructionist outlook. These have resonated also in the choices about the levels of analysis: where the more sociological approaches have focused on the individual level and on the processes of unfolding through the vantage of the participants, the influence of eco-

[30] Which, going little more than a century back, were actually interested in solving the very same issue of human co-existence as societies, emerging from the very same streams of scholarly discussion.

nomics has been evident in the many realist management theories taking the firm, or an even wider collective, as the focal actor and the level of analysis.

Ultimately the microfoundational research stream is a realist approach to the individual, and even intra-individual level phenomena (Barney and Felin, 2013, Felin and Foss, 2005, Felin *et al.*, 2015, Goldman, 1999). The fundamental claim of microfoundational approach is that there are no macro level causalities (Foss, 2011). Instead, the macro level forces influence the perceptions on the individual level, which in turn underlie the individual level activities. Collective level outcomes are the aggregated congregations of these individual level actions (Coleman, 1986, 1990).

The microfoundational approach emerged within the field of strategic management (Felin and Foss, 2005, 2009b). Due to the complexity of the explored phenomena, Felin and Foss (2005) called for research that would take also the micro level of individuals seriously. However, choosing to wear the microfoundational lenses positions a scholar somewhat at odds with both the realist management studies focusing on the collective level of analysis, and with the constructionist organizational studies. The latter tension is evident in for example the duals fought around the themes of routines and performativity, quickly illustrated next.

In the constructivist sphere of organizational studies, taking individuals seriously is not a novelty: the discussion about the microfoundations of routines (Felin and Foss, 2011) was met with a level of derision from the sociologically oriented, constructivist routines scholars (Pentland, 2011) claiming essentially that microfoundations approach was merely re-inventing the wheel, but with less attention to the unfolding of the actual real life phenomena. In the ensuing retort (Felin and Foss, 2012), the impact of the different philosophical underpinnings were clear: where Pentland called for understanding the messiness of human action, Felin and Foss called for explanations based on construct clarity. In essence, where the practice perspective of routines (Feldman and Pentland, 2003) focuses on the collective construction processes of the in-between individuals, the capability perspective of routines (Parmigiani and Howard-Grenville, 2011) focuses on the agency of the individuals, shaped by the collective forces.

The debate around the concept of performativity a few years earlier pivoted on a similar theme: Felin and Foss (2009a) questioned the power of social constructs over the "real life realities", reflecting the self-fulfilling nature of economic theories as discussed by Ferraro, Pfeffer and Sutton (2005). Summarizing, Ferraro *et al* argued that the strawman of humans as fully rational self-interest seekers in economic theories has resulted in shaping the humans accordingly. Felin and Foss

countered this by stating that if that were the case, humans should be not only selfish but also fully rational: however as the reality is that the humans cannot be fully rational, the underlying reality limits the scope of the performative power of theories. The exchange (Ferraro, Pfeffer and Sutton, 2009, Felin and Foss, 2009b) served to further clarify the philosophical underpinnings of microfoundations as a realist alternative to exploring individual level phenomena, previously mainly focused in constructivist research.

In looking at the interplay of individual level mechanisms and collective forces and outcomes, microfoundational view addresses also change, which requires acknowledging the alternative of process philosophy (Howard-Grenville and Rerup, 2015, Rescher, 1996, Tsoukas and Chia, 2002). Microfoundational approach is underpinned by the substance philosophy, aligned with its realist foundations. Where process philosophy takes the unfolding of the object of the inquiry as the unit of analysis, microfoundational view regards the process of unfolding as individual frames constituting the experienced flow.

In their comprehensive review of strategy-as-practice (SAP) research, Vaara and Whittington (2011) draw attention to the similarities and differences between SAP and strategy process studies, institutional approaches, and microfoundational streams including behavioral strategy[31]. Like Vaara and Whittington point out, the key differences in the microfoundational perspective and SAP emerge from a) the level of interest in the linkage between intrafirm activities and firm performance, and b) philosophical differences Vaara and Whittington coin as "methodological individualism" and "reductionism". According to Vaara and Whittington, in practice philosophy "*organizations are made of practices and it is practices that enable individuals*" (p. 321), whereas in the microfoundational view individuals are the focus of analysis. Winter (2013) joins the list of critics: the reductionism inherent in the realist approach of methodological individualism requires tackling two problems. First of all, how can the "rock bottom" level of analysis be defined – why should the reduction stop at the level of the individual? Secondly, in unison with the strategy-as-practise scholars, considering social action constituting of more than the sum of the actions of the individuals, how can the intersubjectively emergent phenomena be addressed?

[31] A list of similarities and differences according to Vaara and Whittington 2011, can be found in a nice table in p. 319 in that article.

The microfoundational school answers these issues through relying on the insights of Coleman[32] (Foss, 2011, Felin *et al.*, 2015, Powell *et al.*, 2011): as it is the meaning of social science to explore social phenomena, it is logical to focus on the actors constituting that social phenomena, the individuals, including the diverse endogenous and exogenous forces impacting their actions, constituting the intersubjective, collective forces. The simple yet comprehensive diagram known as "Coleman's bathtub" captures the idea nicely.

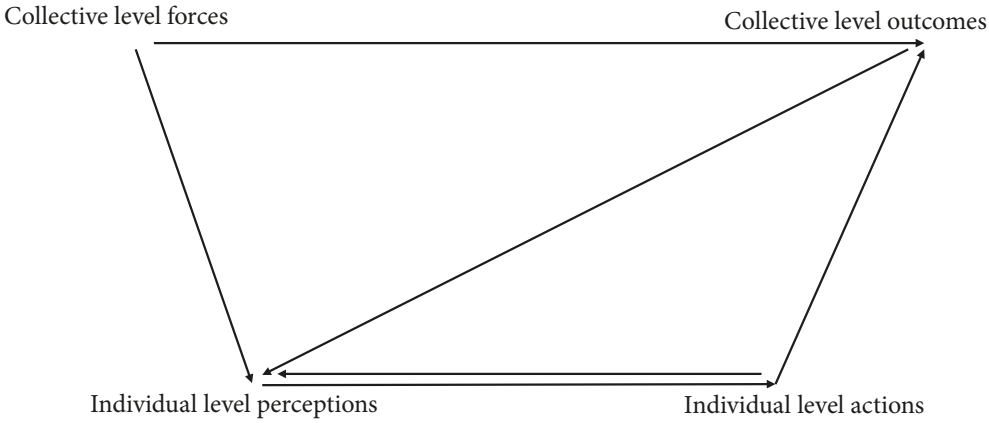


Figure 3: Coleman's tub, adapted

The ultimate claim of microfoundational approach, in itself lauded by the constructivist organizational studies, eg. the strategy-as-practice stream, is that the arrow from collective level forces to collective level outcomes doesn't actually have stand-alone explanatory power: there are no causalities on the macro level. Instead, the collective level forces impact the perceptions and dispositions of the individuals, constituting also of the idiosyncratic personal features (Powell *et al.*, 2011). These

[32] "*Methodological individualism defines, as it were, the "rock-bottom" limits to reduction in social science, because it implies that the social science explanation will have to stop at the level of individuals, and there is no need to proceed further down the explanatory ladder. Though hotly debated throughout the history of ideas of the past century or so, methodological individualism comes in different forms (…), and in the dominant version it is a position that is sufficiently flexible to allow variables at higher levels than individuals to influence the conditions of those individuals (cf. Coleman, 1990) or moderate their interaction… I here associate micro-foundations with this broad notion of methodological individualism. To the extent that management scholars embrace the notion that the aim of social science is to identify and theorize the causal social mechanisms… that generate and explain observed associations between events (…), they should also embrace the notion that the discovery of how human action and interaction causally produce collective-level phenomena is what social science is all about (…). Micro-foundations thus mean theorizing such micro-level causality (…).*" (Foss, 2011, p. 1416.)

individual level perceptions in turn drive the individual level actions, coalesced in the organizational setting to capture also the intersubjective phenomena emergent in the interaction. It is the aggregation of the individual level actions that then ultimately is realized as the collective level outcomes.

I'm yet again faced with the choice of negotiating diverse approaches, both well-grounded in their arguments from their respective vantages, addressing a critical theme in my dissertation. Holding on to my pragmatist credo, I fully acknowledge the role of constructionism in social action, and agree with the importance of the intersubjectively emergent reality not reducible to its individual components. At the same time, the call for construct clarity, reverberating in the microfoundational approach, appeals to me – as does the possibility of some types of realist elements underpinning and influencing at least to some extent the constructionist processes.

The addition of the feedback arrows in the previous picture from the individual actions and the collective outcomes is my first step in trying to accommodate the two perspectives I find highly sensible. Following Weick (1979) and the sensemaking insights, not only are our actions driven by our perceptions, but our perceptions are susceptible to change following our actions. We enact our reality: in confusing situations we just do something to enable retrospective sensemaking of the situation through reflecting the outcomes of our action. This pertains to both the individual level actions and the collective level outcomes of those actions.

In essence, the addition of the feedback arrows captures one part of the doxic action, the mechanism of sensemaking. However, aligned with the previous discussions, both the arrows from the collective level forces and the bottom arrows are in big part constituted by also other elements responsible for creating the spheres of doxa. Considering for example institutions, either through Scott's sociological perspective or through North's more economic take (Scott, 1987, 1995, 2008, North, 1990), they consist of both doxic and reflective elements: laws, regulations and rules, the formal (in North's vocabulary) and regulative (in Scott's) are external, reflectively acknowledged forces shaping, restricting and enabling collective action. In turn the norms, cultures and ethics, informal (in North) or normative (Scott), are in majority absorbed and internalized as doxic action shaping forces.

Likewise, the individual level social action, following from the individual level perceptions is a tangle of both doxic and reflective elements, further muddled by the internal individual features and dispositions playing an equal role. The additional arrows in the following figure explicate these elements.

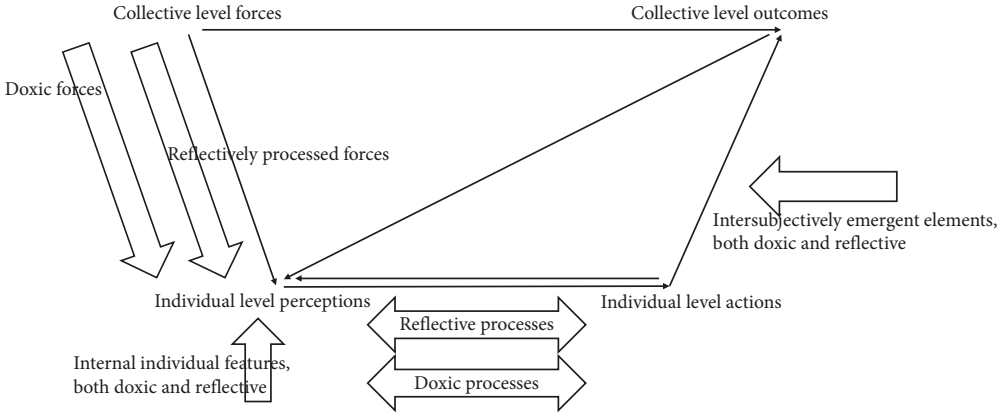


Figure 4: Doxic and reflective elements in Coleman's tub

In this figure I'm committing a mortal scholarly sin of lumping together a variety of research streams with the only intent of arguing that human action, both individual and social, constitutes of both doxic and reflective realms. To begin from the left hand side of the figure, the collective forces impacting the perceptions of the individual form the institutional biography of any given individual, partially doxic, in part reflectively acknowledged. These collective forces have been studied from several perspectives and levels of analysis: for example institutional studies and research on the impact of national culture, ethnicity, religion or socio-economic analyses take a highly macro level perspective, whereas research on organizational identity, culture or schemata explores the collective forces within a specific closed setting (of an organization).

To move on to the node of individual perception, in addition to the collective forces, the idiosyncratic personality features and psychological processes, including the heuristics and biases, endogenous tastes and preferences, and the cognitive capabilities, contribute to the unique blend of the both doxic and reflective disposition of the individual, carried along to the social action. Insights from these elements accumulate in the research streams of psychology, cognitive sciences and for example neurosciences.

Moving on towards the action, it should be stated that the individual level action can be either carried out alone or socially: in the first case, the doxic and reflective processes born out of the doxic and reflective external influences and internal features interact in resulting in the decisions and actions of one individual. In the case of social action, these elements brought along by the individuals are complemented

with the intersubjectively emergent phenomena, for example organizational routines or practices.

There are several ways of fleshing out this skeleton of synthesis by zooming deeper into any of the research avenues captured in the figure. However for the sake and purpose of the overarching quandary of this dissertation, the insights in behavioral strategy about the importance of the choice of rationality, the perceptions of human and organization, and the perception of the firm and environment interface provide relevant building blocks. Before finishing this chapter on strategizing with an integrative framework subsequently viewed through the changes wrought by digitalization, mediated by changes in uncertainty, a detour in behavioral strategy is therefore next in order.

3.5 Behavioral strategy

Behavioral strategy emerged from the wider microfoundational discussions centered on the organizational routines and capabilities research essential in the resource-based view of the firm. Its specific area of interest was coined by Powell, Lovallo and Fox (2011) as follows: "*Behavioral strategy merges cognitive and social psychology with strategic management theory and practice. Behavioral strategy aims to bring realistic assumptions about human cognition, emotions, and social behavior to the strategic management of organizations and, thereby, to enrich strategy theory, empirical research, and real-world practice.*" (Powell *et al.*, 2011, p.1371).

So, behavioral strategy draws from psychology, social psychology, sociology and cognitive and neurosciences to create knowledge about both the individual and collective level drivers of strategizing (in this context including also the linkage between organizational and individual action, and the firm performance). As such, true to its realist underpinnings, its focus area pivots around the nodes of individual perceptions and individual actions, with little emphasis given to the intersubjectively emergent phenomena. While I acknowledge this as an omission meriting a mention, the three dimensions identified by Gavetti (2012) within that stream provide useful building blocks for the ensuing discussion of the core theme of this dissertation, which is why those dimensions will be explored here in some detail.

In his perspective towards creating a model for the behavioral theory of strategy, Gavetti (2012) focuses on the perceivable difference between the Schumpeterian notion of superior performance (Schumpeter, 1911, 1934, 1950) and the prominent take on the drivers of superior performance as expressed in the management and strategy research built on the foundations of the Carnegie School (Cyert and March, 1963,

Nelson and Winter, 1982, 2002). Both views hinge on the importance of the managerial cognition processes, and as such regard the connections between individual level phenomena and firm level outcomes. Gavetti (2012) creates a three dimensional model to "*identify the behavioral drivers of superior performance systematically*" (p. 268). He identifies the dimensions of rationality, plasticity (of the organization) and the ability of the firm to shape the environment, and elaborates the 'behavioral failures' (e.g. p.268) that lead organizations to excel in realizing close opportunities but to ignore the more distant ones. According to Gavetti, these distant opportunities however are the ones that would yield superior performance, as they are the ones missed also by the competitors (acting under same behavioral failures) in the same markets.

In discussing the rationality dimension, Gavetti criticizes the ubiquitous notion of bounded rationality (Cyert and March, 1963, March and Simon, 1958, Simon, 1947), which has helped to understand the myopic propensities of the management that cause the firms to excel in incremental opportunity recognition and exploitation (elaborated also by for example March in his seminal discussion of explorative and exploitative organizational learning capabilities (March, 1991)). However, as the go-to understanding of rationality, the bounded cognition view gives little insight into what drives the exploratory capabilities of the firm (March, 1991), the pursuits of seizing the more distant opportunities. This leads Gavetti to trying to unbind the rationality, to showing that the opportunities yielding superior results actually reside beyond the limits of bound rationality on the rationality dimension axis.

On this pivotal point my following discussions take another turn and wonder what if there is nothing wrong with the notion of bounded rationality in itself? What if the distant exploration opportunities cannot be identified with more of the same kind of rationality, be it bound or unbound? What if the rationality that lends itself to identifying the distant opportunities is of a different nature than the type of rationality discussed as full or bounded – especially if we consider that the type of uncertainty tackled by causal rationality is considerably different than the type of uncertainty becoming more relevant with the increasing availability of big data?

As has been extensively discussed in this dissertation, as scholars we have different philosophical vantages from which we try to contribute to the accumulation of knowledge. The next discussions assume that the different worldviews thus emerging are however not limited to us scholars, but that many of the choices we scholars make through extensive philosophical search, practitioners make also, however maybe with less deliberation. My point therefore is that assuming that we researchers aren't the only ones viewing reality in diverse ways, how would that be reflected along the

dimensions of behavioral theory of strategy, rationality, perception of the individual and organization, and the perception about the firm/environment interface?

One implication relates to the more plural nuances of what is considered rationality, as just hinted at: there is the type of omnipotent rationality of the economic man (Friedman, 1953, Taylor, 1914), and its bound version utilized by the administrative man of Simon (1947) and the Carnegie School (Cyert and March, 1963, March, 1978) or the muddling man of Lindblom (1959, 1979). Born out of different origins, there could then be a selection of rationalities of different nature: the effectual rationality wielded by the effectuating entrepreneurs, sketched and introduced by Sarasvathy and colleagues (Sarasvathy, 2001, Sarasvathy and Dew, 2005, Sarasvathy and Venkataraman, 2011); the improvisational or reflexive[33] rationality (Elbanna, 2006, Elbanna *et al.*, 2013, Mendonça *et al.*, 2004, Miner, Bassof and Moorman, 2001, Sudnow, 1978, Weick, 1998, Yanow and Tsoukas, 2009); or the rationality of the bricolateurs (Baker and Nelson, 2005, Fisher, 2012, Levi-Strauss, 1966) – all identified to play a part in some instances of organizational action.

Furthermore, how do the different viewpoints of the nature of human, and subsequently organization impact strategizing? The lay examples of this include for example the perception of an individual as an inherently trustworthy or inherently untrustworthy being[34], or the mental representation of the firm as a machine or a family, a vehicle for oppression or an instrument of self-expression[35]. Does the entrepreneur or manager view people as something to be strictly governed, or as individuals performing best when left alone? Do the agentic individuals constitute the firm, or are the individuals interchangeable building blocks of the structure?

In addition, what is the relationship between the firm and the environment? Is the boundary solid or porous? Can environment be predicted, or only adapted to? Can environment be changed and controlled? (Reeves, Haanaes and Sinha, 2015, Wiltbank *et al.*, 2006) These questions underpin the discussion related to the third dimension of behavioral theory of strategy, even though the approach taken in this dissertation expands the initial discussion by Gavetti. For Gavetti, the key issue is

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[33] It should be noted that the notion reflexive rationality should not be mixed with reflective rationality in this context. In the discussion by Yanow and Tsoukas (2009), reflexive rationality is kin to the improvisational rationality, thinking-in-action in contrast to thinking-on-action. Reflexive rationality refers to the ability to react rationally to external signals amidst action, whereas reflection, by definition, is something done at a different point in time – one can reflect on either past or future action.

[34] The scholarly discussion of this theme can be seen in the basic assumptions underlying the transaction cost based theorizing and the discrepancy between them and the innovation literature, discussed later in this dissertation.

[35] For an extensive discussion of these four types of firms as metaphors, see Ahonen, 2011.

the ability of the firm to legitimize its actions for the environment, however, as soon delved in more detail, the questions pertaining to the firm/environment relationship do not end there.

To further argue for the following discussions in the context of this book, digitalization changes the business environment in ways that require deep, assumption level changes from the actors involved in strategizing. These perception level transformations include the type of rationality needed in tackling the transformed nature of uncertainty, pertain to the conception of the human and the nature of the organization, and impact the interface between the firm and environment.

3.5.1 Rationality

> *"Where, then, does variety and novelty –whether in the biological or economic sphere– originate from? Perhaps the best place to start is with reference to extant biological arguments that deal with similar questions about the origins of variety and novelty in nature. Evolutionary models that focus on selection require a counterpart to explain where the selection set comes from. In other words, whether biology or economics, we need to not just explain the survival of the fittest but also the 'arrival' of the fittest"* (Felin et al., 2014, p. 7)

Felin *et al* (2014) coin the issue of opportunity in the evolutionary paradigm aptly: bounded cognition allows us to explain the selection process and exploitation of the opportunity, but it gives us little tools to understand where the material to exploit originates. This question itself Felin *et al* (2014) ponder at some length, with a clear underlying message: the computational approach even in its sophisticated form as evidenced in the bounded rationality paradigm, and subsequent evolutionary theory of the firm (Cyert and March, 1963, Gavetti *et al.*, 2012a, Nelson and Winter, 1982, 2002, 2009) cannot answer the question of where does the novelty stem. This novelty, as defined by Felin et al (2014) can be likened to the distant opportunity as defined by Gavetti (2012). Furthermore the notion of entrepreneurial opportunity, the novelty, is not limited to existing merely in the entrepreneurial realm, but is taken as the seeking of new openings sought after also in established companies (Lumpkin and Dess, 1996, Werhahn *et al.*, 2015).

In entrepreneurship literature this discussion circles around the debate of the nature of opportunities: are they created or discovered (Alvarez and Barney, 2007, 2008, 2010, Mainela, Puhakka and Servais, 2014, McMullen and Shepherd, 2006, Venkataraman *et al.*, 2012)? After an interesting discussion of the extant literature of the mechanisms through which the entrepreneurial opportunities emerge, Venkata-

maran, Sarasvathy, Dew and Forster (2012) make an attempt at resolving the debate by embracing the notion of science of artificial as put forth in a later work by Simon (1996):

"(M)ost entrepreneurial opportunities have to be made through the actions and interactions of stakeholders in the enterprise, using materials and concepts found in the world. Opportunities are, in fact, artifacts. And their making involves transforming the extant world into new possibilities." (Venkatamaran *et al.,* 2012, p. 26)

This brings us closer to the overarching theme of this subchapter and the Gavetti model: if we consider the distant opportunities referring to the entrepreneurial opportunities in the sense that they open up possibilities not exploitable by incremental advances, the focal point is not if the opportunities are created or discovered but how they are created or discovered. Wielding bounded rationality explains the discovery of close opportunities, but makes little advances towards explicating either the creation of opportunities or discovering distant opportunities. However, if we adopt the discovery view (Eckhardt and Shane, 2003, Kirzner, 1997, Shane, 2003, 2012), we begin to approach the suggestions proposed by Gavetti (2012). Unbinding the rationality would indeed open up our vista to discover also the more distant opportunities, provided that the opportunities exist to be discovered. This would lead us towards what Alvarez and Barney (2010) defined as a critical realist approach to entrepreneurial opportunity: the distant opportunities exist and can be seized by superior individuals who stretch the bounds of rationality, requiring the strategists pursuing the opportunities to be 'alert' (Kirzner, 1997), something that can well be defined as a disposition to stretch the bounds of what others deem rational – however while continuing to wield rationality, which is essentially of the same nature than the bounded cognition, just an expanded version of it.

But should we go back to the key insight of Gavetti (2012) about the discrepancy between the entrepreneurial action as described by Schumpeter (1911, 1934, 1950) and the Carnegie School driven paradigm of management and strategy, we begin to understand the limits of even unbounded rationality. In their analysis of Schumpeterian and Kirznerian notions of entrepreneurship, Endres and Woods (2010) reflected the underpinnings of Schumpeterian entrepreneurship and the thinking of Carnegie School driven contemporary management and strategy discussion, and came to a similar conclusion than Gavetti (2012) – the original insights of Schumpeter are fundamentally different from those of the Carnegie School driven paradigm. Interestingly, what Endres and Woods found to resemble closest the Schumpeterian paradigm in the contemporary entrepreneurship research, was the effectuation approach (Sarasvathy, 2001, Chandler *et al.*, 2011, Perry, Chandler and Markova, 2012).

Effectual approach sees opportunities as created. Sarasvathy began by observing how the expert entrepreneurs go about making their decisions, and noticed how they seemed to follow a completely different type of logic as traditionally perceived as rational. Instead of beginning with identifying a goal, the entrepreneurs began with identifying their immediate resources, namely what they themselves can and have, and what kinds of people they knew. Instead of proceeding by procuring the requisite resources in order to reach the goal, the entrepreneurs continued by exploring with what they could do with the possibilities at hand, "*transforming the extant into new possibilities*" (Venkataraman *et al*., 2012).

Alvarez and Barney (2010) identified this approach of created opportunities as being based on evolutionary realism (Campbell, 1974, Hausman, 2002), which emerged with pragmatist roots from the debate following the rise of the social constructionism paradigm (Berger and Luckmann, 1967) arguing that social actions and institutions don't have an independent reality but are constructed through the actions and interactions of people in specific contexts. Mellowing the criticized (Godfrey and Hill, 1995, Goldman, 1999, Kwan and Tsang, 2001) constructionist perspective, evolutionary realism[36] accepts the existence of both, stating that indeed there are entities which exist independently of the observer, but that there are also entities, which come to existence through actions, the construction – ultimately the same point Venkataraman et al (2012) made about the ontology of the entrepreneurial opportunity, and the credo overarching this dissertation, however with a different label.

The original actors of effectuation theory (Sarasvathy, 2001) were expert entrepreneurs in a context where Knightian uncertainty (Knight, 1921), Marchian goal-ambiguity (March, 1978, 1982) and environmental isotropy played a role: meaning that the consequences of chosen actions are impossible to calculate to any relevantly probable degree, that the preferences are not given, ordered or even identified, and that the environment is so noisy that it is impossible to determine which signals are worth paying attention to resulting in a situation where the only way to keep functioning is by deeming irrelevant a mass of obtainable information (Sarasvathy and Dew, 2005).

[36] In business and management sciences there seems to be a dire need for philosophical underpinnings that allow for both moderate realism and moderate constructionism, and this need is answered in several ways in diverse subjects and spheres of the field. The version of critical realism in IB, as promoted by for example Welch *et al* (2011, 2017) seems different from the version of critical realism as interpreted by Alvarez and Barney, and instead more kin to their interpretation of evolutionary realism. On the other hand, the adoption of pragmatism in for example accounting (eg. Lukka and Modell, 2010), entrepreneurship (Read *et al* 2016) and international relations research (eg. Friedrichs, 2009) stems from exactly the same need, with practical suggestions highly similar to the suggestions of the proponents of the critical realists in IB, bearing notable similarities to the evolutionary realism as explicated by Alvarez and Barney here.

In circumstances like this, no amount of unbound cognition is useful, as it is not about knowing more, but about lacking a standard of desirability (Thompson, 1967) against which the causes and effects can be organized in terms of more or less desired – partially because the options and subsequent chains of events are yet to materialize. How do you, with traditional (bound or unbound) rationality choose between the options you cannot know to exist nor set on a scale of better-worse?

This discussion reflects the types of uncertainty soon discussed in more detail in this thesis: in short, there are three types of uncertainty, the lack of knowledge, the lack or abundance of standards of desirables, and the lack of meaning structures. The ample research on decision-making has mostly focused on the first type of uncertainty, lack of knowledge, making therefore little advances towards explicating decision-making processes, and underpinning rationalities used, in environments characterized by the two other types of uncertainty. However the argumentation for effectual rationality accommodates also the two other types of uncertainty, focusing especially on decision-making rationality under such uncertainties.

This is the realm of distant opportunities that take the form of created entrepreneurial opportunities. The ontological difference between the different rationalities, effectual and causal (as Sarasvathy termed the traditional rationality residing on the continuum of bounded or unbound) is evident when one views the ontological differences of the opportunities reached by the distinct rationalities: the discoverable opportunities exist in the (naïvely) realist domain, where they either are or are not, independent of the observer. The task of the wielder of causal rationality is to identify the realistically existing opportunities and to map the cause-effect relationships required to reach them. However, in the realm where the opportunities are created, the existence of the opportunities depends on the actions of the individual or firm transforming the available elements into novel opportunities. They are constructed, and this requires rationality that allows the notion of constructionism – there is no absolute reality waiting to be uncovered, but the reality I make through my actions.

The actors in strategizing aspiring to seize the distant and possibly disruptive entrepreneurial opportunities not visible through the limitedness of problemistic search need to adopt a different rationality than the one geared towards exploiting the incrementally achievable opportunities in the vicinity. Therefore philosophical underpinnings of the entrepreneurial rationality are distinctly different from the traditional managerial rationality, which mainly relies on a given reality, existing independently of the actions of the agent.

To summarize, considering that the created and discovered opportunities have different ontologies, also the epistemological tools, rationalities, with which they can

be grasped need to be different. Discovered opportunities are recognized with the aid of bound rationality, when near, and require an attempt at stretching the boundary when distant. Created opportunities are constructed, and have no ontological existence prior to being brought to existence by effectual rationality based on a more constructive epistemology.

The answer to question posed by Felin *et al* (2014) of the origins of novelty is therefore twofold: if we adopt the naïvely realist paradigm, novelty indeed appears from thin air, as the novel opportunities just exist somewhere prior to being identified; however if we allow for the possibility of a more constructive paradigm, the novelty stems from exaptation and novel combinations of existing entities – from the ability of the strategist/entrepreneur to see all the different uses a screwdriver can be put to (see discussion in Felin *et al*., 2014, p. 5). This has huge implications for strategizing: if the worldview is naïvely realist, and the notion of rationality causal, it may hinder the ability to notice the possibilities of creating the opportunities that could be reached through the use of effectual rationality in a more constructivist realm.

This impacts also the opportunities emerging through digitalization, underpinned by data abundance and novel feasibilities – in short, in digitalizing reality the crucial questions are no longer predominantly about solving a predefined problem, but the utilization of the extant materials (emergent from digitalization) in figuring out the new problems and accompanying opportunities. Take Internet-of-Things as example: realizing an organization wide IoT requires the given problem solving rationality, causal logic. However, coming up with business opportunities based on the IoT requires a completely different type of rationality, the effectual – or entrepreneurial – logic.

These discussions of the underlying logics and perceptions reflect the diverse types of organizational capabilities identified by James March. In his seminal article, March (1991) discusses the two types of learning capabilities he names exploitation and exploration. The exploitative capabilities refer to making the most of existing assets and abilities, seeking refinement, efficiency and excellence in execution. The explorative capabilities relate to innovation, flexibility, adaptability – in essence to seeking new opportunities. These capabilities constitute a paradox (Birkinshaw and Gupta, 2013, Gibson and Birkinshaw, 2004, O'Reilly and Tushman, 2008, Smith and Lewis, 2011), as while allocating resources to the development of one set of capabilities leaves less resources to developing the other set, both sets of capabilities are essential to ensure long term survival of the organization. Upholding this duality requires upholding paradoxical aims: cost-efficiency requires the removal of waste (i.e. anything not essential to the core process), whereas innovation requires both or-

ganizational slack (Nohria and Gulati, 1996) and redundancies, as from the present it is impossible to see which of the alternative new options will prove out to be relevant in the future (Weick, 1979).

March also points out that as exploitative approaches yield faster results, it is tempting for organizations to focus on honing their exploitative practices on the expense of the more uncertain explorative practices – further emphasized by the group behavioral tendencies in organizations and industries, resulting in shared understandings of reality, which may or may not correspond with the external reality (Pazzaglia *et al.*, 2017). In sum, the basic assumptions (Schein, 1985) of the organizations reinforce and are reinforced by such practices that are perceived to yield desirable outcomes with speed and certainty: myopic exploitation trumps risky exploration. Additionally, the centralization of firm activities, necessary to an extent when the organization grows in size, supports exploitation while impacting negatively the explorative innovation capabilities (Jansen, Van Den Bosch and Volberda, 2006).

While there is little empirical research linking the effectual and causal rationality on the individual level to the organizational level capabilities of exploration and exploitation, it is possible to deduce that as the explorative capabilities hinge on creativity and innovation, the effectual approach might be well suited to the endeavors relying on entrepreneurial abilities. In turn, the causal problem solving logic is useful in the exploitative actions, working on increasing the efficiency of a given process. The individual level, microfoundational choices of rationality, or at least logic, have organizational impacts.

3.5.2 Perception of human and organization

For Gavetti (2012), this dimension relates to the plasticity of the organization, ie. its capability change in pursuing the distant opportunities. However, in the following discussion I'm not interested in the actual changing capabilities of the firm, but in the perception of the manager about the organization, and more profoundly, human beings in general. It makes a big difference in strategizing whether people are viewed as inherently untrustworthy or trustworthy; if the metaphor of the firm is closer to a machine or a family.

An example of the impact of the managerial perception regarding the trustworthiness of individuals is illustrated in the transformation[37] of the R&D division within

[37] I chose this example as in addition to the scholarly article written about the case, through my previous work I had access to observing the transformation as it unfolded. I even used this change as the empirical context of my master's thesis, in addition to working with the organization in two separate instances in 2014 and 2016 for a period of six months in both cases.

a Finnish pharmaceutical company (Thong and Lotta, 2015). When a new leader entered the organization in 2007, the department was highly siloed, with capabilities not exploited to their full potential. The atmosphere was highly introverted, "*everything was deemed secret, unless there were excellent reasons for sharing it*" (from an interview with the leader[38]), with several control mechanisms in place resulting in even minor decisions being escalated to the top management.

While the organizational change was triggered by market needs and business threats, fear was explicitly not used in communicating the need to the personnel. Instead the focus was on cultural change, in the aim of creating the "best R&D in the world" in terms of both performance and employee satisfaction. This reflected the perception of the leader of human beings as inherently trustworthy and capable of making the best decisions by themselves. Organization was transformed both structurally, and first and foremost culturally: "*Everything is deemed open and shared, unless there are excellent reasons for keeping something secret*" (see previous footnote). The business impact of these changes driven by the different perception of human as trustworthy of the new leader were immense, in more detail discussed by Thong and Lotta (2015), the latter having been involved in the process throughout the transformation.

In addition to research on organizational trust (Frederiksen, 2014, Jarvenpaa and Leidner, 1999, Six and Sorge, 2008), the implications of the impact of managerial perception of the inherent trustworthiness of individuals is also discussed in innovation and creativity research (Amabile, 1997, 2008, Catmull, 2008, Csikszentmihalyi and Sawyer, 2014, DiLiello and Houghton, 2008, Nohria, Groysberg and Lee, 2008, Nooteboom, 2013, Williams, 2004, Woodman, Sawyer and Griffin, 1993).

For example, Williams (2004) found a clear linkage between the creativity outcomes of the personnel and the managerial attitude: the need for exerting control and structures, or the tolerance of divergent thinking on behalf of the manager had an impact on the creative outcomes, this first hindering it, the latter supporting it. As we know that creativity requires (at least to an extent) intrinsic motivation (Amabile, 1997), which in turn is driven by sense of autonomy, mastery and belonging (Deci and Ryan, 2000), a managerial disposition emphasizing the need for hierarchical control, grounded on the perception of humans as inherently selfish (as assumed in the transaction cost economics (Forsgren, 2013) can severely hinder the innovation pursuits of the organization – while being helpful to an extent in the efficiency pursuits.

It falls out of the scope of this dissertation to try to list all the possible mechanism through which the managerial perception differences impact organizational action.

[38] Material in my master's thesis (Wirén, 2015).

However these examples hopefully clarify adequately that in looking at the dimension of human and organization in the behavioral theory of strategy, it is not only the nature of the organization *per se* that is important, but also the perception of the manager of human beings in general and the organization in specific matter.

This is an essential point in the post-digitalization organizations where the work is dispersed in both time and space dimensions. It is no co-incidence that the companies currently dominating the digital realm, Google and Facebook to name few, are also renowned for their work place policies. The digitalization induced volatility requires new levels of organizational agility: how fast can environmental signals or internal learnings be diffused throughout the organization in ways that result in requisite changes and developments (Kogut and Zander, 1992, Nonaka and Takeuchi, 1995, Volberda, 1996, Zollo and Winter, 2002) – and what are the managerial dispositions that enable this type of learning?

Here the relative smallness and organizational flatness of the firm is an advantage, and many of the organizational innovations emerging within the highly digitalized industries highlight the essentiality of a specific kind of organizational culture. Examples include the holacracy endeavor by Zappos (Van De Kamp, 2014), celebrating failure with champagne at Supercell (Murphy, 2013), or rewarding people who quit during their trial period with a bonus (Vincit, 2016) – all created to contribute to a specific type of work setting more adaptable to the high velocity environment through lowering the costs of internal communication by emphasizing organizational culture.

Essentially these choices hinge on the managerial perception along the dimension of internal control vs trust in individuals. Paradoxically, work place digitalization enables control on an unprecedented level[39] while reaping the benefits of digitalization requires such entrepreneurial attitudes and organizational flexibility as can be reached only through creating a trusting organizational culture.

3.5.3 Perception of firm/environment interface

Gavetti argues (2012, p. 275) that even if the manager was to succeed in recognizing a distant opportunity, and had an organization that would be quick to react upon the opportunity, the success of the attempt to realize the opportunity still relies on the external acceptance of the novelty – the actions of the firm need to gain legitimacy

[39] See for example Hitachi, a firm offering such ID badges that monitor the conversations of the employees and report to the employers not only with whom any given individual has conversed, but also the nature of the conversation and level of enthusiasm expressed. http://edition.cnn.com/2014/02/02/opinion/greene-corporate-surveillance (Greene, 2014)

in the markets. This is a key point – however what Gavetti (2012) points out from the viewpoint of legitimacy, Wiltbank, Dew, Read and Sarasvathy (2006) take further. They initiated their study by reviewing 187 strategy articles, and distilled those into 16 articles they deemed to identify the cornerstone approaches (for findings, see Wiltbank *et al*, 2006, appendix) to strategy making. This led them to open with an observation:

> *"Studies in mainstream strategic management boil down to two fundamental prescriptions for how firms can decide what to do next (…): They should either try harder to predict better (rational strategies advocated by the planning school) or move faster to adapt better (adaptive strategies espoused by the learning school)." (Wiltbank et al., 2006, p.983)*

In this review, Wiltbank *et al* could distinctly identify the ontological approaches underlying the prediction (Ansoff, 1979, 1991, Hough and White, 2003, Porter, 1980a, 2008) and learning (Lindblom, 1959, 1979, Mintzberg, 1978, 1990, Mintzberg and Waters, 1985, Pettigrew, 1992) based approaches, and the approaches seeking to bridge them, like scenario planning (Amer, Daim and Jetter, 2013, Schoemaker, 2012), and dynamic capabilities (Augier and Teece, 2009, Barreto, 2010, Eisenhardt and Martin, 2000, Eisenhardt, 1989, Teece *et al.*, 1997, Teece, 2007, Winter, 2003). Let's shorten the elaborate discussion in Wiltbank *et al* to two snippets:

> *"Deterministic frameworks in strategic management all share a basic conception: prediction is useful in strategy making because the consequences of what can be predicted can be controlled." (Wiltbank et al., 2006, p. 987)*

> *"In environments characterized by Knightian uncertainty, prediction and control are not just empirically mismatched; they are conceptually at odds. Prediction can never be adequate for the purpose of control, even in principle, because of the role of human creative action in actually producing a non-existent, not just a hard-to-predict, future." (p. 988)*

In essence, the key contribution of Wiltbank *et al* (2006) stems from questioning the view inherent in both the prediction and learning approaches: the relationship of the firm and its environment is controlled by the environment – environment is, and the firm can either try to predict it or adapt to it. What Wiltbank *et al* proposed was that there is an alternative take on this relationship: the firm can also exert a level of control over the environment in which it operates. In addition to predicting or adapting, the firm can transform the environment. Therefore their approach inverts

the relationship between prediction and control: what can be controlled, doesn't need to be predicted (Sarasvathy and Dew, 2005).

The emphasis of the discussion in Wiltbank *et al* (2006) is on the strategic mind-set, and essentially emphasizes the perceptions of the environment, whereas Reeves, Haanaes and Sinha (2015), in their subsequent discussion adopt a more realist view in looking at the more objectively determinable malleability of the environment. In short, Wiltbank *et al* pay attention to how the perceptions in the firm about its ability to control the environment impact the subsequent strategizing, whereas Reeves *et al* try to gauge the objective features of the environment, and suggest diverse strategic choices based on the environmental dimensions of predictability and malleability. These discussions are fused into the following figure.

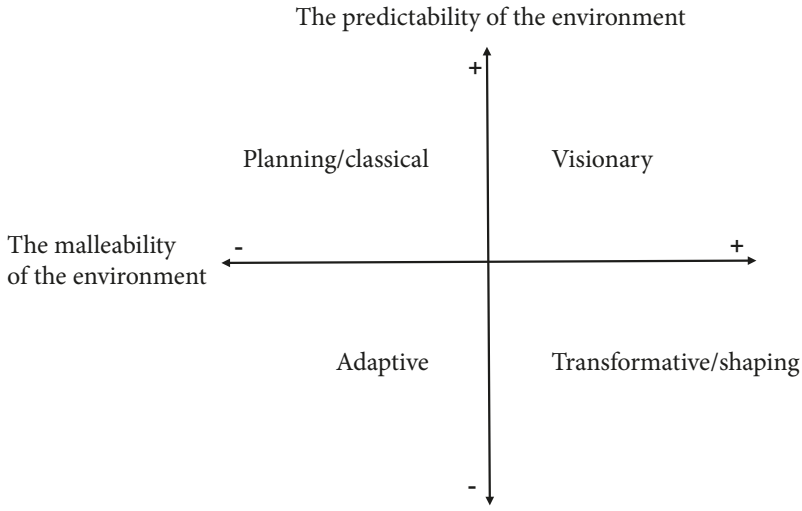


Figure 5: Four firm/environment relationships, adapted from Wiltbank et al 2006 and Reeves et al 2015

The discussions of the nature of the environment (Reeves *et al.,* 2015) and the perception of the nature of the environment (Wiltbank *et al.,* 2006) hinge on two axes; the predictability and malleability of the environment[40]. In the quadrant of planning (in the vocabulary of Wiltbank *et al*) or classical (according to Reeves *et al*), the strategic approaches of the firm are based on the (perceived) predictability of the environment (Ansoff, 1979, Porter, 1980a). In turn, the strategic approaches in the adaptive quadrant (Eisenhardt, 1989, Mintzberg, 1990, Teece *et al.*, 1997, Teece,

[40] Reeves *et al* identify yet a third environmental element, the level of threat. If the environment is hostile enough to threaten the very survival or the firm, neither of these four approaches can be utilized, but in turn a survival strategy needs to be implemented.

2007) rely on organizational agility to react to unpredictable events, as for example discussed at length in the dynamic capabilities literature.

Neither of these approaches acknowledges the ability of the organization to shape the environment, which in turn characterizes the strategic approaches in the transformational (in Wiltbank *et al*) or shaping (in Reeves *et al*) (Kim and Mauborgne, 1997, Sarasvathy and Dew, 2005) quadrant and the visionary (Hamel and Prahalad, 1991, Rindova and Fombrun, 1999) approaches; the distinction between the two being the time perspective along which the firms perceive themselves able to exert a level of control over the environment, the level of predictability.

The proposition of the importance of the (perceived) malleability of the environment resonates vibrantly with the shaping ability axis by Gavetti – instead of settling for legitimizing their actions in the environment the firm is embedded in, the firm has an opportunity to shape the environment. Let's view the example Gavetti mentioned through these lenses:

> *"For example, in the early days of Internet portals, at least two alternative conceptions competed for legitimacy. Some firms, such as Lycos and Infoseek, represented their industry as a technology business and saw themselves as high-tech competitors; others, such as Yahoo!, adopted a media representation and proactively attempted to persuade external stakeholders that this perspective was viable."* (Gavetti, 2012, p. 274)

Essentially, what did Yahoo! do? It didn't gain legitimacy by predicting the future of Internet, or by adapting to the extant environment. Instead it engaged in proactive interaction with stakeholders that contributed to the transformation of the nature of the emergent field. One could also argue that even if Google took a more technologically pronounced approach (Gavetti, 2012, p. 274) reminiscent of Lycos' less successful approach, what Google has subsequently achieved is in no small amount attributable to its success in transforming how we view Internet: it's a place for (mis) information accessible through google.com.

Wiltbank *et al* argue that if we consider Knightian uncertainty (Knight, 1921), we enter the realm where we cannot know the consequences of actions not conceived yet – prediction is impossible. For example, prior to the success of Google or Facebook, we would have been hard pressed to calculate the consequences of founding such firms (McNamee, 2018), as there existed no examples of that kinds of operators in the markets *ex ante*. We could grasp the elements that subsequently led to the launch of these internet giants as they now are, however before their founders created the opportunity from those elements, transformed the extant into new possibilities – as

we remember from Venkataraman *et al* (2012) – we simply could not have predicted the following sequence of events.

From the juxtaposition of the discussions in Wiltbank *et al* and Reeves *et al* an interesting question arises: which matters more in strategizing, the somehow objectively determinable malleability of the environment, or the perception of that potential malleability? This fundamental point was inadvertently clarified by a misunderstanding by Arend, Sarooghi and Burkemper (2015) in their ontologically misaligned evaluation of effectuation theory (Read *et al.*, 2016). They criticized the beginning point of effectual action by questioning the abilities of the effectuating entrepreneur, wondering how the entrepreneur could truly be in possession of adequate qualities to successfully exploit contingencies. However, the claim of effectuation does not involve the objectively provable abilities of the entrepreneur, but his/her belief in what he/she feels is immediately possible for him/her – the perception of the entrepreneur. Ultimately this means that there are two potential types of misperceptions underpinning the strategizing: the environment may be perceived as more or less malleable as can be through the firm actions realized. This discussion will be returned to later in this dissertation, in the context of the impact of digitalization on the (perceived) environmental malleability, however for now the conclusions in Wiltbank *et al* are given some room before continuing with another pertinent theme in regards to the firm and environment interface.

Wiltbank *et al* adopt an effectual disposition where the world is seen as more malleable, something that can be bent to enable the formulation of novel opportunities. From that perspective the opportunity and the environment are not separated, but mere extant elements that can be transformed into new possibilities. As this process may already include shaping the environment to realize the opportunity, realizing the opportunity requires no additional legitimatization, as part of the opportunity creation process includes the environment being simultaneously co-created with the external stakeholders to enable the realization of the opportunity. This means that in this perspective the focus of strategizing shifts from trying to identify the extant opportunities and finding out ways of realizing them to the creativity required in bending the malleable reality in ways that result in novel opportunities. This changes strategizing: it's not about identifying a goal and coming up with resources to reaching it, but about utilizing the existing resources in coming up with new goals.

As mentioned, in addition to the perception of the malleability of the environment, the firm/environment interface discussion has another dimension: the boundary between the firm and the market. This is the target area of one of the most diffused theories within the international business research stream, the internalization theory,

derived from the fusion (Buckley, 2016) of transaction cost economics (Buckley and Casson, 1976, Coase, 1937, Williamson, 1975) and resource-based view (Penrose, 1959). The transaction cost theory looks at the interface of the firm and market as forming along the line of whether it is more cost-efficient to control the required assets within the firm through the mechanism of hierarchy, or to leverage the price mechanism of the market. In turn, Edith Penrose vanguarded the notion that the internal capabilities of the firm play a role in the subsequent growth of the firm. Both approaches merit a quick overview before returning to the overarching discussion of this subchapter.

Edith Penrose (1959) is often considered as one of the first scholars to outline what since became known as the resource-based view (Barney, 1991, Teece *et al.*, 1997). In her theory of the growth of the firm she suggests that firms have two types of capabilities, entrepreneurial and managerial. The entrepreneurial capabilities drive the firm to grow through organic means or through vertical and horizontal integrations, whereas the managerial capabilities are essential in ensuring that the existing assets and resources are well managed in ways that actually provide revenues[41]. Penrose was interested in finding out whether there are limits to the size of the firm, and concluded that the only limits emerge out of the need to balance the managerial capabilities with the entrepreneurial ambitions: if firms grow too fast they may lag in the managerial capabilities in ways that render the firm unable to utilize its assets in a profitable way, and on the other hand, if there is an excess in the managerial capabilities, entrepreneurial growth ambitions are required to provide the managers something to manage.

The control mechanisms of hierarchy and price as understood in transaction cost theorizing also require further explanation, which Hayek (1945) provides: essentially the question is about the nature and location of knowledge. In his profound article, Hayek defines the "economic problem of society" as the problem of "utilization of knowledge not given to anyone in its totality" (Hayek, 1945, p. 520). Through this definition of the problem, he explains the mechanism of price, the market.

In a closed system where all components are known, any problems between the means and ends can be solved by simple calculus. However, in a system where the knowledge is dispersed and fragmented, in the possession of diverse agents not in contact with everyone else, the knowledge of either available means or the diverse

[41] In this she is actually also precedes the subsequent exploration and exploitation approach coined by March (1991), later extended to the discussions of the ambidextrous capabilities of the firm (Birkinshaw and Gupta, 2013, Gibson and Birkinshaw, 2004)

ends pursued is not available, and thus cannot be used in solving the economic problem between the diversity of means and ends through planning or calculus.

The ingenuity of price in this type of setting is that it reflects the significance of a particular item in the whole means-ends structure that item is a part of. Price, understood in this way, does not refer to any internal qualities of the item, but indexes numerically the relative value (rate of equivalence, margin of substitution) of that item. This means that an agent dealing with that specific item in any situation does not need to know all the elements (the whole means-ends structure) contributing to the value of that item, but instead can deal with the locally available knowledge represented in the price (the relative value of that item).

This is the underpinning idea of markets. The relative prices of the offerings of any vendor reflect the overarching supply and demand of those offerings in a system where no entity possesses full knowledge of all the elements contributing to the supply and demand. The validity of the price mechanism is therefore dependent on the following assumptions: 1) supply and demand indeed have equilibrium-seeking tendencies, and operate in a closed system[42] 2) prices are not artificially manipulated by contracts or by hiding knowledge about supply or demand, and 3) full knowledge about the markets is unavailable to any single actor, while diverse actors can possess different levels and types of knowledge.

Instead, a firm relies on the control mechanism of hierarchy, essentially based on the availability of all relevant pieces of knowledge within a (more limited) closed system. The control mechanism of hierarchy hinges on centralized knowledge. There is an actor on top of the hierarchy pyramid possessing all knowledge pertaining to the objects of transaction within the hierarchy. This central savant is therefore left with the task to organize the hierarchy in ways that best support the realization of the value. However, as the assumption goes (Forsgren, 2013), the individuals within the hierarchy are interested in pursuing their individual interests even when they collide with the interests of the hierarchy, which means that they need to be controlled against two problems: harmful actions and shirking. Both are achieved by disconnecting the outcomes of action from those actions, and instead rewarding obedience (Williamson, 1993, 2003).

The control mechanism of hierarchy relies on the self-interest seeking nature of individuals to be geared towards achieving the goals of the omniscient savant at the top of the pyramid. This is in dire contrast with the entrepreneurial reward mech-

[42] However this understanding of the market as an equilibrium seeking relatively closed system is the key point of difference between the neoclassical and Austrian schools of economics: the latter highlight the power of innovation in bringing completely new things into the system, meaning that ultimately the system is at no point fully closed (Chang, 2014, Kirzner, 1997).

anism, where the outcomes of actions provide the rewards (or punishments). The validity of the hierarchy as a control mechanism therefore relies on the following assumptions: 1) there is centralized knowledge that can be fully or boundedly rationally deployed to ensure the best course of action within the hierarchy, 2) human beings are financial self-interest seeking entities, whose actions can be controlled by financial rewards and punishments, based on the level of obedience, not tied to the actual outcomes of the work activities.

What Buckley and Casson (1976) essentially did, was to merge together the economic insights from the transaction cost theory and Penrosean view on the importance of the required capabilities of the firm. This led to the formulation of the internalization theory explaining the formation and internationalization of the multinational firm: firms grow and internationalize by internalizing assets and markets which contribute to the development of firm specific advantages (FSA), which make transactions within the firm more cost-efficient than market transactions. The boundary between the firm and the market is positioned at the point where the FSA both contribute to the cost-efficient internal markets (cost-efficient in comparison with the external market), and provides leverage when dealing with external markets.

However, this dichotomous understanding of the distinction between the firm and the market has been somewhat questioned in regards to the powerful emergence of business networks (Aarikka-Stenroos and Ritala, 2017). Especially in the mobile and IT industries, the best performing firms have succeeded by creating business ecosystems[43] (Basole *et al.*, 2015, Clarysse *et al.*, 2014, Iansiti and Levien, 2004, Moore, 1993), essentially characterized by coopetitive relationships. The neologism refers to business interactions which are simultaneously collaborative and competitive, thus blurring the distinction between a firm and a market.

The academic jury is still out regarding the question of whether these novel business networks are just a hybrid of firms and markets (Möller and Halinen, 2017), a new way

[43] There is ample discussion about whether the concept of business ecosystem is just a fashionable word referring to the older concept of business network. In short, whether the distinction exists only on the level of the signifier or also on the level of the signified. To explain the issue, according to Ferdinand Saussure (1857-1913) a concept expressed by a word consists of the signifier (eg. the word and sound-image of cat) and the signified (the animal cat) (De Saussure, 1916). Peirce, a contemporary of Saussure and also avid researcher of semiotics, reached independently a similar conclusion about the constitution of a concept, however with the added element of the interpretant (Ormerod, 2006), meaning both the individual doing the communication (I'm thinking fondly of my mother's orange cat) and the one receiving it (you're thinking about the ominous black cat you just saw crossing the road), in essence the institutionalized understanding of the linkage between the icon of referral (signifier) and the parcel of reality bracketed out for that referral (signified). So, the question is, do the concepts of networks and ecosystems refer to a same phenomenon, to different phenomena, or is their use dependent on whoever is using the concept at any given moment? Möller and Halinen propose one solution (2017).

of defining the boundary between the two archetypes, or something completely different, however with the growing impact of global value chains (Gereffi, Humphrey and Sturgeon, 2005, Saliola and Zanfei, 2009, Sturgeon, Van Biesebroeck and Gereffi, 2008) or global production networks (Kobrin, 2015) it would indeed seem wise to at least acknowledge that a bipolar approach to firms and markets yields little insight into the contemporary networked business environment growing in complexity. Additionally, the decoupling of a mass of firms from the production function[44] begs a new approach to understanding the nature of a firm in the first place.

In one part this is related to the ability of the firm to utilize external assets and resources without committing to ownership liabilities (Shivakumar, 2014). A good example are the digital platforms (Kenney and Zysman, 2016) within the telecommunications industry: both Apple and Android provide both a distribution channel (App Store, Google Play), and a set of resources (application developer interface), which have enabled the booming growth of for example game developers. In essence, especially multihoming in diverse ecosystems (Hyrynsalmi *et al.*, 2012, Hyrynsalmi, Suominen and Mäntymäki, 2016) enables the firm to exploit external resources with minimal investment risk in those resources, which in turn increases the adaptability of the firm as it can rapidly move between such sources of external resources it deems most beneficial at a given time. However what this phenomenon contributes to is the blurring of the divide between the firm and the market, the increasing porousness of the boundaries of the firm.

What this essentially pertains to, in regards to the perceptions driving strategizing, is the requisite scope of strategizing: is it enough to perceive strategy and strategizing as a firm-specific entity and activity, and if so, where should the boundaries of the firm be drawn (or where are they perceived to be)? How and in what scope should the networks be considered? In addition, considering the malleability of the environment, what is the scope of that potential (perceived) malleability – the downward value chain, the network, the ecosystem or should the firm engage in a potential battle between diverse ecosystems?

These themes will be further explored in the discussion chapter. For now, it has been the aim of these insights to highlight the relevance of choices of rationality, perceptions of humans and organizations, and the perceptions of the firm and environment interface. The next subchapter ties together these themes discussed under

[44] How do we draw the firm boundaries of for example the world's largest media with no content production (Facebook), or world's largest accomodation provider with no real estate (AirB'n'B)?

the umbrella of strategizing, in order to introduce an integrative framework of strategizing, the dependent variable of this research.

3.6 Integrative framework of strategizing

So far this chapter has introduced several bricks now in need of some masonry. The resulting edifice of this subchapter should enable the reader to understand the link between strategizing and uncertainty in such a way that tracing the impact of digitalization first on uncertainty and subsequently on strategizing reads as a coherent narrative.

The first building block is decision. As discussed, decisions are both distinct entities bracketable from the flow of actions, events and experiences, and unbracketable ripple effects of prior actions, events and experiences constituting the phenomenal flow of life. Some of the decisions are genuinely prospective, but some are retrospective, preceded by actions subsequently made sense of by granting specific bracketed entities the label of decision.

When this flow of actions and decisions takes place within an organization coalesced around some reason involving the sphere of economic action, we enter the realm of business. Strategy, as a noun, is then the mental map used to harness the collective action, the sensemaking and sensegiving mechanism employed to first perceive a here and to conceive some future there, and to subsequently impact the flow of actions and decisions from the here to a there. Strategizing, as a verb, in turn consists of the actions and decisions that have an impact on both the conception and the realization of the following there.

In this dissertation the concept of strategizing consists of three dimensions overlapping in time. The simplest is founded on the notion that in order to get from here to there, we need knowledge of how to do that. The second dimension is also familiar: in order to have a goal, a given there, we need to have a standard of desirability along which we can position that goal, and choosing that standard constitutes the second dimension. The third dimension is more complicated, as it takes place mainly in the doxic realm: we can only choose between standards of desirability if they exist in the first place, which means that the third dimension consists of the meaning making mechanisms through which we create those standards of desirability. The following figure depicts strategizing as the interplay of these three dimensions.

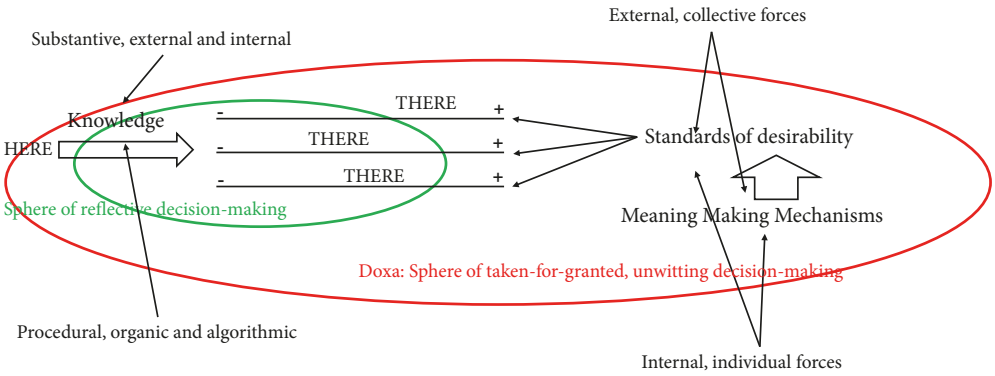


Figure 6: Core of srategizing

At any given moment of here, an organization is on its way to a future there. The knowledge required for moving towards a conceived there consists of substantive and procedural elements (Dosi and Egidi, 1991). There is the raw information we get from both external and internal sources, and that raw information is processed somehow in order for it to apply to our circumstances. The information pertains to the organization (eg. resources, assets, capabilities) and to the environment (eg. competition, market needs, events), and it is processed by humans and computers in ways that are geared towards making the information relevant in aiding us in moving towards a conceived there.

The standard of desirability means a scale along which one direction is better and another worse (Thompson, 1967). For example, a goal defined by terms of profit is positioned on the monetary standard of desirability, or a goal defined by its environmental impact is positioned on the environmental sustainability standard of desirability. The choices between different standards of desirability, ie. the positioning of the goals of there, are influenced by both external forces, such as institutional impacts, and by internal tastes, preferences and values (March, 1982).

Underpinning the diverse standards of desirability are the meaning making mechanisms creating them. For example, for the monetary standard of desirability to exist, there must be a mechanism that gives money, ultimately bits of paper, metal or digits, its perceived value – for example as a means of exchange or a symbol of credit (Ali, 2014, Ryan-Collins *et al.*, 2012). Or for the environmental impact to be important, there has to be a mechanism of meaning creating the value of our ongoing existence on this planet. These meaning making mechanisms reside in big part in the doxic realm – our perceptions of value and meaning reflect both the external influences

of our institutional biographies and our internal dispositions and psychological features.

These three dimensions will be discussed extensively in the next chapter focusing on uncertainty, but for now these dimensions form the nucleus of individual level actions and decisions. However, remembering that in this dissertation the concept of strategizing includes also the collective level outcomes, the tub needs to be evoked again. Firstly, viewing the individual level actions and decisions through these three dimensions highlights the areas being impacted by collective forces, depicted in the following figure.

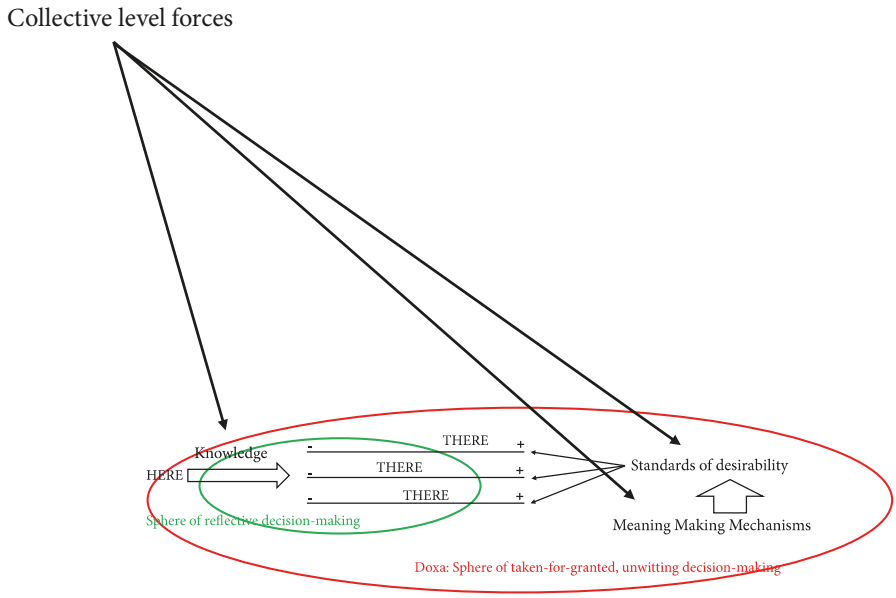


Figure 7: Explicated impact of collective forces

The collective forces include elements processed through reflective thinking, especially as they pertain to the dimension of knowledge, including information about markets or events relevant for the organization. In addition they include doxic elements, eg. normative (informal) institutions, which contribute to the creation of the meaning making mechanisms, and to the choices of the standards of desirability. These influences from the collective level target both the individuals within the organization and the intersubjective elements emerging in the social setting of the organization.

To move on from the individual level perceptions towards action, the three themes identified by Gavetti (2012) in behavioral strategy play a role. While the three themes constitute but one part of the idiosyncratic individual disposition, in the context of business activities understanding their impact cannot be underestimated. The choice of rationality, the perceptions of humans and organizations, and the understanding of the firm and environment interface impact the direction of the action. These influences are shown in the following figure.

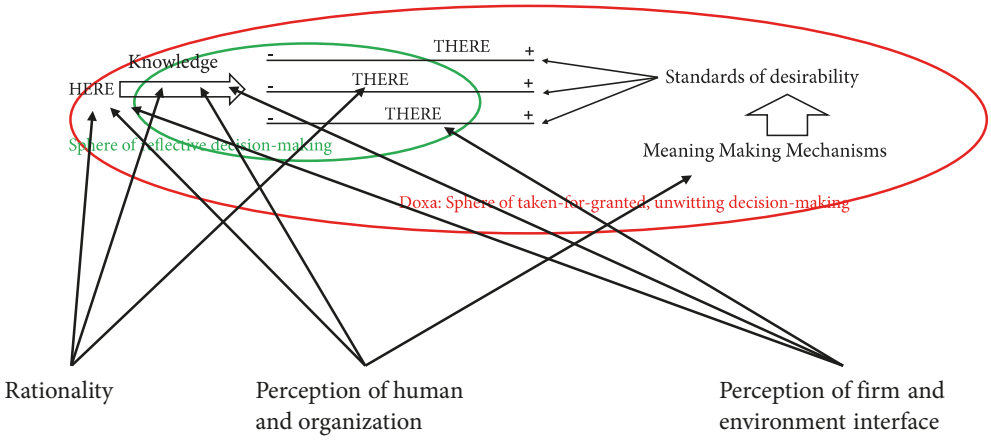


Figure 8: Impact of rationality and key perceptions on dimensions of strategizing

To begin with rationality, it impacts the understanding of the here, forms the there and shapes the use of knowledge in between. The judgements of what is possible for us, whether the opportunities are created or discovered, and how those opportunities can be realized as desirable theres hinge on the type of rationality wielded.

The perception of human and organization has an impact on the understanding of the here, on the uses of knowledge in pursuing a there and additionally, a more profound impact as an influence on the meaning making mechanisms. The fundamental worldview of humans (eg. as inherently trustworthy or untrustworthy) shapes the subsequent perception of organizations (eg. as machines or families) and constitutes one element of the meaning making mechanisms.

In turn, the perception of the firm and environment interface has a similar impact as rationality: it shapes the here and there, and the use of knowledge in between. The here and there look different depending on how malleable the environment is envisioned to be, and how porous the boundaries of the firms are considered to be. These different perceptions create different paths for action.

Rationality, perception of humans and organizations, and perception of the firm and environment interface have both doxic and reflective nuances. While all of them can be reflected, without a specific triggering impulse to do so, these elements easily form and reside in the realm of doxa. Reading one type of management literature highlights the prevalent doxic constitution of these elements: the taken-for-granted rationality is causal, the fundamental assumption of humans is self-interest seeking and subsequently untrustworthy, and the firm is a separate entity, distinct from the market and the operating environment, in competition with other separate entities. On the other hand, each of these doxic beliefs have been criticized and discussed to the extent of criticizing the critique, especially in the fields of more sociologically oriented critical management studies (Hühn, 2014, Spicer, Alvesson and Kärreman, 2009, Ford, Harding and Learmonth, 2010).

So far the discussion has focused on the strategizing process of an individual, swayed and influenced by both exogenous and endogenous forces processed to an extent in the realm of doxa and to an extent through deliberate reflection. However, when the action becomes social, involving more than one individual, these are not the only forces and processes at play. In the vocabulary of the strategy-as-practice, these elements pertain to the practitioners, whereas in order to understand the practices (the procedures), or even more interestingly the praxis (the unfolding of the microevents constituting the procedures), more is involved than the aggregated melee of these elements impacting the individuals.

This area of intersubjectively emergent elements is the core focus of the practice oriented research streams (Feldman and Orlikowski, 2011, Jarzabkowski *et al.*, 2007, Jarzabkowski, Lê and Feldman, 2012, Parmigiani and Howard-Grenville, 2011, Peppard, Galliers and Thorogood, 2014, Sandberg and Tsoukas, 2011, Tsoukas and Hatch, 2001, Whittington, 1996, 2003). Relevant themes include for example coordination, routines, identity, culture, sensemaking and sensegiving, power – in essence each consisting of rich research streams that have increased our knowledge about the minutiae of organizational action. However, for the sake and purpose of the integrative framework here being drafted for the purpose of engaging in the overarching discussion of this dissertation, none of the avenues are here explicitly delved. Instead, I yet again commit the academic sin of lumping together diverse streams of knowledge by stating that there are intersubjectively emergent phenomena, which play a major role in the aggregation of social action into collective level outcomes.

The following figure captures the so far mentioned themes from the individual dispositions through social actions to the aggregated outcomes.

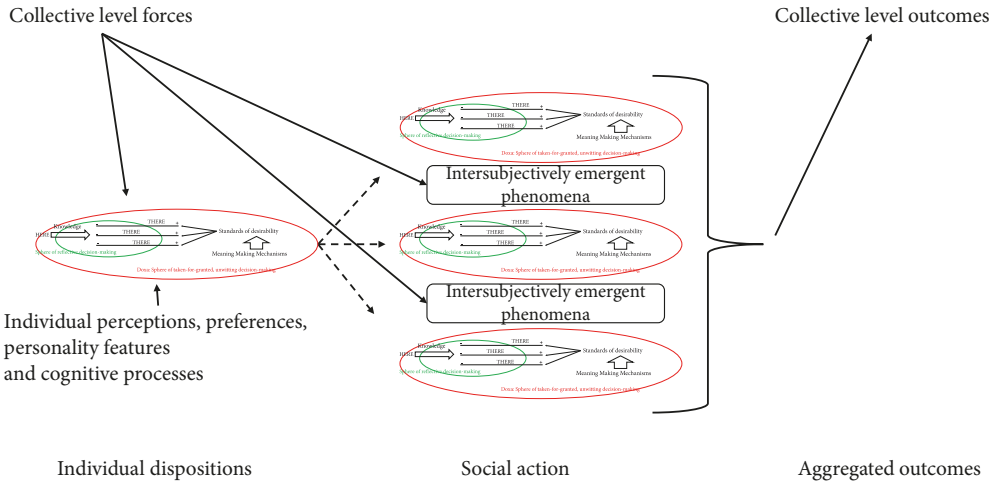


Figure 9: Integrative framework of strategizing

As discussed, the collective level forces impact the individual perceptions in regards to the substantive and procedural knowledge processed reflectively, the choices of standards of desirability in both doxic and reflective ways, and the meaning making mechanisms mainly in the realm of doxa. In addition, the collective level forces contribute also to the constellation of the intersubjectively emergent phenomena in social action, for example through both the formal and informal institutional elements.

The dispositions of the individuals are, in addition to the impacts of the collective forces, constituted of the idiosyncratic individual personality features, tastes, values (in short, preferences) and cognitive processes taking place both in the realms of doxa and reflection. A relevant subset in the context of business activities consists of rationality, perceptions of human and organization, and perceptions of the firm and environment interface.

The rationality impacts the understanding of both the moment of here and the shape and position of the subsequent there, and the type of procedural knowledge used to process the substantive knowledge in both doxic and reflective ways. The perceptions of the human and subsequently the organization are reflected in the doxic meaning making mechanisms, influencing the choices of goals and the understanding of the moment here. In turn, the perception of the firm and environment interface impacts the same elements as rationality: the perceived shapes of the here and there, and the processing of the substantive knowledge.

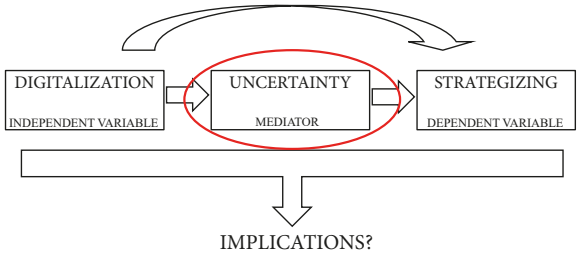
When the action becomes social, these individual bundles of doxic and reflective elements meet in ways that create the intersubjectively emergent phenomena

of coordination, routines, identity and for example sensegiving and sensemaking. In short, the social action consists of more than the respective bundles of individual participants, however the individual bundles contribute to the creation of the inter-subjective elements – as per structuration theory (Giddens, 1984a) the humans shape the structures in which their actions are embedded.

The aggregation of these social actions constitute the collective level outcomes. Depending on the perspective, these outcomes can be viewed through the lenses focused on the firm performance as aligned on the standard of desirability of financial value, or through the sociological lenses more interested in the social outcomes of these actions, including the impacts on the human, organization or society.

This integrative construct captures the essence of the concept of strategizing as used in this dissertation. As it is the premise of this dissertation that the impact of digitalization on strategizing is mediated through the changes in uncertainty, the next chapter focuses more deeply on the nature of uncertainty as dealt with in this conceptualization of strategizing.

4 UNDERSTANDING UNCERTAINTY



" 'Would you tell me, please, which way I ought to go from here?' 'That depends a good deal on where you want to get to,' said the Cat. 'I don't much care where--' said Alice. 'Then it doesn't matter which way you go,' said the Cat,' '-so long as I get somewhere,' Alice added as an explanation. 'Oh, you're sure to do that,' said the Cat, 'if you only walk long enough.'"
(Lewis Carroll: Alice in Wonderland)

As strategizing is ultimately dealing with uncertainty, it is the impact of digitalization on uncertainty that constitutes a link between digitalization and strategizing. This chapter digs deep into what we understand as uncertainty in order to highlight what are the most critical types of uncertainty we need to address in the globally unfolding digitalization.

4.1 Overview

Humanity has always struggled with uncertainty. With the advances of science and technology we have become better and better in acquiring knowledge aimed at reducing uncertainty. An ancient seafarer would have been thrilled if introduced to the contemporary weather forecasting abilities. However, the exact same processes geared towards mitigating the impact of some types of uncertainties have resulted in creating more complex and dynamic novel sources of uncertainties.

Paradoxically, we live in an era where we know more that humanity has ever known – and face uncertainties on the scale humanity has never dealt with before (Artigiani, 2005, Peat, 2007). The converging trends of radical technological advances (Linturi *et al.*, 2014), geopolitical turbulence (Kobrin, 2015, 2017) and the environmental issues (Jones, 2015, Wilenius and Casti, 2015) constitute a dense fog of uncertainty that limits our visibility in an unparalleled way. Quite fittingly, even the ubiquitous concept of uncertainty used in defining our contemporary times is shrouded in haze: what do we actually mean by uncertainty?

Uncertainty as a lay term is quite intuitive – a coffee table discussion about something uncertain most likely pivots around a shared understanding of what is discussed. But when we take a look at the scholarly literature and the operationalizing of the concept, a shared understanding of uncertainty becomes – well, uncertain.

One of the first and most influential texts dealing with the concept of uncertainty is the "Risk, Uncertainty and Profit" by Frank Knight (1921). Summarizing his extensive discussion, risk refers to something of which the probability can be calculated (there are eight green and two red balls in an urn - you can calculate the risk of drawing a red ball), normal uncertainty refers to knowing the nature of the entities addressed, but not their number (there are green and red balls in the urn, but you don't know how many of each), and true uncertainty, also known as Knightian uncertainty refers to not even knowing the nature of the entities addressed (there might be balls or scorpions in the urn – or maybe even no urn to begin with).

Complementing Knight's approach with the set theory and the theory of potential surprises discussed by Shackle (1949, 1961), Packard, Clark and Klein (2017) delve deeper into the concept: essentially they create a typology of uncertainties based on two axes consisting of two sets of options (of action) and outcomes (of that action). If both sets are open, meaning that there's an infinite number of available options and equally infinite number of potential outcomes, the uncertainty is absolute. The quadrant of finite outcomes (closed set) but infinite option (open set) they define as creative uncertainty, whereas the reverse (closed set of options, open set of outcomes) they name environmental uncertainty. The quadrant of both closed sets of options and outcomes they further divide along the line of whether the distribution of the elements in the sets is known (risk) or unknown (they name ambiguity).

While the sets of options and sets of outcomes constitute two different sources of uncertainty, essentially they are grounded on the lack of knowledge present in either the sets of options or outcomes. What is missing in the discussion, is the mechanism through which the sets of outcomes could be assessed, positioned on a scale of better and worse. Taking a detour through Thompson (1967), essentially Packard *et al* discuss the dimension of knowledge about causes and effects, but ignore the other pertinent dimension of standard of desirables Thompson remarks to have an impact on the decision-making process. March (1982) in turn focuses on this dimension, which he ultimately calls goal ambiguity.

What Alice lacks, in the quote at the beginning of this chapter, is the standard of desirables: she doesn't have a way of comparing the potential destinations in terms of better or worse, because she lacks the value scale on which she could assess them: based on what would one place be better than another? This dimension can be con-

ceptualized as ambiguity, following the goal ambiguity notion attributable to March (March, 1982, Sarasvathy, 2001). It should be made clear that this use of the concept of ambiguity[45] is not the same as the use proposed by Packard *et al* (2017), but while the discussion of the "right" meaning of the concept of ambiguity in literature would certainly be beneficial in enabling shared understanding of this particular dimension, this book isn't about to embark on that. Ambiguity in the context of this dissertation is used with attached clarification of whose understanding of the concept is referred to.

Understanding the dimension of the Marchian goal ambiguity however reveals yet a third relevant dimension contributing to the uncertainty: where do these standards of desirables and subsequent scales of preferences[46] come from? This question was pondered extensively by the post-modern French philosophers, with for example Foucault creating his archaeology and genealogy of science approaches, Lyotard conceptualizing the notion of metanarratives, Derrida deconstructing the pre-existing notions by highlighting the absent and emphasizing the impact of language in creating the reality we perceive, Latour rendering everything into actors in network, and Bourdieu discussing the notion of doxa (Ahonen, 2001, Bourdieu and Wacquant, 1992, Derrida, 1978, Eagleton and Bourdieu, 1992, Foucault and Rabinow, 2000, Latour, 1987, Lyotard, 1984) to name a few prominent examples. Essentially the biggest contribution of post-modernists has been to highlight and illustrate the underlying assumptions and meaning structures, which guide our actions. The standards of desirables are not given, nor can their origins be reductively traced back to any sets of fundamental principles (though not for the lack of trying). They come from somewhere through some mechanisms on both individual and collective levels. It is the irreducible nature of these mechanisms that create the third dimension of uncertainty: the lack of meaning.

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[45] Packard *et al* (2017) employ the concept of ambiguity in the way originally introduced by Ellsberg (1961), further elaborated by Dequech (2004, 2011) meaning a lack of some portion of information potentially available to others but not to the decision-maker. It can be argued that if we take the ambiguity as defined by March (1982) as the lack of the scales of preference, then that lack could be perceived as information potentially available to others, but not to the decision-maker – someone else might, in some limited cases indeed possess information about the valence of the outcomes on some assumed standard of desirability. In that case the Marchian goal ambiguity could be a subset of the Ellsbergian/Dequechian ambiguity, with a distinct reference to the type of lacking information the latter concept of ambiguity consists of.

[46] Thompson referred to this as the standard of desirables, whereas March discusses preferences. In this dissertation the concepts are used so that the standards of desirables are seen as the fundamental root causes for creating the scales of preferences, along which the particular goals can then be aligned.

These three dimensions of uncertainty coincide with the three dimensions of the individual process of strategizing, as captured in the following figure based on the discussion in the preceding chapter.

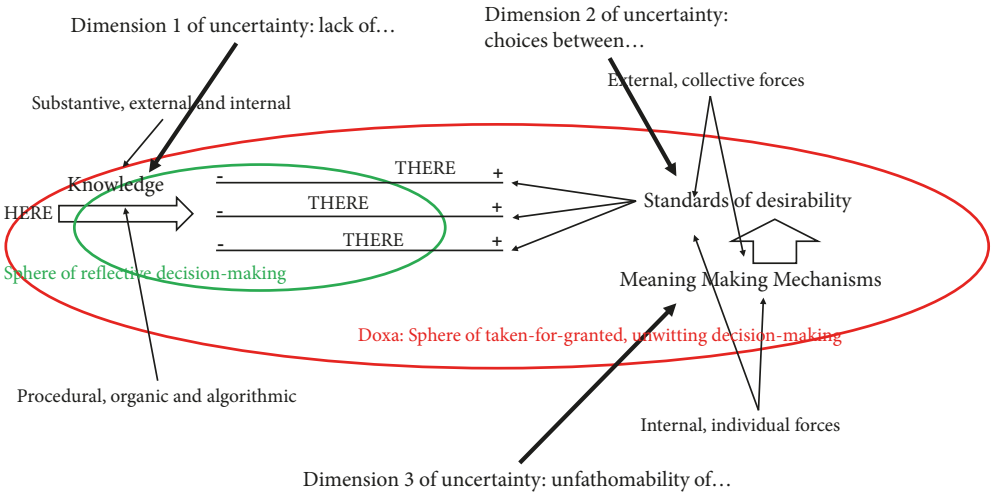

Figure 10: Dimensions of uncertainty

So, essentially the concept of uncertainty in the context of this thesis refers to the three types of voids we need to overcome before choosing our next steps of action, either wittingly or not. However, not all types of uncertainty share similar philosophical foundations, which may offer an explanation of why these three dimensions are seldom discussed in the same context. Drawing from the aleatory vs epistemic distinction by Perlman and McCann (1996), and the ontological vs epistemological typology of Davidson (1996), Dequech (2004) discusses at length how the uncertainties can be either ontologically real, namely exist in the exogenous reality independent of the experiencer, or epistemologically constructed, meaning that they come in to being endogenously to the experiencer.

However, Dequech (2004) explicitly defines uncertainty as lack of knowledge, meaning either the real unknowables (ontological/aleatory uncertainty) or the inability of the experiencer of the uncertainty to have knowledge, existing of not (epistemological/epistemic uncertainty). Here he comes close to Dosi and Egidi (1991) who divide uncertainty in substantive and procedural uncertainties: the first type of uncertainty refers to the ontologically real vacuum of knowledge whereas the second type refers to the uncertainty due to the imperfect processing capabilities of individuals to create knowledge out of existing or non-existing information. Interestingly Dequech (2004) links this to the notion of bounded rationality (Cyert and March,

1963, March and Simon, 1958, Simon, 1947) made famous by the Carnegie school, and the insights of Kahneman and Tversky (1982), who studied the cognitive biases employed in decision-making. The bottom line of the argument is that uncertainty constitutes of lack of knowledge of real external information that doesn't exist (yet), and the imperfection of us individuals to make sense of all the information regardless of whether the information existed or not. In short, uncertainty as lack of knowledge has both an exogenous and an endogenous facet.

Accepting that the lack of knowledge dimension of uncertainty resides therefore at least in the objective realm of reality (when referring to non-existing knowledge, Knightian uncertainty), and in the subjective realm (when referring to the imperfect processing capabilities of us humans, procedural uncertainty), we can ask the question of whether or not that dimension of uncertainty resides also within the realm of intersubjective? This is where an insight from Huff (1978) provides us with leads: a part of uncertainty is construed by the difficulty of understanding how others perceive uncertainty in a specific context, and another part by the unpredictability of changes people undergo in the process of diminishing the experienced uncertainty (Sund *et al.*, 2016)p.6). These examples of the lack of knowledge dimension of uncertainty are not dependent on the ontological realness of the lack of knowledge, nor are they merely constructs of our individual cognitive functions. So, the lack of knowledge facet of uncertainty resides in all three ontological reals, objective, subjective and intersubjective. This insight leads us further in exploring the ontological location of the two remaining dimensions of uncertainty.

Returning to the familiar distinction of means and ends creating the foundation of the uncertainty matrix by Thompson (1967), we can continue with distinguishing the dimension of knowledge from the dimension of standards of desirables. When standards of desirables construct a clear scale of preference, we can define a goal we then pursue with the aid of the knowledge we possess. A perfect example is the monetary scale, as it provides the most familiar scale of measures against which the activities of a firm or an individual are often assessed: while the goal can be positioned in the vague way of "the more the better", it still is a goal, which aligns the activities. Another example is environmental impact, which provides an intuitively reasonable standard of desirables, and yet another the well-being of an individual.

What these chosen examples hopefully reveal is that while it can naturally be argued that a goal positioned along the monetary scale can also align with a goal along the environmental scale (Bansal and Roth, 2000), the alignment is nothing to take for granted (Jones, 2015, Kolk, 2016). The goals positioned on the monetary scale may well lead to (and has indeed countless times been pointed out having led to –

one needs but to read almost any climate change report from the past few decades) calamities on the environmental scale. Real life is riddled with choices of goals where opting for one scale collides dramatically with another potential scale. This translates into uncertainty about the lack or abundance of the scales of preference: out of the existing and competing ones, how do I pick the one along which I position my goal? The dynamism on both endogenous and exogenous side creates additional problems. How can I know that having chosen a goal along these measures, by the time of reaching the goal they are still valid? My individual preferences may have changed, and similarly, the scales of preferences dominating at the time of formulating the goal may have undergone changes rendering the goal irrelevant, detached from the scales of preference persisting at the time of reaching the goal.

To begin with the ontological realm of subjective, the Popperian world two, my individual tastes, desires, values all form endogenous scales of preferables, which reside in the realm of the subjective. The uncertainty here consists of the tendency of us humans to change – there are no guarantees that my tastes, desires and values are the same tomorrow as they were yesterday (March, 1982).

To move on to the realm of intersubjective, organizational research provides insights: the interesting research by Ravasi and Schultz (2006) highlights the process of how an organization undergoes change, which impacts the scales of values the organizational identity is based on. The rich stream of organizational identity research (Gioia *et al.*, 2013, Pratt *et al.*, 2016) focuses, among other things, on this particular dimension of uncertainty as it resides in the realm of intersubjective, within the level of organization. However, it is not only on the level of the organization that these shared scales of preferences form, are maintained, change and disappear. For example, on the wider level it is not long ago that the skin color or gender of an individual constituted a scale of preference. What creates further uncertainty is the fact that few scales of preferences are even in any fixed point in time non-controversial, or shared across diverse collectivities.

An interesting question about the ontological loci of this dimension of uncertainty emerging from the difficulty of choosing between the diverse standards and scales therefore follows: while there is the type of endogenous uncertainty residing in the realm of the subjective, and the type of exogenous uncertainty inhabiting the intersubjective, can we fathom any instance where these standards of desirability would be located firmly in the realm of the objective? In other words, are there such scales of preferences that would unarguably be objectively real in all contexts for all participants?

The postmodernist answers this with a firm "no", while the naïve realist might want to say "yes". The naïve realist might not see the intersubjective and constructed

nature of our scales of preference and would therefore see little value in looking at the uncertainties inherent in the act of choosing between them, and the postmodernist would disengage from any sentiments suggesting any realness to these scales, being therefore inclined to merely shrub off all scales as mere narratives, leading therefore towards the realm of moral relativism.

The question of the objective nature of these standards of desirables is a quest for the philosophers of ethics. This question preoccupied Kant, who came up with his categorical imperative[47], a close kin to the biblical formulation known as the golden rule of doing onto others that which one wishes to be done onto oneself, further spinned by Rawls (1971) in his political philosophy paraphrased into the question of what kind of a society would you create if you didn't beforehand know your position in it (Brennan and Buchanan, 2008). As this is not a dissertation in the domain of philosophy, I really cannot venture a position on the existence of the objective standards of desirables, but true to my pragmatist credo, instead utilize the existence of this problem to embark on the discussion of the third dimension of uncertainty.

If we can assume that there is no objective scale of preferences (at least so far indisputably unearthed), but simultaneously acknowledge that aligning both our individual and collective actions requires some standards of desirability – and that indeed, as evidenced by the purposive action we witness in our everyday lives, such scales are adhered to, and thus can be by their effects judged to exist at least in the realms of subjective and intersubjective – we are dealt with another question. Where do those scales of preferences come from? How do they emerge, gain stability, change and sometimes evaporate?

If we were to believe in the objective nature of these standards of desirables, these questions would not constitute uncertainty. However, as discussed above, we are far from having found such objective standards, yet obey some sets of standards and indeed align our goals along a plurality of them, monetary and environmental already used as examples. The myriad mechanisms we employ on both individual and collective level in constructing those standards of desirables to enable our daily decisions and actions therefore constitute the third dimension of uncertainty. To clarify the discussion so far, choosing between diverse scales of preferences creates a different type of uncertainty, than does the process of constructing those scales in the first place.

What Harari and Lyotard have in common is the suggestion that these scales of preferences are constructed through shared narratives we believe in, in order to give meaning to our actions. Narratives are therefore the mechanisms through which we

[47] "*Act only according to that maxim whereby you can, at the same time, will that it should become a universal law*" (Kant, 1785)

construct the value scales, however the reason for employing those mechanisms is the elemental need to reduce meaninglessness and randomness. There is a deeply ingrained need within us to make sense of our experiences, to attach meaning to our perceptions and actions – even to the extent that losing that sense of meaning has debilitating effects on our abilities to go about our daily lives (Park, 2010).

This third dimension of uncertainty, lack of meaning, is therefore born out of these two drivers: the need for meaning (in both individual and collective level action), and the lack of fundamentally objective standards of desirables that could fulfill that need once and for all. This type of uncertainty resides in all three realms of reality, discussed in more detail in a later subchapter.

To summarize and move on, purposive action requires a direction aligned on a standard of desirability, and knowledge of causes and effects contributing to the movement towards that direction. While knowledge exists in all three realms of reality, subjective, intersubjective and objective, the value scales exist (so far) only in the realms of subjective and intersubjective. This lack of objective standards of desirability means that those standards need to be and are constructed through meaning structures on both individual and collective levels. Therefore uncertainty any purposive action needs to deal with consists of lack of knowledge (type one uncertainty), lack or abundance of the standards of desirability (type two uncertainty) to be chosen from, and the complex meaning-seeking processes and mechanisms through which those value scales are constructed, the lack of meaning (type three uncertainty).

4.2 Lack of knowledge

Like suggested in the introduction, this facet of uncertainty is definitely the one most deeply discussed in the existing uncertainty-related literature. In this dissertation, the lack of knowledge dimension will be dealt with by relying on the recent framework by Packard *et al* (2017), which is based on a thorough discussion of the diverse ways uncertainty has been categorized and conceptualized in previous literature, providing a comprehensive mapping of these prior typologies onto their novel framework.

As the context of the discussion in Packard *et al* is the dynamic decision-making processes of entrepreneurs, their framework pertains to uncertainty as perceived, not uncertainty as real (p. 7 in the approved manuscript), as essentially the entrepreneurial judgments are grounded on the perceptions of uncertainty, the ontologically real uncertainty being somewhat elusive to delineate. However, the framework provides a comprehensive starting point for discussing the dimension of lack of knowledge,

especially as elaborated with a view through the three realms of reality, subjective, intersubjective and objective.

Like Packard *et al* note, the typologies of uncertainty have most often been grounded on the seminal work by Knight (1921), mostly distinguishing between the probabilistic types of uncertainty (risk), and the non-probabilistic types of uncertainty (normal and true uncertainty) (Figueira-de-Lemos, Johanson and Vahlne, 2011). However, heeding the familiar notion of means and ends[48] they define as options and outcomes, Packard *et al* utilize set theory and show that both the options and outcomes constitute sets, which can be both open or closed (finite or infinite). In their framework, Packard *et al* ultimately show how and why the open or closed nature of these sets create uncertainty, and how dealing with these uncertainties influences the dynamic decision-making processes of entrepreneurs.

Risk and normal uncertainty (what they call ambiguity following Ellsberg) reside in the quadrant where both sets are closed, the distinction emerging from the knowledge of distribution available to the decision-maker: in risk the distribution is known, in normal uncertainty not to the decision-maker, while that information could be possessed by an omniscient observer. In the vocabulary of Dequech (2011), this constitutes weak uncertainty, which can be substantive or procedural (Dosi and Egidi, 1991), meaning that this uncertainty can be created by either not having access to external knowledge, or lacking the cognitive or other processing capabilities to wield that knowledge. In the practitioner oriented VUCA-matrix, Bennett and Lemoine (2014) distinguish between volatility, uncertainty, complexity and ambiguity (used yet again in a different way, as Knightian uncertainty), however in a way where the dimensions of VUC actually reside merely in this quadrant of closed sets: volatility and complexity moderate this weak uncertainty (meaning risk and ambiguity in the Ellsbergian sense) rendering it in practice quite potent, even when the sets of options and outcomes are closed.

The lack of knowledge in the quadrant of closed sets of options and outcomes can therefore be ontologically objective (complexity, volatility and Ellsbergian ambiguity render substantive knowledge objectively unreachable even in cases where both options and outcomes are finite), intersubjective (the diverse understandings of lacking knowledge, and diverse learning processes between individuals create further uncertainties (Huff, 1978)), and subjective (procedural uncertainty and Ellsbergian ambiguity).

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[48] This duality of means and ends is one of the characterizing themes in economics, as stated in the most prominent definition of economics as science originally expressed by Robbins (1932): "*Economics is the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses*" (p.12)

The quadrant of closed options but open outcomes Packard *et al* name environmental uncertainty. This quadrant is well addressed in research exploring managerial decision-making processes (eg. in the context of policy-related uncertainty (Engau and Hoffmann, 2011), or pharmaceutical industry (Granlund and Lukka, 2017), international business (Mascarenhas, 1982), internationalization process (Figueira-de-Lemos *et al.*, 2011) to name but a few examples), especially through the diverse constructs, which attempt to map out the different elements contributing to the uncertainty emerging from the open set of outcomes. For example the work of Miles and Snow (1978) or the subsequent Perceived Environmental Uncertainty framework (Miller, 1992, 1993, Werner, Brouthers and Brouthers, 1996) are attempts to reduce the open set of outcomes into something more manageable. Miller (1992, 1993) for example identifies six categories of environmental uncertainty: 1) the uncertainty of government policies, 2) macro-economic uncertainties, 3) the uncertainty of the resources and services used by the company, 4) the uncertainty of the product market and demand, 5) the uncertainty of competition, and 6) the uncertainty of the technology in the industry. Each of these categories are further divided into sets of subquestions, through which the PEU can then be calculated. While the PEU framework is an attempt to reduce the open set of outcomes, what it essentially highlights is managerial decision-making bounded by closed set of options, attempting to operationalize the open set of outcomes into something calculable – forcing the open set closed.

The lack of knowledge emerging from the open set of outcomes can present itself as state, effect or response uncertainty (Milliken, 1987): we don't know the state in which the future outcomes are realized, neither do we know the effect of those outcomes on us, nor the responses we should thereof engage in. The lack of knowledge can be both substantive and procedural, however whenever either of the sets is open, we are dealing with strong uncertainty (in Dequechian terms). The lack of knowledge in this environmental uncertainty quadrant has representations in all three realms of reality. It is an objective fact that considering the infiniteness of potential outcomes, there is real uncertainty. Like highlighted in the constructs like PEU, essentially we can deal with outcome uncertainty only through our perceptions of it, which means that this lack of knowledge is also highly subjectively tinged. In addition, again referring to Huff's insight, a part of the lack of knowledge about the outcomes results from the different interpretations in between individuals, and the dynamism inherent in the changes of those interpretations, which means that this dimension of uncertainty is also present in the intersubjective realm.

Packard *et al* name the quadrant of open options but closed outcome creative uncertainty, linking this theme into creativity research (Amabile, 1997, 2012, Csiksz-

entmihalyi, 1997, 2014a, 2014b), which shows how means scarcity under given ends pursuits actually enhances creativity. This is also the discussion theme in the bricolage approach (Baker and Nelson, 2005, Fisher, 2012, Levi-Strauss, 1966) looking at entrepreneurial behavior under resource scarcity. Imagine for example a composer with a looming deadline to produce a 20 minutes piece of music for a violin quartet: the outcome is clearly defined, however there is an infinite number of ways in which to combine the individual notes in meaningful ways[49]. The lack of knowledge constituting uncertainty in this quadrant is underlined by the impossibility to narrow down the potential options available into a finite set – the choices can be limited, but never to anything less than infinite (Packard *et al.*, 2017, p. 11 in the accepted manuscript).

The lack of knowledge in creative uncertainty is primarily subjective (Foss *et al.*, 2008), as essentially it arises out of the need of an individual outcome pursuer to choose between the perceived infinite options. However it has objective underpinnings, as it simply isn't objectively possible to close the set of options – quite the contrary, as objective knowledge about the options would only serve to increase the infinity. Introducing intersubjectivity into the melee doesn't change the quality and quantity of the lack of knowledge, while potentially having an impact on the composition of the lack of knowledge: the intersubjectively arising understandings of options would be different than purely subjective options, however as we are dealing with infinite sets in each case, uncertainty exists.

Absolute uncertainty reigns when both sets, options and outcomes, are open. As the context of their article is the dynamic decision-making processes of entrepreneurs, Packard *et al* (2017) highlight that this is the realm in which most entrepreneurs act. They provide an illustrative sequence of questions an aspiring entrepreneur might make: first she wonders if she should start a business, and then if she should start this business[50]. Answering yes to the first question comes with an infinite set of options and outcomes, while the second yes can transition the entrepreneur into the quadrant of creative uncertainty. Packard *et al* show how these two questions delineate the discussion in the recent research stream within entrepreneurship stud-

[49] Or to take an example closer at hand: there's a clear goal of producing a dissertation on the themes of digitalization, uncertainty and strategizing, however there are infinite ways in which to go about such an endeavor. Packard *et al* show a similar example based on how a sculptor goes about dealing with a block of marble.

[50] Of course, in real life the questions can occur in different order, as shown by McMullen and Shepherd (2006): an aspiring entrepreneur might first become aware of a specific business opportunity in general, and then engage in self-reflection of whether that would be a business for her. The question of whether or not to become an entrepreneur at all would therefore overarch the process of opportunity identification.

ies, namely the effectuation approach (Sarasvathy, 2001, Sarasvathy and Dew, 2005, Sarasvathy and Venkataraman, 2011).

The difference between causal and effectual logic[51] is the difference between creative and environmental uncertainty, and highlights the different approaches to dealing with the absolute uncertainty: entrepreneurs acting causally start with a predefined goal (essentially by closing the set of outcomes), and proceed by addressing the options at hand, what they have and what do they need to acquire in order to reach the defined outcomes. The effectuating entrepreneurs instead do not start by trying to reduce the infinity of outcomes, but instead start by focusing on the most easily available resources (by tolerating the open outcomes, but limiting the options), engage in stakeholder interactions, which result in both additional resources and some goal restraints. Ultimately the outcomes emerge as a result of the process of this cycle of expanding resources and converging expectations. So, essentially the effectual entrepreneurs limit the infinity of options by seizing the nearest options, and subsequently limit the outcomes through collaboration.

The diverse mechanisms with which an entrepreneur can deal with absolute uncertainty serve to highlight this quadrant of lack of knowledge type uncertainty. When both options and outcomes are open, uncertainty becomes so paralyzing, that in order to keep moving, we must artificially try to reduce either set to something more bearable. Ultimately, heeding Sartre or Nietsche (Ahonen, 2001), this is actually the reality we inhabit, which means that all our perceptions of finite sets are just artefacts we construct in order to be able to hold on to the illusion of purpose and meaning of our actions.

While we are still dealing with the lack of knowledge, the existence of this absolute uncertainty begins to nudge us towards the other two dimensions of uncertainty. Absolute uncertainty is objectively real, however we human beings are excellent in our attempts to intersubjectively and subjectively construct mechanisms, which allow us

[51] This was discussed further in a preceding chapter, but to recapitulate, the most used metaphor to describe the differences between effectual and causal logic comes from cooking. One can either start with knowing exactly what dish one wishes to make, continue by finding the recipe, shopping for the exact ingredients, and then by following the recipe to produce the desired dish. This is the causal approach. The effectual approach to cooking is for the aspiring cook to enter the kitchen, open the cupboards to see what is at hand, and then just cooking what she can with those ingredients found in the kitchen. In the expanding cycle of effectual entrepreneurship other people enter the kitchen with their own ingredients they wish to be a part of the dinner, meaning that the effectual cook has not only access to accumulating amount of ingredients, but also becomes restricted by an increasing number of people whose palate she needs to satisfy with the result. At some point having another ingredient just isn't enough of a motivation to try to modify the simmering stew to satisfy yet another eater (Sarasvathy and Dew, 2005).

to not experience life as pure open sets of options and outcomes, ultimately the only objectively emerging limitations following from causalities, normal or counterfactual. This essentially means that while in any point of time the options and outcomes are infinite, through the causes and effects of our actions we narrow both sets. Having eaten the cake I no longer have it, me not having the cake being in a causal relationship with my action of eating it, thus limiting the options I have concerning the cake. The standards of desirables, scales of preferences, values are essentially such constructs. Therefore the lack or abundance of them is the next dimension of uncertainty.

4.3 Lack (or abundance) of standards of desirability

The discussion of goal ambiguity in the 1982 paper by March can be seen as an extension of the work known as the Carnegie School driven behavioral theory of the firm (Cyert and March, 1963, Gavetti *et al.*, 2012b, March and Simon, 1958, Simon, 1947). The notion of bounded rationality refers not only to the imperfect processing capability of humans and the impossibility of attaining all relevant knowledge, but also to the decision-driving mechanism March and colleagues termed satisficing. Prior to the insights of the Carnegie School, the assumptions underlying macroeconomics about humans as "Homo economicus", meaning fully rational, self-interest maximizing actors was prevalent also in the firm level theories. However, what March and Simon (1947, 1996) showed, supported by for example the insights of the muddling man (Lindblom, 1959, 1979), was that people rarely make decisions based on maximising the benefits, but instead settle for the first satisfactory solution, influenced by different social forces like political elements, contingencies and diverse personal attributes (Cohen *et al.*, 1972).

This led March to ponder at length the existence of any goals built on the maximisation maxim, and resulted in the understanding that not only are there endogenous elements like tastes, aspirations and other personal preferences, which change within an individual, making it impossible for even one person to know if what I like today is something I like also tomorrow, but also exogenous elements resulting from the changes in the environment that make it essentially impossible to know if the outcomes of my choices today are still valid at the future time of their realization.

While Packard *et al* (2017) allocate a position in their framework also to the discussion of uncertainty by Thompson (1967), they actually conflate this dimension of lack of standards of desirables Thompson explicitly touches upon with the open sets of outcomes. However, the choices between the diverse standards of desirability in

my view constitute a different dimension of uncertainty than the lack of knowledge pertaining to the infinite sets of outcomes, as I'll shortly elaborate.

Thompson's approach is distinctly different from the Carnegie School driven discussion. Where March and colleagues focus more on the endogenous view, Thompson creates a decision-making matrix based on the existence of more exogenous factors, namely knowledge of the causes-and-effects and the possession of a standards of desirables. Thompson further explicates guidelines for how to pursue (and evaluate) action in both, either or neither, however he keeps the discussion about the axis of the standard of desirables quite short, more or less merely remarking that in the context of business, it is natural to utilize the monetary scale as the scale of preference: more profit equals better along that scale.

Even though Thompson doesn't dig deeper into this discussion, it nonetheless opens up an interesting avenue in this present endeavor. Yes, it is quite intuitive that in the realm of business, there's the given profitability (or cost-efficiency if we take a look at the fundaments of for example Transaction Cost Economics (Williamson, 2003) or the internalization theory (Buckley and Casson, 1976)) as a scale of preferences, however we need only to look at politics to see that while economic issues are prominently discussed, the fundamental distinction between business and public policy is the impossibility of aligning all the activities along the scale of monetary issues. While we can calculate the cost and benefits of for example childcare, road infrastructure, education, military might and medical facilities, we cannot position the value of each pursuit along a singular standard of desirability, the monetary scale. We have to choose between diverse standards of desirability.

It is exactly this type of uncertainty, the difficulty of choosing between diverse standards of desirability, that the institutions reduce. The discussion of institutions can be considered to have emerged from the economist Thorstein Veblen (1898, 1899), an avid critic of the full rationality assumption. Vanguarded by Veblen, the old institutional economics school exerted influence over the drafting of the New Deal in the US (in 1933 and 1935), focusing the efforts towards the institutional elements (financial regulations, social security, trade unions to name a few) of the administrative decision-making (Chang, 2014).

With the increasing might of the neoclassical school of economics and its focus on the individual-based, universal assumptions, the old institutional school faded. With a clear distinction made to the old institutionalism, a new institutional economics however began to emerge in the late 20th century, with the publication of the book "Institutions, institutional change and economic performance" by Douglass North (1990). In the parallel universe of sociology, an institutional theory was coined by

Richard Scott (1987, 1995, 2008), further developing the insight of DiMaggio and Powell about the isomorphism between diverse institutions (Dimaggio and Powell, 1983).

These institution-based views (Peng *et al.*, 2009) share the understanding that human action is constrained and enabled by diverse institutions, which provide the guidelines of acceptable behavior. The institutions may be formal (in North's vocabulary) and regulative (in Scott's semantics), or informal (North) and normative/cognitive (Scott). Laws, rules and regulations constitute the first category whereas norms, cultures and ethics exemplify the second. Essentially what the institutions do, is to reduce the uncertainty emerging from the diversity of different standards of desirability: when something is customary or the law, it provides a standard of desirability that can be taken for granted.

The institution-based views have been diffused widely in for example international business research (Peng *et al.*, 2008, Dunning and Lundan, 2008, 2010) as they provide a comprehensive[52] approach towards looking at the differences and similarities of diverse collectives. Also the concept of institutional void (Khanna and Palepu, 1997, 2005, Khanna, 2015) is notable, as it highlights the absence of such structures in for example emerging markets that are taken for granted in the developed markets. This illustrates the discussion about the type two uncertainty at hand, as the institutional voids create exactly the type of uncertainty that emerges from the lack (or abundance) of standards of desirables.

Essentially what the ample research on institutions or their effects highlights, is the need for such mechanisms that reduce the uncertainty inherent in choosing between diverse standards of desirables. This is captured by the phrase that institutions constrain and enable action. The constraining of action essentially happens through removing some potential standards of desirability and diffusing some taken-for-granted standards of desirability within a collective, thus limiting the need to choose between all potentially available scales of preference at any given moment. The enabling of action refers to the assurance that within a specific set of institutions, an actor may be fairly certain about how others act, which enables collective activities (like driving a car – a feat not possible if not for both the existence of the regulatory traffic rules and the normative faith that others abide by them to at least some extent).

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[52] In the 1980's there was a lot of discussion about the importance of culture, with the seminal work of Hofstede (1984) highlighting the impact of different regional cultures in organizational action. However, with the growing globalization the construct of regional culture has become more and more elusive, with the emphasis shifting towards looking at the culture as only one element of the informal (normative) institutions influencing action.

While the impact of the institutions on the individuals emerges exogenously, the diverse institutional biographies of individuals however contribute to the endogenous processes within the individual: as we are creatures of both idiosyncratic personal features and socially conditioned beings, the exogenous institutions partially define our personal assumptions of what we take for granted[53].

Institutions are man-made constructs, fully intersubjective creations with no objectively real and immutable underpinnings. However, after the institutions have been formed, they gain an objectively real existence: they exist independently of the observer, and have solid enough representations to allow them to be studied with even the most rigorously positivist empirical approaches. They can also be considered objectively real in the sense that their effects on an individual aren't dependent on the intersubjective or subjective processes of that individual. Put simply, even if I choose to ignore or disobey institutions, they still influence me: if I break the law, I go to prison, if I misbehave, I'm frowned upon. They are not mere figments of individual or collective imagination.

In essence, institutions provide sets of solidified, collectively constructed answers to the questions of what is wrong and right, better and worse, desirable or not desirable. What their might shows, is the acute need for such answers, in other words, the need to reduce the uncertainty of choosing between potential standards of desirability. Institutions, however, are not the only constructs created to reduce that type of uncertainty: they fulfill the purpose on a macrolevel, leaving firms and individuals to battle the Marchian goal ambiguity in the more microlevel choices. Even though the number of microlevel choices of standards of desirability is limited through the constraints of institutions, those choices are still quite infinite.

On the level of both organizations and individuals, routines are one of the most prominent ways of dealing with this type of uncertainty. Routines can be defined as recurring sets of action, continuously honed by repetition to save cognitive effort (Feldman and Pentland, 2003, Felin *et al.*, 2012, Nelson and Winter, 1982, 2002, 2009, Parmigiani and Howard-Grenville, 2011). While the saving of cognitive effort pertains also to the attempt to reduce the type one uncertainty (lack of knowledge), it equally serves in reducing the type two uncertainty by rendering the need to pause and identify the various possible standards of desirability available invisible.

Ultimately the easiest way to conceptualize the type two uncertainty, lack or abundance of standards of desirables, is by envisioning a world without institutions and routines. We can still possess all the knowledge we currently have, but the lack of such

[53] More discussion about institutional biographies and the nature of man as both the subject "I" and the object "me" can be found at the onset of the Strategizing chapter.

structures that would inform us about the desirability of any possible goal, would also make collective action impossible. While the self-utility maximization maxim of economic theories is hotly debated, theorizing grounded on that assumption provides a given standard of desirables against which the individual and collective behavior can be imagined to be positioned, thus enabling prediction and aggregation. Whether that is an accurate depiction of human behavior, is another question, explored in more depth elsewhere in this dissertation, however the existence of that particular assumption is yet another way of trying to reduce type two uncertainty.

Ultimately the lack or abundance of standards of desirability dimension of uncertainty is most visible through the diverse mechanisms constructed for dealing with it. Zooming in to the verb "constructed" brings us closer to the third type of uncertainty. In discussing institutional economics, Chang (2014) points out that the inherent weakness in the old institutional economics is still a discussion not sufficiently addressed in the new institution-based views: where do these uncertainty reducing institutions come from? How do they emerge, stabilize, change, persist and fade out? This question resonates vibrantly in this dissertation, as it highlights acutely the third type of uncertainty. How do the diverse standards of desirability emerge and gain their value?

4.4 Lack of meaning

In his popular book "Sapiens: A Brief history of humankind", Harari (2014) takes the reader on a journey to the history of human civilization asking the question of why did our breed of humans conquer the neanderthalian man, and why did some civilizations end up the winners of history where others vanished. Essentially the answer he comes up with is that Homo Sapiens has the ability to imagine and believe in abstract things, which enables us to join forces to pursue rewards beyond the imminently present survival needs of sustenance and shelter. Translated into a scholarly discussion, essentially Harari subscribes to the post-modern notion of narratives and metanarratives (Lyotard, 1984). Put simply, we live by believing in stories that give us the meaning of what we encounter, provide us with the notions of right and wrong, good and evil – shared values and common goals.

This importance of meanings penetrates all levels of human action. On an individual level, the stream of meaning-making in psychology has explored how individuals surviving hardships cope afterwards the better the more meaning they have been able to retrospectively give to their difficulties (for a review see (Park, 2010), the better life stories they have been able to create to imbue their experiences with meanings. Also

on the individual level, the importance of meaning is further revealed in the conceptual change research (Vosniadou, 2009). Enlightening examples come from the developmental psychology insights about how children learn, and how those learning processes follow us throughout life: ultimately we begin with "naïve theories" based on our immediate experiences, which we then enrich or revise (Vosniadou, 1994). We, as children, are not empty vessels into which the learning is poured bit by atomistic bit until a full picture emerges, but instead start out with complete frameworks giving meaning to our experiences, through which we then negotiate the information gained in learning processes.

When the new, "correct", information is easily applied into our existing framework, we enrich that corner of our framework with that knowledge. However, when the new information doesn't fit into our existing framework, three things can happen: we either neglect the new, ill-fitting information, create a misconception[54], an attempt to assimilate new knowledge into the existing conceptual structures containing contradictory information (Vosniadou, 1994, p. 45), or revise the old structures. Interestingly, these "naïve theories" persist through our lives, as it seems that they can only be overridden, not overwritten (Shtulman and Harrington, 2016). In essence, from very early on we need meaning: our brains are wired in a way that makes it impossible to process knowledge when it cannot be applied to a pre-existing structure of some kind of meaning – a worldview as Cobern (1994) discusses. But where do those very early meaning structures, worldviews come from?

On an organizational level, the rich stream of sensemaking looks at how collectives create shared understandings, reduce equivocality by giving experiences meanings – or struggle when failing to do so (Maitlis and Sonenshein, 2010, Maitlis and Christianson, 2014, Weick, 1979, 1988, 1995, Weick *et al.*, 2005). Essentially Karl Weick's impactful contribution was to show how these individual level processes of us individuals assimilating new information through our existing mental models and schemas ("maps" in Weick's terminology) translates also to collectives: equipped with presuppositions constituting the mental representations through which we view the world, we enter a baffling situation and engage in enactment, in other words do something, which then provides us some material we can use to assimilate the

[54] An enlightening example can be found in studies looking into how children negotiate the experience of living on a flat surface with the given, scientific information that the Earth is round. When asked directly, they would repeat what they had heard, namely that the Earth is round, but when explored in more depth, what they actually had done, was to fit the new knowledge into their original framework constructed out of their everyday experiences. This resulted in mental models of Earth as for example a sphere within which the people lived on a flat surface, or a sphere with flattened top on which people lived, or a disc with ends you could fall off from (Vosniadou and Brewer, 1992).

baffling experiences into our pre-existing mental models. In a collective setting this assimilation is a shared process, carried out through cues from actions and verbal expressions, which may or may not result in a shared representation, sensemaking.

Essentially the discussion about how routines emerge (Dionysiou and Tsoukas, 2013) opens up this theme even further. Positioned in the routines process research approach[55] and drawing from the insights of symbolic interactionism (Blumer, 1969, Fine, 1993, Joas, 1997, Mead, 1934, Snow, 2001), Dionysiou and Tsoukas show how routines emerge to reduce the inherent uncertainty of shared settings. Symbolic interactionism is grounded on Mead's notion of the duality of the concept of myself: "I" represents the agentic subject with a free will, and "me" the social object, reflecting the expectations of how a person like myself should in a given setting be. Routines emerge in shared settings when people initiate interaction and continuously asses both themselves and others and align their actions through the cues they perceive from others about themselves. This coalescing process results in a shared understanding that reduces the initial (type three) uncertainty about the situation, including the expectations of what the interaction, routine, is supposed to accomplish.

The key contribution of Dionysiou and Tsoukas was to show that routines emerge from enactment geared towards reducing uncertainty – individuals start to act to produce material they can subsequently use for making sense of the situation (Weick, 1979). In essence, the very first aim in interaction is to create meaning that enables further collective action. Only when the actions of others have meaning to me, is my action in the same situation meaningful. Otherwise all I perceive others doing is random, riddled with the type three uncertainty, and engaging in meaningful action is impossible, as in the realm of random actions, all my actions are rendered random for the lack of meaning providing structures to which my actions could be attached.

Returning to the question posed at the end of the individual level discussion about the origins of the individual level mental representations, and asking the same question in the level of organizational action shows that the symbolic interactionism (Mead 1934, Blumer 1969) and its offspring of sensemaking approach (Weick 1979)

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[55] Organizational routines are researched from two different perspectives (Parmigiani and Howard-Grenville, 2011): the capabilities view, with roots in economics and the evolutionary theory of the firm (Nelson and Winter 1982, 2002, Winter 2003), is interested in answering what routines as entities do in and for the organization, whereas the process view, grounded in the more sociological turn-to-practise approach (Feldman and Pentland 2003), opens up the black box of routines to explore how they emerge and unfold. In the latter stream the routines are conceptualized as dualities of ostensive and performative parts, the ostensive capturing the structure of what the routines are expected to accomplish (why they exist) and the performative reflecting the actual carrying out of the routines in specific circumstances by specific actors (how they are performed).

are attempts to answer that question. The meaning in the level of an organization is constructed through reflecting my actions through the mirror of other's actions, and in turn mirroring the actions of others in my subsequent reactions. The meaning making mechanism can thus be construed in the level of organizational action, even while the individual level, the microfoundational answer to the origins of individual level meaning is more difficult. But how about the macrolevel of institutions, discussed in the previous chapter?

On the macrolevel, the feat of providing standards of desirability is achieved notably by the existence of institutions. But how are those institutions formed and shaped? In his fascinating text, Wildavsky (1987) asks that if we perceive (political) institutions being shaped by negotiations between diverse interests, we should start by asking where do those interests come from? If the interests emerge from preferences, where do the preferences come from? Can preferences be merely reduced to individual tastes, quite randomly dispersed in a population of idiosyncratic individuals, or what are the mechanisms through which the preferences emerge, solidify into interests, which ultimately aggregate into institutions?

Like Wildavsky points out in relation to the self-interest maximization assumption of economic theorizing, "*The least interesting behavior, instrumental actions, may be explained by preferences; but about the most interesting, preferences themselves, nothing at all can be said*"(Wildavsky, 1987, p.5). Bowles (1998) discusses the same issue[56] extensively in his call for opening up the "black box" of preference emergence and formation, ultimately concluding that while there may be some tastes emerging directly from the genetic inheritance, there are several mechanisms of learning, cultural conditioning, and institutional impact that shape the preferences throughout the life of an individual. Thus the preferences are not merely exogenous (given) in the act of choosing between diverse ends, but also emerge endogenously from the interaction with and influence of the possible ends solidified as normative institutions. We do not merely choose from a set of options based on some given standards of desirables, but the mere existence of those sets of options influences our standards of desirability in the first place.

This dilemma begins to highlight the third type of uncertainty, the lack of meaning. Knowing that worldviews in the individual level (Cobern 1994), symbolic interactionism driven sensemaking in the organizational level (Weick 1979, Dionysiou

[56] "*We know surprisingly little about how we come to have the preferences we do; the theory of cultural evolution is thus similar to the theory of natural selection prior to its integration with Mendelian genetics. While it is comforting to recall that Darwin's contribution was possible even though he did not know how traits are passed on, this lacuna is nonetheless a major impediment to endogenizing preferences*." (Bowles, 1998, p.80)

and Tsoukas 2013) and institutions in the macro level (Bowles 1998, Wildavsky 1987) reduce the uncertainty inherent in the need of choosing between diverse standards of desirability (scales of preferences), it is the shrouded and amorphous nature of the processes through which those constructs emerge that create the third type of uncertainty. Not only are we uncertain about which preferences to choose, but also about how do those preferences become preferences, ie. gain the meaningfulness required for them to be preferences.

This requires a practical example. For the clarity of argumentation next I will present three, one on each level of analysis so far mentioned, individual, organizational and macro level.

4.4.1 Three examples

Individual: Matthew's choice

Matthew is somewhat unhappy in his current work. He dislikes the content of the work, however appreciates the possibility of a good work-life balance the current job offers: no extensive travelling, flexible work hours. Then Matthew is offered a new job, which would be far more interesting in the work content. On the downside, the new job would require sacrifices in the work-life balance as it would require more travelling and offer little opportunities to self-organize the working hours. The financial compensation is the same in both jobs.

The uncertainties involved in the decision Matthew needs to take emerge from all three dimensions of uncertainty. There is simply lack of knowledge, for example about the exact nature of the new work and about the potential changes in the current work that may affect its likeability. Additionally there is the type two uncertainty emerging from the need to choose between two different standards of desirability: job satisfaction and work-life balance. This type of uncertainty is the most acute Matthew consciously needs to deal with.

The third type of uncertainty emerges if Matthew asks himself, why would he consider either job satisfaction or work-life balance more important? Why does the meaningfulness of life mean what it means for Matthew? When he begins tracing the idiosyncratic individual innate features and his learned normative notions of what constitutes a meaningful life, do either one of the options actually continue to provide meaning for Matthew? Why would job satisfaction or self-expression in work matter? Why is family important?

The third type of uncertainty becomes pronounced when Matthew realizes that these mechanisms constructing his notion of meaningfulness are not grounded on

any solid and given absolutes. As such, the meaningfulness of either choice can be deconstructed by questioning each part of it, ultimately ending in a lacunae of anything onto which the meaning structure can be pinned. Fortunately for our Matthew, however, he, like most of us, is equipped with the innate personal framework of meaning[57] that most likely inoculates him against the need to begin deconstructing the meaningfulness he intuitively attaches to either choice, simplifying the question therefore to only the issue of choosing between two standards of desirables.

Organizational: Gateway conundrum

In the process of digitalizing a global, heavy machinery firm, it is understood that in order to create a digital representation of the heavy steel equipment, it is not enough to build in intelligence to the new products, but the existing equipment need to be retrofitted with gateways that produce the data necessary for subsequent development of more sophisticated service, eg. predictive maintenance. The purchasing of those gateways is therefore a key process, as the existing equipment is both numerous (in hundreds of thousands) and diverse (ranging from huge harbor cranes to tiny forklifts). Ultimately the purchasing choice is reduced to two possible options: gateway A is a more sophisticated design, whereas the gateway B could be delivered sooner. Both the forecastable financial costs and benefits of either option are equal enough to be dismissed in the decision-making.

There is of course an ample amount of type one uncertainty – as the whole digitalization is a new avenue for the firm, the lack of knowledge pertains to not only the gateways and their retrofitting processes, but also to the subsequent utilizing of the data thus created. The second type of uncertainty emerges from the need to choose between two standards of desirability: is it more important to have the gateways ready as soon as possible to exploit the early mover advantages in the industry, or to make sure that the gateways installed are sophisticated enough to be on par with the future technological developments?

In the meeting[58] where this decision needs to be made, both scales of preferences have their proponents. The marketing manager quips "who cares about the design of some black box – we're not selling it, but what it enables, and the sooner we can start selling, the better!" to which the head of engineering replies "our key competitive advantage has always been the quality of our offerings – hastily installing a suboptimal

[57] Remember the discussion of conceptual change (Vosniadou), worldviews (Cobern) and meaning making (Park) touched upon previously?

[58] This example comes from another research project, through which I was present in this meeting.

piece throughout our product range would undermine all of that!". In the ensuing debate, the third type of uncertainty rears its head.

The marketing manager was born with some personality traits subsequently impacted by his upbringing and social spheres in a way that ultimately influenced his career choice of marketing. The professional expectations of the field in general, the needs of the specific firms he has been working in, and his professional successes have further shaped and solidified his worldview. Thus, his perception of business hinges on the elements that are most meaningful for him: the interaction between the seller and the buyer. Strengthened further by his KPIs, for him the most crucial aspect is the need to close deals, the more the better. The worldview of the head of engineering is equally a result of similar processes, however geared towards different aspirations and schemata. His KPIs reward quality, understood as lack of mistakes, and outperforming the competition in the technological design of the products.

Deconstructing the diverse mechanisms through which the marketing manager and the head of engineering give meaning and make sense of the actions of the firm highlights the endogenous aspect of the type three uncertainty. Should they so choose, both could take the introspective road, similar to Matthew's option, and question why do the things they find meaningful have meaning to them. Were they to do this together, they would merely find a plethora of individual characteristics and social forces responsible for constructing the respective worldviews, and find themselves lacking any such underpinnings for either set of schemata as to enable creating an objectively real standard of desirables, a solid meaning structure. At best, they could end up in a sensemaking process, which would result in the emergence of a negotiated, shared understanding, shared schemata grounded on such choices both would be comfortable in constructing.

However, in this case the type three uncertainty has also an exogenous facet, as ultimately the decision doesn't come down to negotiating the chosen standards of desirability constructed by either two individuals, or resulting from their shared meaning construct. The exogenous type three uncertainty arises from the fact that all potential stakeholders, invisible and unheard in the decision-making table, each have their own meaning structures through which they evaluate the results of the decision. Limiting the potential meaning structures to the two already present at the decision-making table, there may well be customers whose meaning making mechanisms indeed make them value speed over technological excellence, and customers who require perfection even when it requires slower execution. Deconstructing the meaning making mechanisms in both cases leaves us again without any solid underpinnings that would enable constructing an all-encompassing standard of desirability.

Put simply, the wider the ripple effects (as measured by the individuals involved, the monetary implications or the time scope), the more impossible it becomes to identify all the potential meaning giving structures having an impact on how the outcome is perceived. Even when a set of such structures could be identified and subsequently through immense efforts deconstructed to their constitutive parts of individual level features and diverse social forces, what would be revealed, would be the utter lack of any such foundations that would enable constructing an objectively real standard of desirability against which the original choice could be reflected.

This problem would not go away even if the original decision-makers were introduced to an omniscient artificial intelligence that could calculate all the potential outcomes of their choice. What the artificial intelligence could never capture are the idiosyncratic perception filters, meaning structures through which the diverse individual stakeholders make sense of the subsequent sequence of events. This results in the ultimate unpredictability of human action, the type three uncertainty: as our actions and reactions are filtered through our individual meaning structures, what is good and rational for one through one set of meaning mechanisms, can be perceived as bad and incomprehensive through another set of lenses. Deconstructing the diverse meaning making mechanisms reveals – nothing that could be used to construct universal meaning mechanisms.

Macro: Triumphing Trump

In the last round of the USA presidential elections of 2016, two distinctly different candidates battled, Hillary Clinton and Donald Trump. Against the expectations of the so-called traditional media, most Europeans and a big segment of Americans, Donald Trump won. The question asked in the so-called traditional media and by the loosing segments was: how is it possible that someone with the appearance of such racist, chauvinistic buffoon[59] appealed to such a big portion of the Americans?

Subsequent analysis have offered as explanation two themes: first, the ones voting for Trump voted for change in status quo, which was being perceived as represented by Clinton. Secondly, Trump's promises, nationalism and the simplistic slogan ("Make America Great Again") appealed to the portion of Americans who

[59] It should be emphasized here that the depictions are drawn from the media, as are the subsequent explanations about the demographic constitutions and tendencies of both the proponents and opponents of Trump. I make no claims about the truth value of these statements, but use this example here as an adept, accessible and familiar example of macro level representation of the third dimension of uncertainty. This said, my personal view to the Trump presidency is somewhat more systemic – I don't, but would like to, understand the system that can produce and support so diverse representatives of a nation as Barack Obama and Donald Trump.

were at the losing end of the globalization, for example experiencing unemployment due to jobs being outsourced and striving for cleaner energy closing down the coal mines.

The surprise experienced by the losing segment (and most Europeans) exemplifies the impact of the type three uncertainty. The type one uncertainty, lack of knowledge about the candidates and the trajectories electing either existed, but was thoroughly analyzed and discussed before the elections. The type two uncertainty was represented by the nature of either candidate as representing a standard of desirability: Clinton represented status quo, existing establishment and the prevailing institutions, however understood, whereas Trump represented change and rebellion against the prevailing institutions, whatever that was perceived to mean.

The type three uncertainty emerged from the diverse meaning making mechanisms represented in the voters. Through the meaning making mechanisms of the Clinton supporters, she could be perceived to represent education as a good thing, women empowerment as a good thing, reason and diplomacy (as good things) – or to take a more cynical view, the possibility of upholding the established power structures in Washington, important to the ones in power under the current institutions. However through the meaning making mechanisms of the Trump followers, those same representations could be seen as not good things: education equaled elitism, powerful women equaled unnatural development and threat to the perceived role and necessity of men, lack of perceivably rational behavior was seen as signaling heroic swimming against the tide, and diplomatic skills were seen as wasting time when something needed changing right now. In addition, being socialized in the narrative of the self-made man, the strong prevailing undercurrents of continuous doubt against anything governmental swayed against making a choice to uphold the current regime.

In retrospect, deconstructing the meaning making mechanisms of the voters choosing Trump is a possible feat, though many construction blocks will most likely always remain unknown to anyone but the individuals in question. The surprise in the traditional media highlighted the inability of the individuals socialized to construct different meaning making mechanisms to understand how differently similar representations of a phenomenon can be perceived through completely different set of socialization and life circumstances.

With all the available knowledge making little difference, the choice between the two standards of desirability emerged from the fundamentally different meaning making mechanisms that cannot be negotiated through trying to identify any solid underpinnings constituting the building blocks for constructing meaning.

4.4.2 Type three uncertainty in a nutshell

In order for us humans to live a life that makes sense, we endow our phenomenal experiences with meaning. First, on the individual level, we construct worldviews through both our biological traits and the diverse social influences we throughout our lives are bombarded with. On the level of organization, we engage in symbolic interactionism and shared sensemaking to construe such understandings that enable collective action (when successful). On the macro level, our actions are constrained and enabled by the institutions we shape within the specific setting in which the specific institutions emerge. These structures give rise to the values we adhere to, providing the standards of desirability necessary for purposeful action.

Type three uncertainty emerges out of the impossibility to deconstruct these structures to such components that would be unanimously and objectively shared – or even unanimously and objectively real. When meeting other people, we will always be ignorant of the meaning structures through which that person, those people view the world. Therefore we are always subject to surprises, in other words uncertainty, when the actions of another individual or collective, emerging from their individual meaning structures appear, through our meaning structures, irrational or downright bad. No amount of knowledge can ever reduce that uncertainty.

4.5 Dealing with the three types of uncertainty: insights from futures studies

Futures research is an interesting field. Not only because it deals with what is yet to happen, but also because based on the non-existence of any actual data from the future, the ontological and subsequently epistemological choices necessary for conducting futures research need to be considered carefully. Amara's (1981) seminal insight about futures as possible, probable or preferable captured some nuances of this discussion, paving the way for subsequent realization of futures additionally as makeable (Veenman and Leroy, 2016).

Essentially the question is, are futures seen as ontologically real trajectories of past and present – in essence as something extant but for the happening, and as such, reachable through positivist methodologies grounded on past trajectories? Or are futures constructed through our actions, grounded on our thoughts, perceptions and imagination – as such malleable and understandable through interpretive epistemologies? Of course there is the third option of viewing futures as non-existing and fully opaque, something fundamentally surprising – something we just need to adapt and

react to. However this approach merits little in the futures research field, as it undermines the whole point of having the fundamentally normative field in the first place.

Reviewing the futures literature, Piirainen and Gonzalez (2015) discuss the different onto-epistemological underpinnings through Popper's three worlds (Popper, 1979), showing how the different choices about the world in which the futures reside create three paradigms: (post-)positivistic, interpretive/critical and pragmatist. However Kuosa (2011) takes a wider historical perspective and shows that mankind's attempts to deal with the future began with the supernatural attempts to reach the spirits of capture the signs, essentially ontologically similar to the positivist methodologies but for the methods: where the ancients relied on "magic", the contemporaries rely on science to reveal the extant futures. The next phase is the modern view, best captured by Jim Dator in his first law of futures studies "*The future cannot be "predicted" but alternative futures can be "forecasted" and preferred futures "envisioned" and "invented" – continuously*" (Dator, 1996). This approach fuses the interpretist/critical and pragmatist approaches identified by Piirainen and Gonzalez (2015) and looks at how such knowledge can be created that would enable better decisions today to shape a better tomorrow, for example through creating diverse scenarios (Amer *et al.*, 2013).

It is the third paradigm[60] identified by Kuosa (2011) that actually leads towards the discussion of the three types of uncertainty at hand. Emerging from the dialectic and critical approaches, the narrative turn in futures research (Milojević and Inayatullah, 2015) differs from the other paradigms in seeking a more dialectic understanding of why and how past, present and future are perceived as they are and what do those perceptions imply. As such, this approach is grounded on post-modern underpinnings, however instead of merely pausing to deconstruct the underlying mechanisms, as futures oriented, also the reconstructing, transforming side is more extensively addressed than in for example critical management studies (Spicer *et al.*, 2009).

Anchored in this paradigm, the Causal Layered Analysis (hereafter CLA) is a method crafted by Sohail Inayatullah (1990, 1998b, 2004, Inayatullah and Milojevic, 2015). Grounded on the science genealogical and archeological approaches of Foucault, the method distinguishes between four different onto-epistemological levels, all perceived to exist simultaneously, each providing a set of lenses through which a phenomenon can be understood. As such, the method as an analytical tool can be

[60] Again, paradigm is not used in the Kuhnian sense of one surpassing another, but in the sense highlighted also by Ahonen (2001) that in social sciences, several different paradigms co-exist in any moment of time.

used in trying to understand such objects of enquiry, which can be perceived to consist of several dimensions difficult to view through any one chosen set of onto-epistemological lenses. As the three types of uncertainty discussed in this thesis exist in more than one realm of reality, CLA enables positioning the uncertainty types into one framework.

The simplest way to explain CLA is to analyze a familiar phenomenon with it, and as the Trump election is not only already discussed in this dissertation, but also something most readers are most likely familiar with, next that example is used to show the mechanisms of CLA.

The top level of CLA is called litany, and it consists of the empirical observations of a phenomenon, the part that makes the headlines. In this case the litany is "Trump won the presidential elections". This layer is something that be validated through positivist epistemologies, something that most observers can agree to perceive as ontologically real, something that allows even for the naïve version of reality.

The next level of CLA is social causes, and this is the level of most scholarly endeavors. In Trump's election, the causes are seen as dissatisfaction of the losers of the globalization (remember the previous discussion in previous chapter), and the rebellion against the prevailing establishment doing nothing to remedy the situation. Untangling the social causes is a complex process and allows the wielding of several epistemological methodologies: through positivist approaches some hypotheses can be validated or disproved, through constructivist approaches the roles of individuals and social structures can be unveiled. Equally, for example the class theories of Marx or the institutional approaches can be used on this explanation level.

The third level, named worldview, is when things get interesting (in my view), as it is the first level to invoke the deconstructive insights from Foucault. In this level the question is, what are the worldviews of the individuals involved in the phenomenon at hand, and how did those worldviews contribute to the emergence of the phenomenon. At this level of analysis we can zoom into the life of a disgruntled coal miner to understand the impacts of both his personal traits and his institutional biography to see how he views the world. Equally we must zoom in to the lives of the voters of Clinton, to understand their perceptions of reality[61]. What we gain as a result is an insight into how these different worldviews have interacted, interact and will in the future interact. It is not because of the different circumstances of the voters that they voted as they did, but it is because of the meaning structures constructed in those

[61] Vehemently attacked by Taleb, who named them "intellectual yet idiots". (See https://medium.com/incerto/the-intellectual-yet-idiot-13211e2d0577#.ntt8r6u7f). I choose not to reference Taleb as I don't personally like his tone, however this blog (snippet from his "Skin in the game" book is a good example of few sets of worldviews, Taleb's and possibly some Clinton voters.

circumstances, the worldviews through which they viewed the events that resulted in the voting.

The fourth level is named myth/metaphor[62]. Essentially the question asked on this level relates to the emergence and identification of such powerful myths that are partially responsible for creating the worldviews in interaction with lived circumstances and personal features. For example, the "land of opportunity" and "self-made man" myths illustrate such metanarratives on which the American culture has in big part been founded. These myths appeal to emotions and as such are powerful contributors to the worldview. Trump's campaign evoked several of these myths drawing their power from the emotions, the gut reactions[63]: the perception of Trump as the ultimate self-made man personifying the American dream, thus creating an idol to follow, the externalizing of the obstacles in the path to self-made happiness by constructing enemies (Mexicans, the government and "elite"), and the upholding and bolstering of such metanarratives as Americans as the "chosen people" ("America first!") that appeal to the sense of self-worth of individuals.

Now, remembering the three worlds of Popper, we can position the levels of analysis in the CLA into the following matrix.

Table 2: Ontology of CLA

	Objective (w1)	Subjective (w2)	Intersubjective (w3)
Litany	x		
Social causes	x	x	x
Worldview		x	x
Myth/Metaphor			x

The level of litany deals with the empirically solid representations of phenomena, and as such is objectively real. The social causes have objectively real represen-

[62] Both third and fourth levels of analysis follow deconstructive approach, however they differ in the unit of analysis: in the worldview level the unit of analysis is the individual, including both the personal (eg. cognitive) features and the social forces constructing the worldviews, whereas in the myth/metaphor level the unit is the collective, more particularly the metanarratives contributing (as elements of social forces) to the shaping of the individual level worldviews.

[63] Interestingly, this often printed explanation found in traditional media in the wake of the elections was highlighted from a new angle with the revelations of the so called case Cambridge Analytica, which will be discussed more thoroughly later in this dissertation: in short, by harvesting Facebook data it was possible to personalize advertisements that played on the fears and anxieties of the individual voters. However, I emphasize again that I make no truth claims on the process or the outcome of the elections, the constitution of the voters, or the nature of Trump, but utilize these viewpoints ubiquitous in media to illustrate the phenomenon of the type three uncertainty.

tations, but additionally emerge through subjective understandings, moderated by intersubjective constructs. The worldview is primarily subjective, however some of its building blocks emerge intersubjectively. The myth/metaphor is the representation of shared metanarratives, thus rendering them purely intersubjective creations.

But how does this relate to the focal discussion of the three types of uncertainty? As suggested earlier, the three types of uncertainty reside in different ontological realms. As an outcome, the two first types of uncertainty have yielded to scrutiny through some sets of epistemological choices, whereas the third type of uncertainty has remained unseen when viewed through such epistemologies. In essence, the type one and two uncertainties (lack of knowledge and lack or abundance of standards of preference) can be viewed when the level of analysis is either litany or social causes, as explicated in the CLA. What follows is that those types of uncertainty are visible through such methodologies that explore events on those levels, namely such approaches that have not been influenced by the post-modern deconstructionism.

However, the type three uncertainty, lack of meaning reigns in the levels of worldview and myth/metaphor. To access events on that level, one needs to subscribe to some post-modern insights. The positive contribution of post-modern approaches grounded on skepticism and deconstruction has been the understanding of the impact of assumptions – narratives and metanarratives, the meaning making mechanisms. The divide between the post-modern perspectives and the more prevalent traditions of eg. positivism and constructivism has however meant that not all insights revealed through diverse sets of lenses have travelled well: this is the case with the type three uncertainty as seeing it requires an aptitude for deconstruction, an approach prominent only in the more post-modern spheres of science.

However, where the post-modern perspectives have fallen short is the discussion of how to escape from the value relativism ultimately rendering any constructive collective action impossible. The question is, if everything indeed is just artificial and imaginary, narratives on top of metanarratives, how can we know what is meaningful action? If all narratives are essentially "made up", why would one be better than another – aren't we all dealing with "fake news" to a varying degree?

This is where the CLA makes its most welcome contribution. For its original designer Inayatullah, the method is first and foremost a discursive tool to create transformational spaces. This means that none of the levels has priority over another, but that the whole idea is to move down and up through the levels in order to create a fuller understanding of the phenomenon under scrutiny between the diverse partici-

pants exploring the issue[64]. Understanding the causalities vertically and horizontally, within and in between each level gives rise to different future possibilities: an issue can be solved in different way on each level of analysis, the timeframe of changes becoming longer towards the bottom.

One interesting thing is that when the issue is first analyzed through CLA, not only are the different potential solutions visible on every level, but also the choice of perspective becomes pronounced. What is the problem we are seeing, and according to who? Subsequently, when solutions are presented, the discussion of from whose perspective this would be a solution needs discussing. These discussions are at the core of the transformational spaces CLA aims at creating in the setting in which it is used (Inayatullah and Milojevic, 2015), and this is the way in which CLA surpasses the cynicism of post-modernism. Adding the question of "why do I see the issue the way I see it?" brings this approach very close to Bourdieu's idea of reflective sociology, his proposed way out from the impasse of deconstructionism (Ahonen, 2001, Bourdieu and Wacquant, 1992).

As an example, on the litany level, the problem could be that Trump is president or that his attempts are being thwarted. As such, the solutions would respectively be to either remove Trump of the ones stopping him. On the level of social causes, one exemplary solution could be to help the unemployed and marginalized back to the society by creating new jobs, however depending on the perspective, that would either lead to re-opening the coal mines and hindering globalization (pro-Trump strawman), or to coming up with new jobs and encouraging people to study so that they would be able to work in such fields that are not under the threat of being outsourced (anti-Trump strawman). These solutions are much slower to execute than just removing the undesired element.

On the level of worldview the problem changes to how can we make others understand our point of view? The solutions shift the focus to increasing equality, developing and harmonizing basic education – essentially viewing the social institutions responsible for creating social fragmentation with the attempt to change those institutions towards more cohesive directions. The discussion must also include a profound negotiating of the values, standards of desirability included in the cohesion building efforts – or the discussion of the desirability of such efforts in the first place. As such, the solutions are far more difficult and slower in unfolding than on the upper levels.

[64] CLA is mostly used in workshop settings, where the diversity of participants helps in creating a more multifaceted understanding of the issue. However it is also used as an analytical tool by individual researchers, which essentially means that the researcher using it needs to be able to see the issue from multiple perspectives.

On the level of myth and metaphor, it is debatable whether the changes can be triggered intentionally, or whether the underlying metanarratives just evolve gradually. Any solutions on this level would therefore require changes in the meaning of the emotion evoking national identity forming myths of "self-made man" and "land of opportunities"[65]. However, the potential changes would take decades, centuries to unfold[66]. This of course leads to questioning the benefits of understanding the problems emerging from this level of analysis: if we cannot influence it, what does it help to be aware of it? In my view, as these "gut reaction" triggering myths contribute immensely to the higher level causalities we can influence, understanding the very fundamental myths and metaphors is essential in drafting solutions that can through intentional action be shaped.

Returning again to the red thread of uncertainty we can see that the identified problems on each level emerge from diverse types of uncertainty, and as such the sketched solutions aim at reducing different types of uncertainty. On the level of litany, the problem of Trump presidency emerges out of the lack of knowledge of how he will act and what will ensue. On the level of social causes, the problems arise from lack of knowledge and the choice of standards of desirability types of uncertainty. On the level of worldview, the problematic uncertainty emerges from the individual level meaning making mechanisms, whereas on the level of myth/metaphor, the problems emerge from the collective level meaning making mechanisms. This allows positioning the diverse types of uncertainty on the CLA framework, to facilitate the processes with which each type can be approached.

Table 3: CLA of the three types of uncertainty

	Realms of reality	Lack of knowledge	Standards of desirability	Lack of meaning
Litany	O	x		
Social Causes	O, S, I	x	x	
Worldview	S, I		x	x (individual)
Myth/Metaphor	I			x (collective)

[65] However, like we know from organizational identity research (Ravasi and Schultz, 2006), we can hold on to a label while changing the content: a similar identity shaping myth can be endowed with different meanings without changing the narrative. For example, we can keep using the word "freedom" as a standard of desirability, however what we understand as freedom can change for example from freedom to own a gun to freedom from fear of being shot.

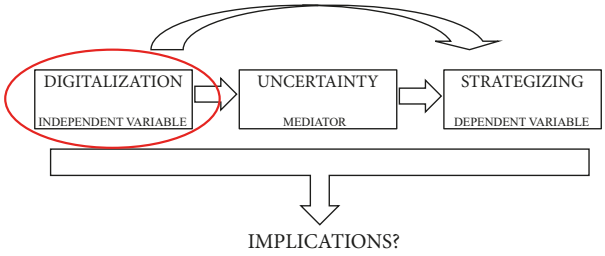
[66] Especially when dealing with something as elusive as national identity, from the recent events in Catalonia we see that while the structures have for decades pushed towards integration, the emotional structures upholding the group identity sentiments in Catalonia have not changed.

The positioning of the different types of uncertainty is also reflective of the different Popperian worlds, ontological realities, where their impact can be perceived. The issues on the level of litany have objective existence, and the accompanying type of uncertainty is the lack of knowledge in its various forms. On the social causes level, the issues exist in all three realms, which means that on that level of analysis the uncertainties perceived emerge from lack of knowledge and the problem of choosing between different standards of desirability. The worldview level encompasses the individual level interpretation of the issue, thus existing in the realms of subjective and intersubjective. Subsequently the uncertainties experienced emerge from the choices between standards of desirability and the lack of meaning on the individual level, created by the different meaning making mechanisms within an individual (personal features and social forces). On the level of myth and metaphor, the focus is on the ontologically intersubjective, collective level meaning making mechanisms, which create the lack of meaning type of uncertainty a collective is subject to.

To summarize the discussion in this chapter, uncertainty consists of three dimensions, which reside in different ontological realms. Therefore few previous scholarly endeavors have viewed these three types together, as choosing a specific philosophical position sensitizes towards identifying one or two of the dimensions of the uncertainty, not encouraging viewing all three together. However, due to the distinct philosophical requirements of futures research, the CLA was developed to facilitate viewing social phenomena through several so far acknowledged philosophical perspectives. Because of the empirical merits of adopting the CLA as an analytical tool enabling transformational spaces in which to understand a phenomenon as comprehensively as possible, the method was adopted in this dissertation to provide an existing framework, which logically allows for viewing the three, ontologically diverse dimensions of uncertainty in a same framework.

Introducing CLA heeds also to the normative pragmatism adopted in this dissertation. As in my view the biggest failing of post-modern approaches has been to stop at deconstruction, the CLA enables utilizing the insights from the deconstructive methods in efforts that aim at inducing changes for the better – however that is then defined. After all, showing that all our actions are grounded on stories helps little in trying to figure out a way of co-existing on this planet. Indeed, if it seems that sharing the faith in stories is the most powerful way of enabling collective, non-destructive action, we should be eager in pursuing such stories that help us make better decisions.

5 DIGITALIZATION



"…the data from which the economic calculus starts are never... given to a single mind which could work out the implications, and can never be so given."
(Friedrich von Hayek: The use of knowledge in society)

Humanity has always created technology in order to make life easier. For millennia, the main focus of technological innovation was on facilitating manual labor, from the pre-historical arrow heads and earliest agricultural ploughs to the revolutionary spinning jenny and the contemporary automated factories. However, with the emergence of information and communication technologies, the scope of facilitation has widened to encompass not only the manual, but also the cognitive workload – previously lightened notably only by the development of writing and subsequently the innovation of printing few millennia later.

Dubbed information era by some, our contemporary age is characterized by the increasing creation, processing and dissemination of information. One of the buzzword-like concepts that attempt to capture this permeant yet evasive phenomenon is digitalization, endowed in this dissertation with the status of a key concept, because labelling[67] an entity makes its exploration easier.

The following chapter should not be mistaken as a literature review of the definition of the concept of digitalization. Instead, it is an analysis of the drivers of the changes emerging from technological advances, necessary for addressing the research phenomenon and quandary of this dissertation. Acknowledging that there are myriad definitions of this concept, in this dissertation digitalization refers to the trinity of digitized technological systems, humans as subjects and objects of change, and the perceptions of the humans (likewise as subjects and objects of change), as introduced by Tilson, Lyytinen and Sörensen (2010a, 2010b).

[67] Alternative labels could also have been possible: datafication would have captured some of the nuances, fourth industrial revolution or the sixth Kondratieff others – even information age might have been bent to a label. However the concept of digitalization, as perceived in the discussions of digital infrastructures seemed to provide the best foundations for capturing the essence of the object of enquiry, for reasons that will hopefully become clear with this chapter.

In the following discussions, the focus is not on the technological advances in themselves, but the adopted perspective is sociotechnical, kin to such research approaches as materiality, sociomateriality and sociotechnical systems (Leonardi, 2012). In short, the chosen approach resonates with the worldviews positing that it is neither the technology in itself nor the humans (including their perceptions) in themselves that drive change, but an amalgam of both fused together in the course of everyday action (Latour, 1987, Leonardi and Barley, 2010, Orlikowski, 2010). No individual component of that amalgam carries by itself agentic powers of change, however in order to understand the microfoundational drivers of change, in the following discussions this amalgam is artificially taken apart into its constitutive parts of technological systems, humans and perceptions.

5.1 Technological systems

5.1.1 Digital representation of reality

As Peters (2014) in his nigh poetic essay notes, tracing the etymology of digit reveals the dual use we humans have had for our fingers[68]: we have counted with them and we have pointed, indexed, with them. Both uses still define everything we name digital.

In terms of counting, digital technologies are underpinned by the invention of binary systems, most notably based on the ideas of Gottfried Leibniz (1646-1716), further developed into the Boolean algebra by George Boole in 1847, and used as the basis of the Morse code, introduced by Samuel Morse in 1835. The introduction of Morse alphabet coincided with the invention of the telegraph, and prevailed in the ensuing battle between diverse coding systems, becoming the standard (Brennen and Kreiss, 2014, Vogelsang, 2010). Morse code captures the essence of digitization even today: any information you can code (for example into a language), you can further represent with only two values, zero and one.

One pivotal moment in the ensuing digital development can be traced to the first Macy conference in cybernetics in 1946, when John von Neumann stated that it is possible to code all information directly into binary form (Peters, 2014): as-

[68] Digit refers to the outmost parts of vertebrae limbs, such as fingers or toes. The concept started to refer to a numeric symbol through the emergence of decimal system: as we humans have ten fingers, the decimal system corresponds with the number of our fingers, *digiti* in latin. Interestingly, the current usage of the term neglects the decimal origin, instead being mainly used in the context of a binary numerical system.

signing any information signal a threshold value enables endowing all values above that the value 1, and below that the value 0 (e.g. sun above horizon equals 1, below horizon 0). Independently, yet simultaneously, the advances in pulse-code modulation (Wikipedia, 2018d) enabled the digital representation of analog audio signals, paving way for not only subsequent developments in digital audio, but also in the methods with which highly different analog signal types can be converted into digital data.

The importance of this insight results from freeing the process of digitization from the middle man of language, elemental in for example the Morse code (Peters, 2014). The subsequent, exponentially accelerated development in digital technology is fundamentally underpinned by this notion: any form of information signal can be made digital. And because any form of information can thus be expressed in a similar format, in theory, any form of information can be processed with same technology (Tilson, Lyytinen and Sørensen, 2010b).

This underlies the major promise (and threat) of digital technologies: analog information is coded in context specific ways and as such can be processed with only specific technology designed to process exactly that type of information[69], whereas coding all types of information digitally, into bits, means that digitization decouples the type of information and the technologies used for handling it[70] (Tilson *et al.*, 2010b, Tilson, Lyytinen and Sorensen, 2010a). So, in theory, any information coded into bits can be accessed and processed by any technology that can access and process digital information. This is a key point in the phenomenon of digital convergence soon discussed more, however first a few more notes on the act of digitizing are in order.

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[69] "*An analog signal maps changes in one continuously varying quantity (e.g. air pressure changes corresponding to sound) onto changes in another continuously varying quantity (e.g. an electrical voltage). Thus, the electrical signal created by a microphone is an "analog" of the sound it captures. Analog information can be communicated along cables or through space using radio waves by encoding it in variations of electrical properties (e.g. amplitudes, frequencies or phases). Similarly, analog information can be stored using, for example, the physical properties of a groove in an LP or magnetic variations on a tape. As a result, most analog transmission and storage systems are dedicated to one type of information or another*." (Tilson, Lyytinen, Sorensen 2010a, p. 2)

[70] "*Digitizing refers to a process whereby analog signals come to be represented by numbers, and ultimately as bits (a contraction of binary digits). Any analog signal can be digitized including audio, video, and images of increasing resolution and quality. The flexibility of digitizing is that, in principle, the same storage, transmission, and processing technologies can store, transmit, or manipulate just about any type of digital information. Thus, various forms of digitized information no longer have to be tightly coupled to particular transmission and storage technologies.*" (Tilson *et al.,* 2010a, p. 3)

In order to understand digitizing, we have to return to the second insight in Peters's essay: digitizing is not only about counting (ie. endowing analog signals with binary numeric values), but also about pointing – the act of digitizing indexes a datafied element in the physical reality, creating a digital representation of the element expressed in binary digits. Bit by bit, the act of digitizing therefore creates a digital representation of our physical reality (Hermann, Pentek and Otto, 2016). This digital representation of physical reality is more than an immaterial way of storing information about physical realm entities: the relationship between the physical reality and its digital representation is not unidirectional.

Digitization does not end at creating a digital representation of physically existing entities, but also enables a feedback loop from the digital representation to the physical realm. Either through the same sensor technology harnessed to detect and convert physical events into digital information, or through another set of technologies connected to the emerging digital representation of a specific entity, the linkage between the digital realm entities and the physical realm entities can be also used to create changes in the physical reality.

This results in the blurring of the boundaries between physical and digital reality, the underlying driver of for example the Industry 4.0 scenarios (Brettel *et al.*, 2014, Kagermann *et al.*, 2013, Kagermann, 2015, Gilchrist, 2016, Lasi *et al.*, 2014). In essence, the underlying logic is the same in the so called Smart factories or a pizza ordering mobile app: in the highly automated factories each movement of a physical lump of metal is datafied and digitized and transmitted into the digital system, in which certain processes are carried out and further transmitted back to the physical realm triggering the next movement in the physical realm. The fundamental logic is the same when you use the app in your mobile device to order pizza: your hunger is through your interaction with your mobile touchscreen converted into digital data, transmitted to the digital platform where it is processed to be received by the pizza parlor triggering actions that result in baking and delivering the pizza to you.

Ultimately digitizing is linked to the "datafication" of everything (Harari, 2017, Van Dijck, 2014, Zuboff, 2015), a notion highlighted in the concept of information era. Entities, which in the physical realm exist as qualitatively different (eg. human thoughts and robots), can through datafication and subsequent digitizing gain a qualitatively same existence in the realm of digital representations. Taking into account the two-way interaction between the digital and physical realm, this ultimately means that in theory (and increasingly in practice), entities which previously re-

quired diverse methods of processing, can now be processed together. Robots can be controlled by thoughts (Linturi *et al.*, 2014, Risto Linturi, 2016, Starr, 2014)[71].

So, digitizing is technology that in theory makes all data uniform. However, the creation of the digital representation requires also other things. First of all, a signal to be digitized is needed. Ultimately the building blocks of digital representations originate from five sources (Zuboff, 2015): from increasingly sophisticated and ubiquitous sensor technology (Abbas, Michael and Michael, 2014, Risto Linturi, 2016), from our interactions with digital devices, which always result in a trace (Brynjolfsson and McAfee, 2012, Hedman, Srinivasan and Lindgren, 2013), from highly diffused surveillance mechanisms (Lyon, 2001, 2003, 2015), from traces of digital autonomous transactions, and from the increasingly accessible existing databases created throughout the histories of economic and public organizations (firms and governments).

The accumulation of data from all these sources progresses with astonishing speed. As an example, the advances in sensor technology are rapid and extensive: from brainwaves (Sundaresan, 2017) to monitoring the level of alcohol in the inner air of a car driving by (Hewitt, 2014), or from following the insulin levels of a diabetic to enabling autonomous trucks to drive across a continent (Kolodny, 2018), the physical world phenomena not detectable through the advances in sensor technologies seem verging extinction in very near future. These developments are coupled with digital traces resulting from the human interactions with the digital devices or from automated transactions, the data captured by surveillance methods, and the data accessible through digitizing databases, resulting in a reality where nigh every facet of human action can be datafied.

To sum, we have the mechanisms through which the physical world phenomena are captured in data form, and the mechanism that makes that data uniform. The next requirements for creating a digital reality and utilizing that data are the mechanisms that enable transferring, storing and processing that data, connectivity.

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[71] At the moment of writing this (Feb 2018), a second update of the report on radical future technologies (Linturi, Kuusi, Ahlqvist 2014) originally commissioned by the Committee for the Future of the Finnish parliament has just (18.2.2018) been finished, but not yet published. The report is based on crowdsourcing and validating signals of radical technologies, mainly gathered through a closed Facebook group (www.facebook.com/groups/TuVRadikaalit) of more than 2000 contributors. I gained access to the second update prior to its publication through being a contributing member of the group. Several of the technological possibilities mentioned in this dissertation are grounded on the findings of the original report and its two updates. The update will be first published in Finnish, followed by an English version which will appear on the Finnish parliament website (www.eduskunta.fi/EN/lakiensaataminen/valiokunnat/tulevaisuusvaliokunta).

Information technology refers to the hardware and software used to store and process the data, and communications technology refers to the electric means of transferring that data between diverse actors (Huang *et al.*, 2012), including network and data transfer technologies ranging from radio waves to the new applications utilizing light (Wang, 2017). The notable innovation of internet (Wikipedia, 2018b) vanguarded the convergence of information and communication technologies by standardizing how the digital data should be packetized, addressed, transmitted, routed and received, resulting in the interconnectedness of previously disconnected computer networks. The internet protocol in short means that digital information is converted into a format where all actors in internet can store and process the same data. The concepts of Internet-of-Things or Internet-of-Everything essentially refer to the fact that not only does the data in the internet contain human generated data (resulting from the actions of human-terminal interaction), but also increasingly data directly created by machines (like industrial robots) and smart objects (like your fridge or toaster) (Miorandi *et al.*, 2012).

The concept of convergence[72] (Herzhoff, 2009), in itself a long established discussion (Lind, 2004), while lacking a clear definition (Appelgren, 2004, Nyström, 2007), however refers to the possibility, embedded in the uniformness of digital data, of processing any data by any device underpinned by any digital technology (Lyytinen and Yoo, 2002). In essence, a full digital convergence would mean that the digital representation of reality, created by datafying, digitizing and connecting diverse entities, could be accessed and processed through any digital device in its entirety.

While the current reality is far from it, the already experienced phenomena of convergence have resulted in notable strategic impacts, evidenced in the blurring of the boundaries between industries and across diverse levels of back-end operations (infrastructural and applied technologies) and front-end offerings (Singh and Raja, 2008). Information and communication technologies have become intermingled (Huang *et al.*, 2012), and for example retail and media have changed dramatically (Bughin, LaBerge and Mellbye, 2017) through convergence on the levels of offerings and technological solutions harnessed through changes in corporate structures, mergers and acquisitions[73].

However, while the essence of digital data is uniform, the technologies used in harnessing, storing, processing and transmitting it are currently far from standardized, mutually compatible or interoperable. Tilson *et al* (2010a) discuss the current-

[72] Merriam-Webster Dictionary defines convergence as: "The act of converging and especially moving towards union or uniformity".

[73] While there are ample examples of unsuccessful attempts at creating systemic convergence even within a company, however the control provided by ownership has its appeal.

ly divergent reality through identifying three layers: physical infrastructure, logical infrastructure (code), and content[74]. Currently each layer is dominated by competing and incompatible solutions, driving in part the emergent phenomena of ecosystemization (Basole *et al.*, 2015, Clarysse *et al.*, 2014, Iansiti and Levien, 2004, Moore, 1993, Mäkinen and Dedehayir, 2012) and platform economy.

Ultimately the ecosystems of for example Apple, Alphabet (Google/Android) and Amazon thrive through their ability to create convergence within their ecosystems on all the three levels to the extent of being able to efficiently exploit all digital data in the ecosystem. The battle of ecosystems witnessed within the mobile phone industry is a good example: Nokia didn't lose because of inferior technology, but because the ecosystem based business models of Apple and subsequently Android were better at delivering the convergence promise embedded in digital technology. The ecosystem of Apple, with its interconnected sets of devices, iTunes, App store, developer interfaces and data right management policies was the first digital ecosystem to fully reap the potential of creating convergent digital infrastructure appealing to both a wide mass of customers and offering producers (Tilson *et al.*, 2010b).

To summarize this chapter before moving on, digitizing refers to the act of converting signals into binary digits, thus uniforming all data – in theory. The increasingly advanced sensor technology datafies the physical world entities, providing the signals to be digitized. Additionally, the interactions with the existing digital devices leave a trace, which merge with the sensor based digital data from the physical reality to create a digital representation of reality. The interface between the digital and physical realities allows two-way interaction, which, through the malleability of the digital reality, increases the malleability of the physical environment.

While in theory the uniform nature of digital data would enable convergence, the compatibility and interoperability of all digital data with any digital technology and device, in practice the complex infrastructural and applied solutions are still highly technology specific. This triggers races of standardization, battles of ecosystems,

[74] "*…the physical layer infrastructure includes the networks of cables, computing hardware, and radio frequency spectrum. Non-digital physical layer infrastructures include books and magazines, LPs and CDs, video tape and film stock. It can also refer to physical locations for performances (e.g. theatres, and speakers' corner). The logical infrastructure (or code) layer is the logic that drives the physical infrastructure. In communications networks this corresponds to the software that makes the hardware run e.g. data protocols, the software that implements them, as well as services logics embedded in phone networks. For non-digital physical infrastructures the corresponding logical infrastructure could be the social protocols for getting published, signed to a label, or other ways of persuading gatekeepers to distribute creative works. The content layer represents what is sent across the infrastructure e.g. images, text, speech, music, or movies. This layer also has its own infrastructures. For example, intellectual property laws define what content is owned and what is left to the commons*." (Tilson et al 2010a, p. 6-7)

when diverse actors pursue dominance by creating internally convergent systems in ever-increasing scale and scope. Only future will tell the ultimate scale and scope of those convergent systems.

5.1.2 Big Data, Little Data and algorithmic decision-making

The origins of the concept Big Data are usually traced to 2001, when Doug Laney at Gartner wrote a research note discussing the changes in the three V's of data: volume, variety and velocity (Laney, 2001). Through the advances in datafying physical entities through developing sensor technology, and through the fact that any action and interaction in the digital realm creates more data, the amount of data keeps increasing (volume), and data arises from different sources in different forms (variety). In addition, the advances in the processing capabilities harnessed to deal with digital data mean that data is both created and processed with increasing speed (velocity). (Chen, Chiang and Storey, 2012, Newell and Marabelli, 2015).

While the definitions of big data have since proliferated, in essence the concept refers to the massive amount of digital data that creates the digital representation of reality – in not only contouring diverse objects and entities or physical movements, but equally constituted of the actions and even intentions, interests, desires and tastes captured through the human interactions in digital realm. For example, when browsing Facebook, its algorithm doesn't only track your "likes", but also the pauses in browsing when you stop to read a post before moving on (McNamee, 2018). Your pause becomes digital data, utilized to reap insights about how to deepen your engagement with Facebook.

The volume, variance and velocity of big data mean that the data is heterogeneous in both content and form (eg. from alphanumerical to sound or image), unstructured, changing and accumulating constantly (Constantiou and Kallinikos, 2015), which in turn means that human cognitive faculties are insufficient in processing it. Instead, the processing of big data relies on the increasing computing prowess driven algorithms designed to trace patterns, detect correlations, and subsequently churn out predictions. The most sophisticated algorithms operate based on the so called machine learning, which means that the algorithm is programmed to "learn" through processing vast amounts of data, resulting in the algorithm continuously developing its own algorithm (Wikipedia, 2018c). Essentially, the concept of artificial intelligence refers to these complex algorithms driven by machine learning (Urban, 2015, Yampolskiy, 2013).

Currently the artificial intelligence is so called ANI, artificial narrow intelligence (Urban, 2015), specifically programmed with sets of algorithms to carry out specific

sets of actions, with the machine learning process being harnessed to reach a given outcome. The results have been quite astounding: facial recognition AI is currently more accurate than human, distinct entities of AI have been able to create their own language, and AI can identify the sexual orientation of individuals by looking at their photos (Coldewey, 2017, Eckersley and Nasser, 2017, Wang and Kosinski, 2017, Linturi *et al.*, 2014, Linturi, 2016).

While I'm not quite the believer in Singularity (Harari, 2017, Kurzweil, 2016), the potential implications of developing general (AGI) or super (ASI) artificial intelligence require a note. Singularity in this context refers to the point when the artificial intelligence meets and exceeds human intelligence, not only in carrying out a specified task, but in deciding what tasks require carrying out.

As mentioned, currently the artificial intelligence is, while astonishingly intelligent, narrow. While facial recognition AI can open your iPhone X even when you are wearing sunglasses (Galvie, 2017), the same AI cannot do your statistical regression modelling or drive your car; another AI is required. If we humans, or the AI themselves manage to create a general AI, that would mean that the same AI algorithm could not only process a specific given task, but could process any task, not only the ones given to it, but the ones it would itself recognize as in need of processing. General AI would therefore gain a sort of sentience (referred to as singularity), which it could further use in developing its intelligence to the level of super artificial intelligence – rendering the difference between the intelligence of a mouse and a human minuscule compared to the difference between human, and sentient super artificial intelligence.

So, the algorithmic processing of the big data produces knowledge about general trends and correlations (Van Dijck, 2014). Newell and Marabelli (2015) highlight the implications of big data driven deductions by an example of car insurance: through processing big data created from the correlations between the driver profile (in terms of age and gender) and accidents, the algorithm (or artificial intelligence, if one prefers the concept) can predict that male drivers between 20 and 30 are more likely to be in accidents than other types of drivers. However, utilizing this data in assigning a risk premium for the car insurance risks discriminating, because not all male drivers of suitable age drive recklessly, and the big data driven analytics cannot accurately root out the risky drivers from the more sensible drivers.

It is here that the concept of little (or small) data emerges. Little data is big data about an individual actor (Boncheck, 2013). For example, tracking the driving behavior of an individual creates individual specific data, which can then be reflected against the statistical insights gleaned from big data to assess the risk pro-

file grounded on the driving behavior of the individual. This individual-specific driving behavior data can be then relatively fairly utilized in assigning (or not) a risk premium – or discounts, as for example an American insurance company does (Progressive, N/A). While this example of the use of little data feels benign enough, China is about to embark on a natural experiment on a national scale, utilizing the little data funneled from the big data sourced from the highly diffused mobile pay and social applications, and the existing infrastructure of for example surveillance monitors.

The Chinese internet developed on a trajectory quite distinct from its western counterpart, as lacking the access to such applications and sites popular in the west (Facebook, Google, Twitter to name a few), the Chinese filled the similar individual needs and desires through creating their own alternatives. Originally a versatile social media application, the popular WeChat by Tencent developed also into a mobile pay system, used by 700 million people in 2017 (Wikipedia, 2018e), rivaled closely by AliPay, the payment arm of Alibaba, and the proprietor of Sesame Credit (Hatton, 2015). Both of these mobile pay systems are currently used in the initial design phase of the Chinese government Social Credit System (Botsman, 2017).

The big data accumulating from the popularity of digital payment methods provides the Chinese government with a solution to the institutional gap created by the previously mainly non-existing documentation of such information that could be used as grounds for granting financial credit (Huang, Lei and Shen, 2016). In realizing the Social Credit System (Backer, 2017), the actions of the Chinese will be monitored utilizing digital technology, including the online activities (social interactions and financial transactions) and the physical movements detected by surveillance cameras equipped with sophisticated facial recognition AI (Aldama, 2017), and an according social credit rate will be endowed based on those actions. If the actions are deemed undesirable, it will impact the rate, which will further impact the job market, dating and educational opportunity status of the individual, and the credit rating of not only the individual but his/her kin and friends (Chin and Wong, 2016, Condliffe, 2016, Hatton, 2015). The initiative was launched in June 2014 as "Planning Outline for the Construction of a Social Credit System 2014-2020", with the aim to be realized in full by 2020 (Huang *et al.*, 2016).

Summarizing the discussion so far, big data is the voluminous and variant data created and processed with high velocity. Little data is the individual actor specific data trail funneled from and referenced against big data. Algorithmic decision-making and artificial intelligence refer to processing the vast amounts of heterogeneous data in ways that render it usable. One of the key discussions in regards to algo-

rithmic decision-making is its black boxed nature: as the algorithms are utilized especially in dealing with such data humans cannot process, decision-makers relying on the outcomes of these algorithmic processes cannot really understand the mechanisms through which the algorithms reach their conclusions (Clark and Newell, 2013, Goodman and Flaxman, 2016).

This requires a few notes before continuing to view the human component of digitalization. First of all, the artificial intelligence (the complex algorithms processing big data) is dependent on the extant data sets accessed and processed: the AI cannot utilize such data that doesn't exist, but it utilizes all data it has access to. This means that any potential bias or downright errors in the data sets travel to the outcomes, yet without the algorithmic processing capabilities, the errors or biases in those massive data sets are difficult to identify. Secondly, as the algorithms outperform us humans in processing the data, few or no humans can actually understand the steps taken in reaching the conclusions: therefore detecting a flaw in the algorithmic processes is extremely difficult – we will only get the outcome, not the grounds for it. (Weinberger, 2018b)

Thirdly, an algorithm needs to be programmed with a goal, essentially by pre-prioritizing a set of optimization outcomes in an order of importance. However as that prioritizing has to be done *a priori* being in the possession of everything potentially uncovered through the algorithmic processes (or through such new and surprising changes in the environment which change the problem setting), we can never be sure that the priorities formed based on the understanding of the now-moment will turn out as desirable at the time of reaching them when we are equipped by more knowledge. The algorithm doesn't possess such skills of judgement that would enable it to change its pre-programmed priorities based on new information not originally included in its task. (Goodman and Flaxman, 2016, Newell and Marabelli, 2015, Weinberger, 2018a, 2018b). The discussions of artificial intelligence ethics (Bostrom and Yudkowsky, 2014, F. Dignum, 1999, V. Dignum, 2018, Yampolskiy, 2013) pivot around these themes and require human choices.

The technological advances, consisting of sourcing and digitizing data, convergence and the resulting digital representation of reality evidenced in big and little data processed by algorithms constitute only the technical component of the socio-technical entity of digitalization. Before diving deeper into the human dimension in digitalization, the following subchapter makes an attempt of further clarifying the relationships of the diverse discussions pivoting around the themes of digitizing, digital technologies, digital transformation and digitalization.

5.1.3 Some layers of discussion

Seeing the bigger picture of the phenomenon of digitalization from the technological perspective is somewhat complicated, because the diverse and plural discussions view the overarching phenomenon from several vantages and levels of analysis. Therefore I find it necessary for the sake and purpose of this dissertation to try to identify the diverse levels and the roles in the myriad discussions. The following table is a huge simplification of complex issues, but will hopefully serve as a foundation for identifying the distinct levels and perspectives of different scholar and practitioner discussions accumulating around the theme of digitalization.

Table 4: Some perspectives and levels of digitalization discussion

Perspectives	Contents	Discussion examples
6. Implications	Impacts on industry boundaries, on firm practices and offering types, on society and individuals, on economy	Schwab, 2016, Hermann *et al.,* 2015, Newell and Marabelli, 2015, Geels, 2004, Wilenius and Casti, 2015, Zuboff, 2015
5. Applications	Individual technologies and solutions	Linturi *et al.,* 2014, 2016, 2018
4. Logic	Convergence, servitization, role of technology	Tilson *et al*., 2010ab, Vargo and Lusch (several), Bharadwaj *et al.,* 2013, Herzhoff, 2009
3. Processing	Standardizing, categorizing, analyzing	Eckersley and Nasser, 2017
2. Infrastructural	Generation, Storage, Transfer	Edwards *et al.,* 2007, Newell and Marabelli, 2015, Tilson *et al.,* 2010ab
1. Enablers	Datafication, digitizing, connectivity	Harari, 2017, Tilson *et al.,* 2010ab

To begin with the bottom level of analysis, the ultimate enablers and drivers of digitalization are the datafication of physical realm entities (Harari, 2017) in increasingly minutiae detail through developments in sensor technology, the act of converting that data into the uniform of binary digits, digital data (Tilson *et al.*, 2010a), and the developments in connectivity enabling the widening combining and access to digital data (Zuboff, 2015). The enablers are not in themselves not technology, just like electricity in itself is not, however they are coupled with technological entities that enable harnessing them.

The second level consists of the infrastructural technologies that make it possible to generate, store and transfer digital data (Edwards *et al.*, 2007). The level of infrastructure doesn't refer only to the physical cables, computers and data warehouses that enable utilizing the transformative power of the enablers, but also to the idea of internet as a network of networks and the developments of the telecommunications technologies – the advances in cloud computing, in connectivity (in terms of landlines, radio waves or optical solutions), and in data centers to name a few.

The third level refers to the advances in processing the data: the standardization of technologies that enable convergence, the categorizing and analyzing of the data, exceedingly the realm of the artificial intelligence (Eckersley and Nasser, 2017). This level entails not only the technological advances pertaining to the processing of the data, but also the requisite changes in regulations, rules, norms and codes that drive the developments of such standards that enable connections between diverse entities – the TCP/IP protocol of internet being a notable example.

The fourth level is more abstract. A tangible example of the changing logic underpinned by changes on the more fundamental level is the servitization of products (Vargo and Lusch, 2004): based on digital data about for example the operation of an elevator (KONE) or a ship engine (Wärtsilä), instead of selling an elevator or an engine, the producers can sell lifts of kilometers. Additional examples include changes in the role of technology in strategy (Bharadwaj *et al.*, 2013), or the convergence of information and communications technology offerings (Herzhoff, 2009, Huang *et al.*, 2012). The economic logic underpinning business operations changes from the economies of scale to for example economies of singularity or networks.

The fifth level is by far the most familiar, as it explores the individual technological advances based on datafication and digital technology. From mobile devices to applications, breakthroughs in material scanning, monitoring biometric information, or the developments resulting in autonomous transportation by land, sea and air, this is the dominant level of discussion. It should also be noted that not all radical technological advances (Linturi *et al.*, 2014) are immediately digital or data (advances in solar energy or solutions tackling the pollution of oceans to name few examples), but require additional linkages to be connected to digitalization (solar energy as a power source of diverse solutions or operated and harnessed through diverse digital applications, datafying the substances in the sea water and monitoring the cleaning processes).

The sixth level covers the discussions of the impacts of digital technologies – on individuals, firms, industries, economy and society on many levels. The discussions range from tangible outcomes, such as industry transformations (Bughin *et al.*, 2017),

to the intangible changes in perceptions (Yoo, 2010), and the wider societal implications (Arthur, 2017, Casti, 2012, Newell and Marabelli, 2015, Zuboff, 2015).

In perusing the vast amount of scholarly, professional and lay literature of the topic of digitalization, it becomes obvious that grasping the phenomenon as an entity is difficult – if not impossible – due to the complexity of issues on each level of discussion, and the fact that many of the discussions include some of the levels while neglecting others. I am not claiming that my layered understanding of the phenomenon is by any means conclusive, however as it is through this understanding that I view it, I deemed it necessary to escort the reader to the same vantage from which I continue with the following chapters.

5.2 Humans

To begin the dissection of the interplay of humans and technological systems, a very macro level approach serves the purpose well. A Russian economist, Nikolai Kondratieff proposed in the 1930's that the human society progresses in waves, driven first by technological paradigm changes, resulting in economic, social and political transformations (Kondratieff, 1979). The subsequent K-wavers propose that we are currently entering a sixth Kondratieff wave, driven by the digital technology (Wilenius and Casti, 2015). One depiction of the phenomenon is illustrated in the following figure.

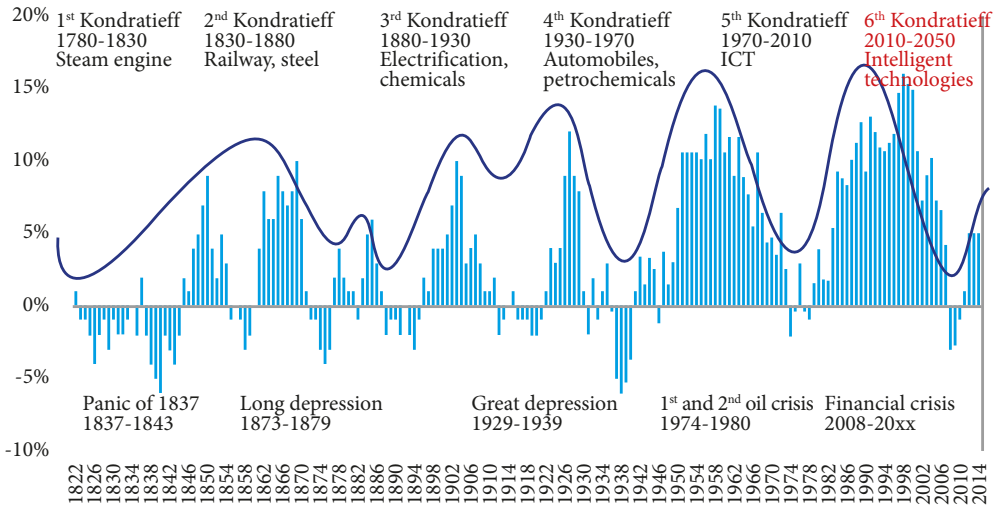


Figure 11: Kondratieff waves in Wilenius and Casti 2015, p. 339

In the figure above, the percentage relates to the Standard&Poor equity index, with the Kondratieff waves following both the technological innovations driving economy, and diverse economic shocks weakening the hold of current dominant technologies, making way for new technological paradigms (Wilenius and Casti, 2015). The message of the figure is that at any given point in time, the economic capital is intertwined with the dominant technological infrastructure, supported by the social and political systems. Either through the dwindling of the potential of the current technology to create more financial benefits, or through a shock, the new innovations gain a foothold (the creative destruction (Schumpeter, 1934)), gradually becoming the next dominant technological paradigms, followed and further strengthened by the economy and socio-political systems. The current transformation would therefore be grounded on the shock of the financial crisis in 2008-2010 creating space for new economic players relying on novel technological avenues, most notably the digitization referred to in this figure as intelligent technology.

While the mechanism is generally accepted, there is however no unanimous agreement about the number or break-off points of Kondratieff waves among scholars (Barnett, 2016, Korotayev and Tsirel, 2010), or of the mechanism through which the waves emerge (Ayres, 1990a, Ayres, 1990b), or for example of the impact of globalization on the potential of a uniform impact of any given technological paradigm change (Ayres, 2006, Dator, 2006). However, the discussion is in principle grounded on similar thinking as the rapidly diffusing concept of Industry 4.0. The difference between the discussions arise from the chosen perspectives: where the K-wavers view the economic developments, as the concept suggests, the Industry 4.0 discussions focus on the operational changes.

The origins of the notion of fourth industrial revolution emerged from the German car manufacturing industry (Gilchrist, 2016, Kagermann *et al.*, 2013, Kagermann, 2015), almost simultaneously diffused globally as a concept capturing the anticipated changes in industrial production (Brettel *et al.*, 2014, Hermann *et al.*, 2016, Lasi *et al.*, 2014, Schwab, 2016). The first industrial revolution refers to the mechanization in the mid 18th century ("Spinning jenny"), the second to the coinciding introductions of electricity and distribution of labor in the change of the 19th and 20th century (Taylor, 1914), and the third to the adoption of personal computers from 1970's onwards[75].

[75] Albeit it should be noted that there are also other cut-off points recognized as revolutions under the buzzword of Fourth Industrial revolution. Some begin with the agricultural revolution, whereas others begin only with the diffusion of electricity, however the cut-off points here explicated seem to be the most dominant version of the concept. For the sake of this discussion pinning down the revolutions "correctly" is not important, as regardless of the cut-off points, the notion is the same.

The current era, characterized by what in this dissertation is loosely defined as digitalization, is in this stream of research *ex ante* identified as driving a fourth, "revolutionary" change in the organizing of production. Essentially the fourth industrial revolution discussion highlights the automatization, autonomization and robotization of manufacturing, facilitated by the industrial Internet-of-Things, and the servitization (Vargo and Lusch, 2004) of the offerings.

While the approaches of Kondratieff waves and fourth industrial revolution are grounded on a very macro level analysis, the Multi Level Perspective (MLP) introduced by Geels (Geels, 2002, 2004, 2010, Geels and Schot, 2007) focuses more deeply on the actual process of socio-technical transformation. The MLP views the phenomenon on three different levels: wider environment, socio-technical regime (current dominant technology infrastructure, its users, diverse stakeholders and beneficiaries in terms of power coalescence), and emerging innovations, depicted in the following figure.

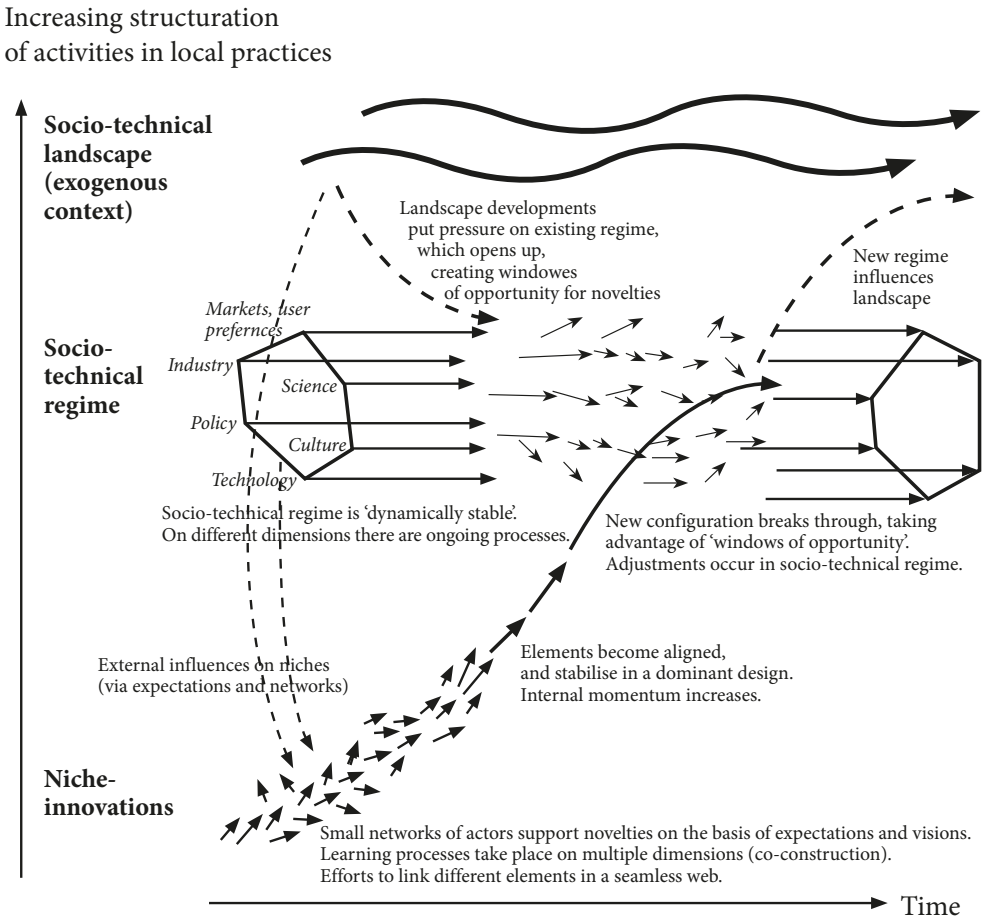


Figure 12: Multi Level Perspective on socio-technical transition in Geels&Schot 2007, p. 401

Building on the notion of technological regime by Nelson and Winter (1982), the core idea is that at any given point in time, the overarching socio-technological landscape is given stability by the dominant socio-technical regime constituting of engineers, scientists, policy-makers, users and other stakeholder groups and the embedded formal (regulative) and informal (normative, cognitive) institutions shaping the development and usage trajectories. This socio-technical regime is influenced by niche innovations, some of which get diffused enough to gain such momentum as to replace or transform the established socio-technical regime, resulting in changes in the overarching socio-technological landscape. This approach underpins also the discussions in Linturi *et al* (2014), Linturi (2016) and the oncoming Linturi 2018[76], which track the potential of radical technologies to create notable changes in the diverse value networks – in other words looking at how the niche innovations and the socio-technical regime interact.

Moving in towards viewing the diffusion of technology on the individual level, the rich research stream of technology adoption in the field of information systems provides ample insights of the more or less deliberate and witting acceptance of technology. One of the earliest models explaining the differences in the adoption of technology dates to the early 1960's (Rogers, 2010), when Rogers identified five different types of innovation adopters and positioned them onto a Gaussian scale ranging from innovators and early adopters to early and late majority, tailed by the laggards. Moore (1991) discussed the notion further and introduced the concept of "chasm" in between the early adopters and majority, highlighting how difficult it is to diffuse an innovation, to reach the critical mass constituted of the early and late majorities required for realizing the main benefits of a given technology.

Subsequent research about the individual and organizational level of sociotechnical systems (Leonardi and Barley, 2010) abounds from several perspectives: how individuals within an organization adopt new technology (Oliveira and Martins, 2011, Venkatesh and Davis, 2000), how consumers adopt new technology (Curran and Meuter, 2005, Taylor and Todd, 1995), or how the individual perceptions and features impact the adoption (Agarwal and Prasad, 1998, 1999, Davis, 1989). In addition, the more constructivist approaches of sociomateriality view the interplay of humans and technology as amalgams where the affordances of technology shape and are shaped by the human enactment (Orlikowski, 2010). Reviewing all these insights falls out of the scope of this discussion (for a concise and comprehensive overview of technology acceptance and adoption see for example Mäntymäki (2011), and for a review of the sociotechnical literature Leonardi and Barley (2010)) as the focal point of this sub-

[76] See footnote 71 for explanation.

chapter is not to explore why does an individual use a specific technology. Instead, next we turn towards the question of the level of the changes digitalization creates.

Viewing these four perspectives together highlights the nested nature of diverse approaches to how technological novelties impact humans. The following figure summarizes these approaches by positioning them on the axes of time and impact.

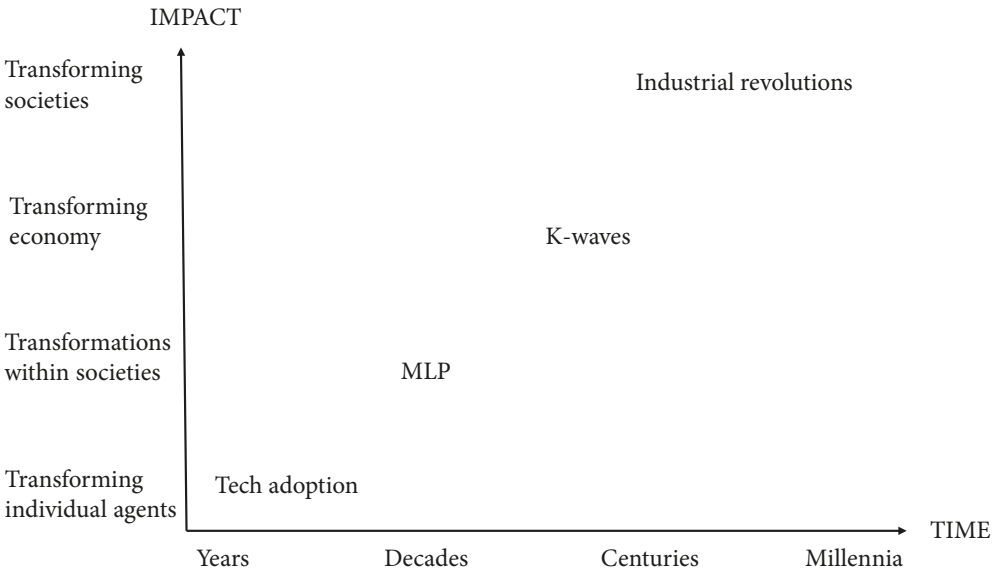


Figure 13: Nested approaches to technology driven changes

In the technology adoption and sociomateriality literature (Davis, 1989, Leonardi and Barley, 2010, Venkatesh and Davis, 2000), the units of analysis cover the individual technologies, the individual humans and the individual organizations. The discussions highlight the interaction of humans and technology, how and why individual humans engage with technology, and what are the implications of this engagement for the firms and organizations, including their operations, emerging sociotechnical systems and the financial outcomes. The scale of impact is therefore on the level of individual agents and the time scope spans years.

The multilevel perspective (MLP) (Geels, 2004) has a wider scope as it explores the change processes within societies: the relationships of existing socio-technical regimes and the niche innovations. The units of analysis are the socio-technical landscape, the socio-technical regimes and the diffusion of niche innovations, which means that the changes are traced through decades, and the scale of impact covers the existing societies, for example on the level of nations, regions or bounded through the criteria grounded on the definitions of the socio-technical landscape or regimes.

The literature on the Kondratieff waves (Wilenius and Casti, 2015) in turn doesn't focus on the boundaries of the societies as defined through socio-technical landscapes of regimes, but instead views the fundamental drivers and principles of the economic organizing. While the discussions include the impact of technological innovations, the time span of the changes is longer, covering centuries. The scale of impact is also even more profound, as the economic structures cut through and shape the different socio-technical entities – while naturally also being shaped by them.

While the discussions under the label of the fourth industrial revolution (Kagermann *et al.*, 2013) pivot primarily on the current era and the anticipated changes in the organization of production, work, economy and societies, viewing the impact and timing of the identified revolutionary drivers positions this approach on the widest macro level. The three revolutionary drivers of mechanization, electricity and division of labor, and computerization can however be complemented with additional, equally fundamental changes going back millennia: the initiation of agriculture, the development of writing and calculus, and the introduction of money to list at least a few equally fundamental development stages (Diamond, 1999, Freeman and Louça, 2001, Fremantle, 1992, Harari, 2014).

The concept of revolution in these contexts needs some explicating: if revolution is considered a sudden phenomenon, the notion doesn't apply, as it took time for these drivers to evolve and impact the overarching organizing of human existence. However, if we view humanity before and after the unfolding of these "revolutions", the impacts each has left in their wake are truly revolutionary. The human civilization before and after agriculture, writing, electricity or computers looks profoundly different.

The relevant question for the overarching discussion of this dissertation then emerges: at what level of transformation could and should the digitalization be viewed? If we define it through the changes it as sets of technological advances has on the humans, at what level do those changes in humans occur? Individual, within set social boundaries, within economy or on the very macro level of societal transformation?

The discussion of the infrastructural nature of digitalization highlights this question, claiming that the digitalization isn't driven by merely the deliberate adoption of specific technologies, innovations or applications (Tilson *et al.*, 2010a, 2010b). Instead, the digital technology is creating a society, where becoming a user is no longer a choice (Yoo, 2010). The same can be said about electricity or sanitation, long ago established as the taken-for-granted essentials of western life. The focal point is that like in the history of electricity, no electric technology *per se* was responsible for the

fact that we now run on electricity – equally, no digital technology *per se* is necessary for the future developments theoretically culminating in full digital convergence.

To understand the potential scale and scope of the impacts of digital technologies on humans, I again evoke the Causal Layered Analysis (Inayatullah, 1998). In the following table I will try to identify the layers of changes created by some previous revolutionary developments, in order to see if similar layers can thus be identified from the ongoing phenomenon of digitalization. This requires reconceptualizing the layers to encompass not only the endogenous dimensions captured in the original version, but to list also the exogenous drivers evidenced across layers, explained next.

As the reader might remember from the previous chapter, causal layered analysis is a tool developed in the field of futures research that enables analyzing a phenomenon through diverse perspectives – including diverse different philosophical approaches. The top level of litany includes the immediate appearances of a given phenomenon and the social causes are the causes that can be traced to create the appearances of the phenomena as effects. The layer of world view captures the underlying assumptions and perspectives that enable seeing and enacting those causes, and the fundamental level of myth/metaphor explores the metanarratives responsible for creating those worldviews.

As such, the causal layered analysis is primarily focused on endogenous themes, meaning the assumption, perceptions, standards of desirability and meaning making mechanisms – the internal drivers of agentic action. However, in order to utilize it in viewing these revolutionary changes in the organizing of human production and economy, the impact of the more exogenous drivers – the structural drivers of developments – on the very bottom level, and on the level of the causes is required. There are exogenous changes that have an impact on the endogenous changes, which in turn drive and shape the endogenous perceptions further impacting the evolution of the exogenous drivers.

In the following table, the layers are therefore named as follows: litany, the top layer covers in itself already the exogenously detected appearances of the phenomena under scrutiny, in addition to entailing also the immediate interpretations given endogenously. Social causes capture the endogenous divers of human actions, but they are complemented with structures, exogenous elements which shape and are shaped by the endogenous elements (in short, capturing the essence of the structuration theory (Giddens, 1984)). The worldview, by definition deals with the underpinning assumptions, being purely endogenous, whereas it is not only the endogenous myths and metaphors that drive fundamental change, but also the exogenous enablers that become woven into the endogenous myths and metaphors, again following the intertwining of structuration theory.

The following table captures two established moments of change in the human history, the agricultural, or neolithic revolution, and the second industrial revolution. Both eras can be defined as revolutionary based on the subsequent impacts, while neither of the eras are revolutionary in the sense of being clearly definable events. The roots and sprouts of these eras span backwards and forwards, however with a clustering in a definable period, creating some semblance of time boundaries.

Table 5: Adapted CLA of agricultural and second industrial revolutions

Phenomena Layers	Neolithic revolution	Second industrial revolution
Litany (endo&exo)	Civilization as we know it	Business as we know it
Social causes (endo)	Growing size of collectives, specialization of labor	Taylorism
Structures (exo)	Cities, villages	Mass production
Worldview (endo)	From nomadic to location bound lifestyle	Society as machine
Myth/metaphor (endo)	From hunting to harvesting	Might of scientific approach
Fundamental enablers (exo)	Agriculture (taming wheat)	Electricity

The agricultural revolution spans millennia in its unfolding (appr. 12 500 – 5 500 B.C.), however compared to the preceding millions of years spent hunting and gathering, the transformation was rapid. On the level of the litany, the outcomes of the agricultural revolution are the farms and cities that restructured the social hierarchies and organizing, and created what we currently refer to as civilization (Weisdorf, 2005). On the level of social causes and structures, we see the growing size of human collectives, enabled by farming and organized into the new structures of villages and subsequently cities. The increasing size of growing collectives was underpinned by the changes in the worldviews, the shift from viewing the nomadic lifestyle as the norm, to seeing the location-bound, sedentary lifestyle as the norm. The fundamental enablers driving these changes were the taming of the wild plants and animals, and the idea of agriculture: instead of pursuing, food could be grown. (Diamond, 1999, Harari, 2014).

The second industrial revolution in turn spanned decades (early-to-mid 19th to early 20th century), if not a century – again a lengthy period in itself, yet a mere blink of an eye compared to the rate of the preceding industrial developments. On the level of the litany, the era saw the emergence of the factories, industries and firms of contemporary form, the outlines of the economic realm as we currently know it. The social causes

underpinning these developments were the introduction of the scientific management, Taylorism, and the emergence of mass production, facilitated by the technological advances of the era. These changes were underpinned by changing worldviews: society began to be seen as a machine, where the individuals of the era where required as the clogs to spin the wheel, and the societies reformed in ways (eg. by initiating mass schooling to create the necessary factory work force) to enable that. The fundamental enablers of this revolution were the developments in the scientific mechanisms[77] and the technological advances that enabled for example harnessing the power of electricity. (Freeman and Louça, 2001, Freeman, 1997, Mokyr, 1998, 2000).

Now, viewing these fundamentally transformative eras in human history through the four levels of the causal layered analysis, how do the changes created by digitalization look like if positioned into the same table? While we cannot yet know the future consequences of the currently unfolding events, is it possible to identify such layers of digitalization that would enable anticipating whether the impact of digitalization on the humanity should be viewed through its impacts on the individual, within societies, on the economy, or on the societal structures themselves?

Table 6: CLA of revolutions and digitalization

Phenomena Layers	Neolithic revolution	Second industrial revolution	Digitalization
Litany (endo&exo)	Civilization as we know it	Business as we know it	Individual technologies and applications
Social causes (endo)	Growing size of collectives, specialization of labor	Taylorism	Experiental computing, two-way interaction between humans and digital infra
Structures (exo)	Cities, villages	Mass production	Standards, internet, increasing computing power
Worldview (endo)	From nomadic to location bound lifestyle	Society as machine	Convergence
Myth/metaphor (endo)	From hunting to harvesting	Might of scientific approach	Datafication Digitization
Fundamental enablers (exo)	Agriculture (taming wheat)	Electricity	Connectivity

[77] Like Mokyr put it "*The first Industrial Revolution – and most technological developments preceding it – had little or no scientific base. It created a chemical industry with no chemistry, an iron industry without metallurgy, power machinery without thermodynamics.*"(Mokyr 1998, p. 1)

Beginning again at the level of litany, it entails the contemporary discussions and representations of diverse digital technologies, applications and advances. The discussions are myriad and range from the developments in the specific technologies to the applications and implications, such as the emergence of the platform economy or the digital business ecosystems. As the technological advances, applications and implications are numerous and complex, this corner of the matrix is richly populated in both scholarly and practitioner-oriented literature.

On the second level of causes, the exogenous structures consist of the exponentially increasing computing power, standardization of data and technologies, and internet, supported by the advances in the connectivity. These structures shape and drive the individual developments evident in the level of the litany. On this level, the social causes include the emergence of what Yoo (2010) names experiental computing, discussed more in the following subchapter: people no longer think of using technology as an independent act, instead people go about their daily lives facilitated by ubiquitous technology as part of mundane routines.

A focal social cause is the two-way interaction between humans and digital infrastructures, best explained by comparison: there is a major difference between the digital infrastructure and for example electricity. We only utilize electricity and do not constitute an integral part in creating the electricity infrastructure. In contrast, in intertwining our life with the digital infrastructures, we don't only use the technology, but are used by it and contribute to creating it (Newell and Marabelli, 2015). It is our individual data, resulting from our interactions with and in the digital realm, that through digitization ultimately powers Facebook, Google or Amazon, contributing to the creation of the digital infrastructure and the litany level applications.

On the level of the worldview, the most distinctive shift in perceptions can be captured through the concept of convergence. Entities previously considered separate are now seen as the same. The blurring of the boundary between digital and physical realities is maybe easiest to explain through the phenomenon of social media. Social life used to exist in the physical realm, in between the human encounters. However, following the emergence of the social media platforms, social networking sites, the digital interactions within them are not only representations of social relationships and hierarchies in the physical world, but instead constitute a realm of social life by its own right. The positive and negative dimensions of human interaction within social networking sites are equally powerful and "real", as their counterparts in the physical realm (Mäntymäki and Islam, 2016).

However, the perception shift of convergence isn't limited to the phenomenon of social media. We find nothing unusual in our ability to monitor the temperature

of our house from afar through our mobile devices, to fulfill our transportation, accommodation or music listening needs with the aid of the same device, or to operate a full scale manufacturing facility through a few taps on a monitor. All of these actions used to consist of dealing with entities of different qualities, therefore in need of processing in different ways, whereas through digitalization the different qualities of physical realm entities have converged in ways that enable processing them through few multipurpose interfaces.

On the fundamental level of myth/metaphor, the endogenous force is the idea of datafication – everything is, creates and can be expressed as data. The fundamental exogenous enabler of this notion of mythic proportions is the act of digitizing, the transformation of any substance and event into binary digits. Fueled by the advances in connectivity, perceiving everything as data and representing it in binary digits drives the convergent worldview, creates digital infrastructures and seeds individual innovations and applications. In digitization, the core driver of these changes is not any specific technological innovation, but the possibility of full convergence inbuilt into the act of digitizing and connecting all types of data. The resulting social changes are actually not dependent on the choices of the individual to adopt or accept any digital technology, but ride on the historical waves that have led towards perceiving everything as data, coding all data in an ultimately uniform way, and connecting all that uniform data together.

Now, when we compare the fundamental level of these three phenomena here discussed, how do the potential implications of the changes in the myth/metaphor/enabler level compare? Will the impact of datafication and digitization equal the impacts of adopting the scientific mechanism and harnessing electricity, and the adoption of agriculture?

We don't know. Your guess is as good as mine. However, whatever level of impact we are dealing with, it ultimate hinges on the endogenous changes in the perceptions and assumptions of the humans – what are the worldviews and meaning making mechanisms we adopt and ground our next actions on? Therefore the next subchapter digs deeper into these elements.

5.3 Perceptions

5.3.1 Experiental computing

In his profound article, Yoo (2010) zooms into three alternative ways of conceptualizing human-computer interaction. The first, most historical approach he names rep-

resentational computing, in which computers (and all they entail, including online access) are viewed as mere technology. The second Yoo names imagined computing, and it refers to the creation and inhabiting of the virtual realities. The third approach, experiental computing, highlights the disappearing notion of specifically using technology – one no longer perceives using the phone but just talking to a friend.

In the first approach of representational computing, a computer in its various device forms (from table tops to mobile phones and tablets) represents fundamentally a tool, more versatile than a hammer, but ultimately the same. The computer is perceived as an interface through which extant resources can be accessed, developed and deployed. In this worldview, digital technology is perceived as a mere part in the continuum constituting of diverse technological tools (geared towards both work and leisure) such as wheel, spinning jenny, telegraph or television. Technology, including digital, is considered as a passive, separate entity from its users, with the main emphasis of research on the organizational theory side being the users, and on the information systems side being the technology as either consisting of distinct entities or technological systems. This line of division between the rich, yet diverse research streams (Orlikowski and Scott, 2008) highlights in itself the division within this perspective: humans and technology are two distinct entities habiting different hierarchical positions in regards to each other, human as the master and technology as the slave.

The approach Yoo calls imagined computing refers to a specific type of usage the computers allow: an individual may create a virtual alias and enhance his/her physical existence by entering the virtual world as another version of him/herself (Wasko *et al.*, 2011). This pertains to both the diverse game worlds and equally to the social networking sites, in which the individual may playact diverse roles, unrestricted by the social norms which (s)he as a physical individual is expected to follow. The reality enhancing nature of digital technology is in a major role in this perception, however that cyber reality remains detached from the physical reality, providing an escapist experience or an outlet for expressing such parts of oneself not given freedom in the physical realm.

While this perspective highlights the immersion of the individual in the digital reality, the "otherness" of that cyber reality still exists: the games, digital worlds or social media exist out there, intertwined with, yet outside the daily life of the individual, ultimately offering little more than has been throughout human history been sought by diving into a novel, taking drugs or watching a film or a play. The difference being the role of agency provided by the historical means of escape and the contemporary possibilities embedded in digital immersion – instead of being a passive reader, ob-

server or mind-enhancer, the individual as an avatar is an active participant in the unfolding of the imagined reality[78].

The third perspective, experiental computing in the vocabulary of Yoo, is also the approach adopted in the studies of sociomateriality (Leonardi and Barley, 2010, Yoo, 2010, Orlikowski and Scott, 2008), actually preceded already by Latour (1987, 2005) who stated that the technology and its use can be decoupled only artificially (Gaskin *et al.*, 2014) as ultimately technology becomes only in the process of its use. Within the organizational studies, the practice oriented research stream of sociomateriality (Feldman and Orlikowski, 2011) is supplemented also by the discussions of materiality (the time-specific constellation of the intrinsic properties of the scrutinized entities that enables theorizing about how the diverse properties shape and are shaped by the human perceptions and interactions (Paula Jarzabkowski, Spee and Smets, 2013)), and the discussions of the socio-technical systems scoped as an organization where the technological and social systems intertwine and shape one another (Leonardi, 2012, Trist and Bamforth, 1951).

In addition, the notion of experiental computing is reflected, albeit implicitly, also in the literature of information systems strategy. In their overview of the information systems strategy research, Peppard, Galliers and Thorogood (2014) show how the development of the field has followed the increasing diffusion of information technology. In the early research, the focus was on IS planning, meaning a specific activity involving the IT personnel and the technology design and implementation. Subsequently, the importance of the information technology was acknowledged in widening the sphere of study to involve the whole organization: IT was no longer a bracketed entity dealt by a specific staff, but an organization-wide phenomenon impacting the widely the organizational action.

As the importance of IT grew, it was reflected also in the calls for aligning the IS strategy with the business strategy. However, until recently, digital technology was deemed a mere development in the diverse technological systems utilized in business. As such, a digital strategy, or the ICT strategy has been considered a function-

[78] It can be of course argued whether the increased role of agency provided by virtual realities is a minor or major difference. In my view it's not a question of a qualitative difference but merely a question of the level of addictiveness: the mechanism driving individuals into seeking a visit to a different reality is as old as humanity, however with the advances in psychology and neurosciences, mediated through digital possibilities we are increasingly better at providing means to satisfying that need. Research on addictions shows that the mechanism of addiction is the same irrespective of the nature of the entity being addicted to (Armstrong, Phillips and Saling, 2000, Hirschman, 1992, Sellman, 2010), which leads me to the viewpoint that adding agency into the means of escape is on a scale of impact similar to switching beer to heroin. Yes, big, however the mechanism prevails.

al level strategy, a separate lower level strategy aligned with, but subordinate to the business strategy (Bharadwaj *et al.*, 2013, Peppard *et al.*, 2014). This perspective was challenged in the special issue in the MIS Quarterly in 2013, aimed at initiating discussion about the need to fuse the business strategy and the IS strategy into digital business strategy. This development ultimately underpins the disappearance of the notion of the representational use of technology: technology is not an independent entity specifically used, but merely one of the elements to account for when focusing on the actual practices and desired outcomes of everyday activities.

Experiental computing is underpinned by the increasing ubiquity of computers in various forms, used as mundane parts of daily activities. A computer is no longer a distinct entity bracketed out for moments of specific use, but an integral part of daily life: we glance at our fitness bands to see our daily step accumulation, hail for a taxi using diverse applications, communicate our thoughts and experiences through snapshots and one-liners in social media updates, compare the availability and prices of our purchases online – and indeed, increasingly carry out our shopping through our ever-present mobile phones. In short, we are continuously engaged in computing. Yoo (2010) talks about "embodied computing"[79]: the focus is not on the technology nor is the use of it distinguished from the normal daily activity – the impact of technology is in the shaping of what we perceive as normal daily activity.

The research about the intertwined nature of technology, its users and usage, and their perceptions and assumptions is rich within the context of organizational studies. However the notion highlighted by Yoo (2010) and Tilson *et al* (2010b) pivots on the understanding that with digitalization, the intertwining of technology, humans and perceptions is not limited to organizational reality, but spans the whole of human life, in part also contributing to the blurring of the divide between organizational reality (work) and the overarching daily reality of individuals. Tweeting is a way of life where the professional and lay roles of individuals are firmly fused. Twitter doesn't represent technology, but an integral part of identity and self-expression covering both work-related and personal facets of the individual's daily existence.

The most fundamental change wrought by digitalization is the paradox (Lewis, 2000, Smith and Lewis, 2011) in how we perceive technology: as the digital technology becomes more and more pervasive in our lives, it simultaneously becomes more and more invisible to us. It metaphorically becomes the air we breathe: a tak-

[79] "*Therefore, an embodiment relationship refers to a relationship between technology and users in which the technology mediates lived experiences of the users. As a contact lens wearer sees the world through contact lenses, technology in the embodiment relationship comes between the user and the world. Technology is not being interpreted, nor is it being experienced as an end in itself. Instead, it directly shapes and occasionally transforms our lived experiences.*" (Yoo, 2010, p. 218)

en-for-granted presence without which we cannot function, yet one we hardly perceive. The fragmented nature of contemporary science contributes partially to the increasing invisibility of digital technology: while the individual parts are scrutinized in exceeding detail, the overarching embeddedness of our existence in the digitally manipulated reality evades attention. The more we zoom into the trees, the less we see the forest.

5.3.2 Changing worldviews and values

In addition to changing how we perceive technology, digitalization impacts the way we view and interpret the external world, and our internal preferences and values. Internet is increasingly the interface between the individual and the external reality – in seeking information we turn to Google or Wikipedia, browse our favorite sites and interact with others through digital forums. In this subchapter the focus is first on how this digitally mediated information flow about external reality influences our perceptions.

In his notable book "The Filter Bubble: What Internet is Hiding from You" Eli Pariser (2011) pinpoints the decision of Google in 2009 to initialize personalized search as the beacon of the new era of Internet. Personalized search means that the search engine uses the digital traces accumulated from the previous online activities of the user to choose the presented outcomes of a given search. In essence this means that as the online activities of the individuals differ, the search outcome of a given keyword are different for each individual. The same approach underpins also the social networking systems (Bakshy, Messing and Adamic, 2015, McNamee, 2018). The algorithms of social networks aim at maximizing the time spent within the networks, which means that they analyze the user behavior in order to present the user with material that increases the engagement. (Lazer, 2015).

The result of personalized search and engagement driving algorithms is the creation of the so called echo chambers (Sunstein, 2009, 2018): like Sunstein notes, what Nicholas Negroponte in 1995 dubbed as the Daily Me (Negroponte, 1995), has in the few decades transformed from futurist utopia to everyday reality. As all our digital activities leave a trace, and those traces are used to present us with content we are assumed to want to see, the information we access online is tailor-made to suit our assumed opinions and preferences, echoing the opinions and preferences deduced from our previous online behavior. In the 1990's this idea, expressed by Negroponte, was fiction, however in 2010's the filter bubbles (Bozdag and van den Hoven, 2015) and the resulting echo chambers (Flaxman, Goel and Rao, 2016) constitute the primary *modus operandi* of the digital infrastructure of Internet and the diversity of applications based on that infrastructure.

Furthermore, like Newell and Marabelli (2015) point out, our opinions and preferences are not only sourced from our deliberate online actions, but also from the in-built sensors in the devices (Abbas *et al.*, 2014) we use to access the digital realm. For example the location-based services in my personal device make it possible to track not only my physical location, but also to combine that information with the location of other individuals' personal devices and the location specific data (eg. the shops or events at any given location), and use these connections in profiling me in even more detail. A diffused utilization of these technological possibilities is exemplified in Facebook advertisements. If I accompany my tractor aficionado friend at an agricultural fair, it may well be that soon after, my Facebook feed presents me with an advertisement of the newest model of John Deere (Peterson, 2017). Another example of the technology converting our physical realm activities into digital data comes from Hitachi that offers firms the possibility of monitoring the exact location, the conversation partners and the length and enthusiasm of conversations of the employees through specific name badges equipped with sensors and coupled with artificial intelligence (Greene, 2014).

So, the reality we encounter through our interactions with our ubiquitous digital devices is filtered based on our past digital behavior, including our social interactions online, and increasingly also on such traces of our offline activities that can be sourced and digitized through advancing sensor technology (Brynjolfsson and McAfee, 2012, Zuboff, 2015). While the porousness or solidity of the boundaries of these filter bubbles and echo chambers are debated (Bakshy *et al.*, 2015, Flaxman *et al.*, 2016), we are increasingly grounding our perceptions of the world on curated material already influenced by what we consider true, relevant or interesting.

This means that each one of us is presented with a unique representation of reality. However, some of the unique representations are further apart than others, which means that the human tendency of seeking tribes, the desire to belong in a group (Deci and Ryan, 2000) plays an equally big role in constructing the representation of reality we through the digital media perceive, and build our respective worldviews on. In addition to being responsible for the fragmentation of our perceptions of the reality, digitalization equally creates new modes and methods of constructing social groups and collectives. These new groups and collectives are not formed following the traditional boundaries created by geography, ethnicity, age or socio-economic status, but emerge through other mechanisms.

Drawing from the discussion of epistemic objects (Cetina, 2001), emerging in the practice oriented theorizing, Jyri Engeström wrote a popular blog posting in 2005 to understand why some of the then relatively new social networks succeeded where

the others did not (Engeström, 2005). An epistemic, or knowledge object refers to an object of attention, which doesn't need to be a thing or a clear entity, but something that the subjects perceiving the object recognize as existing in a more or less defined form. In his discussion of the early social networking sites, Engeström pointed out that it is not actually enough to enable social networking, if there are no reasons for the individuals to connect. What draws people in and together are the social objects around which they want to cluster.

Social objects (in Engeström's terminology, adopted also in this dissertation) are epistemic objects that create the nodes in the social networks, providing the individuals the reason to join the networks and engage in interaction with select others. What is new in these drivers of group-forming is the fact that they do not arise from **within** the traditional boundaries (e.g. geography, ethnicity), but instead they form **around** something that gives the collective a reason to talk to each other, instead of to someone else. An illustrative example of a social object is a Facebook group called "I'll park on the bicycle lane", in which cyclists post pictures of cars parked on, yes, bicycle lanes. The social object is more than the photos of wrongly parked cars, but encompasses the shared sentiments of cyclists about the perceived relationships between the cyclists and drivers. This social object has pulled together a collective of likeminded individuals, created normative institutions, which flow out from the social media group, impacting not only the actions and perceptions of the participating individuals, but also their interactions in the outside world. This in turn kindles the ongoing friction between cyclists and drivers witnessed further in the traditional media, which feeds the social media group with an increasing number of likeminded individuals, resulting in the growing size of that specific "tribe" of otherwise highly diverse individuals.

Social objects take many forms, from hobbies to pro- or anti-Trump, from professions to animal rights, from events, sites and locations to specific preferences in consumption behavior. Interacting within or about the cluster around a specific social object creates digital traces, which are subsequently further processed by algorithms responsible for creating the personalized view encountered in internet searches and social network feeds. So, while the view of the world through the lenses provided by internet is unique to each individual, the social objects create clusters, within which the worldviews homogenize to an extent (Lazer, 2015). This in turn shapes the perceptions, assumptions and worldview, which influence subsequent actions leaving digital traces, further processed in curating even more detailed perspectives.

In short, the more we rely on digital sources, namely internet, in pursuing knowledge about the world around us, the more the algorithms learn about us, and the

more curated worldview they present us. In addition, the algorithms learn about us also through such means of monitoring that are not dependent on our deliberate actions – through the location based sensors embedded in our mobile devices, or through the increasingly ubiquitous surveillance mechanisms to name few notable examples (Zuboff, 2015). These mechanisms have an impact on us not only through the perspective we thus view the external reality, but also through ensuing tradeoffs that impact our internal values and preferences. Newell and Marabelli (2015) identify three of these resulting tradeoffs influencing, and being grounded on our perceptions, emerging from the accumulation of personal digital data and its algorithmic processing: privacy vs security, freedom vs control and independence vs dependence.

The first tradeoff pivots on the choice between privacy and security, being increasingly decoupled as a result of digitalization. The concept of privacy is highly elusive, as are the meaning making mechanisms endowing the concept with value (Smith, Dinev and Xu, 2011): is privacy a state (of being private or of being in control of matters concerning one) or a value (as an inherent human right or a commodity to be bargained with)? In their review of discussions of information privacy, Smith *et al* (2011) further identify what privacy is not: it's not synonymous with anonymity, confidentiality, security, secrecy or general ethics, while all of these separate concepts have connections to the concept of privacy[80].

One example of the unfolding shift in the perception of privacy has been documented among teenagers who, according to a study acknowledge the tradeoff and value their privacy, however are still willing to share their private information in online networks (Marwick and Boyd, 2014). Interestingly, what Marwick and Boyd found was that the seemingly contradictive behavior of valuing privacy yet sharing huge amounts of personal information online emerged from the complex practices the teenagers used in order to control who saw and understood what from their diverse postings. In short, the teenagers took the privacy infringing mechanisms of social networks for granted, but fashioned strategies that enabled them to feel in control while engaging in social interactions through digital media. This underlines a shift in perception from privacy as a general state of being private to privacy as referring to being in control (Smith *et al.*, 2011).

[80] To illustrate the bundling of the concepts through a perception change, in olden times, if you wanted your treasure to be safe, you were sure to bury it in a hidden location and keep the knowledge of its location very private: privacy and security were coupled. Digital data in turn is never private, but it can be secure – the logic being that it shouldn't matter if the sums on my bank account are public, as long as no-one but me can access it. Security and privacy are decoupled.

However, to highlight the tradeoff of privacy and security instead of merely viewing the changes in the perception of privacy, the focus should be on the exchange of individual level privacy and the collective level security (Dinev, Hart and Mullen, 2008). Sensor technology and algorithmic processing enable surveillance of an unforeseen scale and scope: we are rapidly entering the era of panopticon, the prison conceptualized by Jeremy Bentham in the late 18th century (Foucault, 2012). Through surveillance (Lyon, 2001, 2003, 2015), we can increase the collective security within an organization, within a city, or on a national level; combining the monitoring of the physical actions of the individuals with their online behavior could enable predicting and preventing malicious acts[81]. The technology sets little limits, which means that the discussion of the balance – or the tradeoff – of between collective security and individual privacy is a political[82], and ultimately an ethical one. These discussions are underpinned by the worldviews and assumptions of the individuals and collectives, the meaning making mechanisms creating the standards of desirability: in short the individual and collective doxa through which we analyze these implications.

The second tradeoff recognized by Newell and Marabelli (2015), freedom vs control, is closely intertwined with the discussions of privacy and security, however the undertones are more somber. While privacy and freedom are not synonymous, the loss of one may lead to the loss of other. Equally, when pursuing collective security becomes the norm, it imposes control, either informed or uninformed on the individuals. Control however encompasses far more than the realm of security. To control means to use power over someone, a parent over a child, an employer over an employee, a government over a citizen. The mechanisms of control provided by digitalization rely not on the physical cracking of the whip witnessed in previous era, but on the increasing monitoring of the individuals (Botsman, 2017, Greene, 2014, Lyon, 2015, Leonard, 2008). And like we know at least since the early Hawthorn studies of Elton Mayo, people behave differently observed and un-observed (Mayo, 1949) – even when not deliberately nudged to change their behavior (Leonard, 2008).

The third tradeoff, independence vs dependence, is also firmly entwined in the mechanisms of control, arguments of security and the notions of privacy and freedom. The more we use technology to facilitate our daily life, the more dependent on

[81] "*This is exemplified by the Lee Rigby case (the British soldier killed on a street in London), where Facebook was accused of not helping to protect security because it did not use its analytical capability to detect and report the fact that the killer was posting that he was intending to commit just such a murder (http://www.theguardian.com/uk-news/live/2014/nov/25/lee-rigby-woolwich-inquiry-report-published-live-coverage).*" (Newell and Marabelli 2015, p.6)

[82] The recently enforced European General Data Protection Regulation (GPDR) is a timely example of the political actions emerging from these technological development driven discussions surrounding these themes. (European Union, 2016a, European Union, 2016b)

that technology we become. The dependency emerges through many processes: first of all through habituation, the development of routines that shape (and are shaped by) our daily activities. Research on routine formation (Pentland *et al.*, 2011) and on the other hand sociomateriality (Jarzabkowski *et al.*, 2013) highlight the impact of the nature of the technological affordances (Volkoff and Strong, 2013) in shaping and enforcing our daily actions.

Newell and Marabelli (2015) illustrate another mechanism, based on the processes of learning: the more we become used to relying on technology (e.g. in navigating with GPS, parking the car with sensors, or saving phone numbers in a phone), the less we practice those skills, and subsequently, the less we have those skills. To sum, learning and upholding a skill, becoming competent, needs practice (Argote, 2012, Brown and Duguid, 1991, Burke, 2002, Dall'Alba and Sandberg, 2010, Levitt and March, 1988), and externalizing the practice to technology means that no learning happens and the skills, competences deteriorate. This subsequently drives dependence: as the skills to park a car without sensor technology disappear, the sensors become essential, and the driver dependent on them.

A third mechanism of dependence is infrastructural: the environment changes in ways that make it impossible to perform certain actions without relying on (digital) technology. A good example are the banking services (Montazemi and Qahri-Saremi, 2015): as more and more people pay their bills online utilizing the online banking, the more the banks concentrate their customer service in internet and close down the physical service points to the extent that even if you wanted to pay your bill by interacting with a real person at a physical, offline event, you no longer have the opportunity for doing it.

These three drivers of dependence converge in creating the experienced convenience offered by digitalization. We follow habits and routines, because they save cognitive energy, making life more convenient. We use technology in assisting us with performing arduous tasks, because we can save ourselves from the hard work of practicing, making life more convenient. We shape our actions based on the easiest available environmental structures, because swimming against the tide is tiring and would make our lives less convenient. Convenience is the mediating element: the more the digital technologies provide convenience, the more dependency they create.

Drawing together the previous discussions of the identified tradeoffs by Newell and Marabelli (2015), on the other side we have privacy, freedom and independence, and on the other side security, control, convenience and dependency. However, unlike Newell and Marabelli, I don't see these tradeoffs as separate, but highly entwined

– especially when viewed through the changes in the perceptions, the standards of desirability and meaning making mechanisms.

The first change was already touched upon: how do we perceive privacy and how do we value it? Privacy as a state of being private is facing extinction with the increasing traceability of our actions and even thoughts (Hutson, 2017). However, privacy as a state of being in control of matters that concern oneself is faring better – as exemplified by the practices of the teenagers on the one hand, and the changes in legislation (the GDPR) on the other. Privacy as a state of being in control also comes close to privacy as a value of commodity: by being in control of matters pertaining us, we can choose to exchange our privacy for offerings that have more value (than privacy) for us at any given moment. For example, by joining a bonus program of a retailer, the currency we use is our personal data (privacy as commodity), and in exchange we gain benefits in terms of discounts, prizes and increasing convenience in being offered what we are known to want instead of us needing to look for what it is we think we want.

When we perceive privacy as a value in terms of being a human right, the tradeoffs of security and control become more pronounced. Which weighs more on the scales of human values, my human right of privacy, or the collective human right of societal security (as reflected in my perception of my own security as a part of a collective)? Following the discussions of terrorism or the autonomous driving, it would seem that in this issue, the security weighs more: people tend to, albeit grudgingly, approve of the intrusions on their individual privacy in exchange of feeling more secure in their collectives (Dinev *et al.*, 2008). However, what should be noted here, is that privacy and collective security are not linked directly – mere knowledge about the private actions, thoughts or intentions does not yet increase security. The knowledge needs acting upon.

This is the step where privacy and freedom become firmly bundled – and security and control equally so. Mere knowledge gleaned from breaching privacy doesn't increase security[83]: it needs to be coupled with actions that aim at control, that diminish the freedom of the individual to pursue actions deemed undesirable by the surveilling actors (exemplified maybe most acutely in the imminent Chinese Social Credit Rating System). What this means is that the discussion of the perceived importance of privacy is in itself merely conceptual, whereas the practical implications of the perception shift arise through the impacts of the mechanisms of control, the influences on freedom.

The mechanisms of control embedded in digital technology encompass not only the governmental actions or explicit surveillance, but run deeper in the mechanisms

[83] Remember the Lee Rigby case discussed by Newell and Marabelli in footnote 81?

of personalized search and social network algorithms tailoring our worldview. This theme is illustrated in the recent revelations of the influence of the Russian actors on the US presidential campaign in 2016 (Apuzzo and LaFraniere, 2018). While we are lacking the counter-factual evidence (ie. how the elections would have turned out without the external, orchestrated influence endeavors) of the election outcomes, the activities of the Russians however illustrate how the ingrained features of our contemporary internet can be exploited in reducing individual freedom and creating insidious means of control (Cadwallar, 2016). While the case of US presidential elections has elicited a lot of discussion due to the element of a foreign national power infringing on the elections of another sovereignty, the very same mechanisms can be exploited by commercial actors or governments on their own citizens – however examples of such behavior are harder to come by[84], unless we count the Chinese Social Credit Rating System discussions as such.

But, coming back to the overarching theme of this subchapter, the dimension of perception change in digitalization, it is time to weave these discussions into a coherent entity. First of all, both the external and internal perception changes are dependent on the amount of interaction with digital technologies, either through the deliberate online activities leaving a digital trace, or through the increasingly diffused sensor and surveillance technologies tracing our activities. Secondly, both the deliberate online behavior and the diffusion of digital technology embedded with sensors reflect our willingness to become dependent on the convenience of life provided by digital solutions.

Thirdly, the vista of external reality through digital media is the more curated the more digital traces one leaves. This applies both to the individual level personalization of the internet searches and social network feeds, and to the collective clusters forming around social objects, unbound by the distances of space or time. Fourthly, the currencies with which we pay for the increased dependency-driving convenience are privacy on the abstract level, and freedom on the practical level. We become more controlled, while rationalizing the exchange through the need for feeling collectively secure. The sentiments of threat and security further impact our willingness to succumb to the promise of convenience: not only is using digital technology convenient, but it makes our life safer through increasing traffic safety, through facilitating the tracking of the undesirables (quite literally in the case of convicts monitored at home through ankle bracelets), and through monitoring our health (by fitness bands or the

[84] One of these examples emerged just at the time of finalizing this dissertation. The Cambridge Analytica case, the utilization of Facebook data on behalf of the Trump presidential campaign, is discussed further in the chapter 7.

solutions designed to assess the insulin levels on the diabetics) to name a few notable examples.

In sum, concepts such as privacy, freedom or independence are highly abstract (especially in the Western societies, where these values have long been taken for granted – at least to an extent), whereas the promises of convenience and security are quite tangible. Digitalization on the level of perceptions requires reassessing the respective values of these values: what are the standards of desirability and the subsequent tradeoffs our meaning making mechanisms underpin? Put simply, are security and convenience superior to privacy, freedom and independence? If so, why? If not, why not?

5.4 Summarizing: so what is digitalization?

In this dissertation, digitalization is perceived as a trinity of digital technological systems, their impact on humans and the subsequent influences on perceptions. The technological systems are a layered phenomenon, underpinned by the fundamental notion of transforming the objects of all three worlds of Popper (physical entities, subjective entities like sentiments, and intersubjective entities like stories and cultures) into data, despite their originally different ontological foundations. Digitizing and connecting these data form objects subsequently and theoretically enables convergence, meaning that all of these objects can be processed through similar means – if not yet through same technologies.

The data form entities are highly malleable, and have a strong feedback connection to the entities they represent in the Popperian realities. This means that the physical, subjective and intersubjective realities subsequently become more malleable. This malleability impacts the social structures, on the level of the individual, the organization, the economy, and the social collectives of diverse scale and scope.

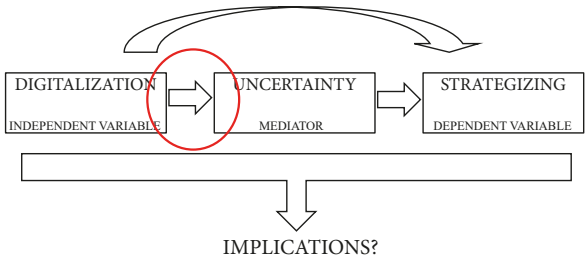
One of the implications of this malleability is the ability of digital technology to curate an individual perspective of the external world for each individual user. This happens through the processing capabilities of algorithmic intelligence that learns to know us from the digital traces we leave either through our deliberate actions or through the increasingly ubiquitous sensors. The malleability simultaneously enables the formation of new collectives, gathered around a social object instead of being formed within the traditional boundaries of time and space.

This malleability offers us convenience and security, in exchange for privacy, freedom and independence. The appeal of convenience is equally evidenced in the in-

creasing invisibility of technology, as we no longer distinguish between using it and just living our lives.

However, there are myriad obstacles still on the way to full convergence and the ensuing level of malleability of everything. Currently the primary obstacles still arise from the technological imperfections, but in the future, the obstacles will be ethical, political and social. The humanity will decide – wittingly or not – the scope and scale of convergence, and the standards of desirability dictating the value preferences guiding the future developments. Only time will tell, if Hayek was wrong in his prediction quoted at the onset of this chapter: will there at some point in the future be a fully convergent digital representation of reality that can be processed by a set of omniscient cognitions?

6 HOW DOES DIGITALIZATION IMPACT UNCERTAINTY?



"What is life, if not the first-ever carbon-based nanotechnology?"
(Dima Zales: The Last Humans)

In essence, the following chapter outlines the answers to the first subquestion of this research: how does digitalization change the constitution of uncertainty? The following discussions takes a deeper look at how each of the dimensions of uncertainty identified in this book are influenced by digitalization. The following figure maps out and summarizes the findings, subsequently explored in more detail.

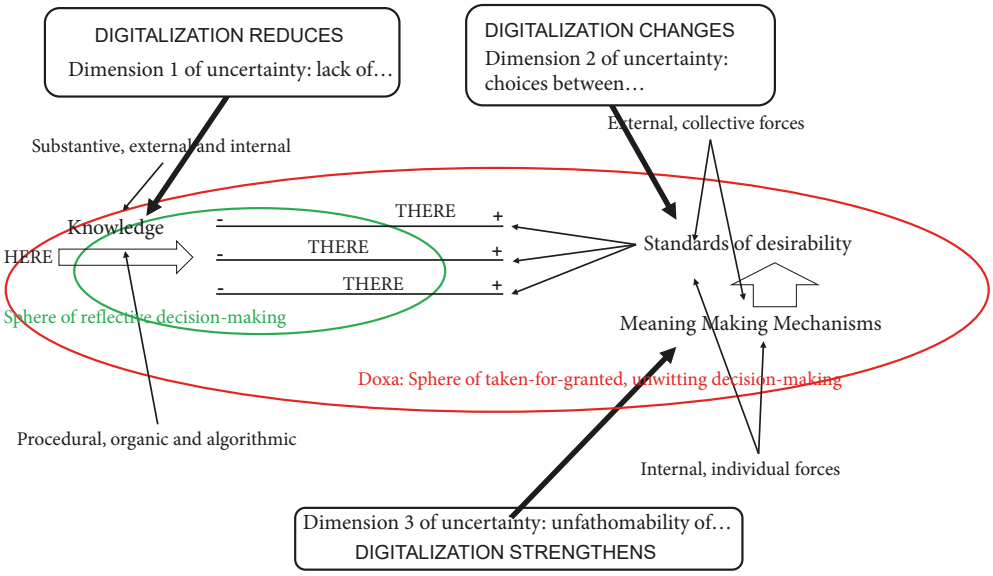


Figure 14: The impact areas of digitalization

To outline concisely, digitalization reduces the relevance of one type of lack of knowledge uncertainty, changes the mechanisms by which we choose between diverse standards of desirability, and enforces the uncertainty arising from the un-

fathomability of meaning making mechanisms. Before discussing the answers to the main research question, these claims need to be argued for next.

6.1 Impact on the lack of knowledge

In the early days of compact discs (CD), there were music aficionados vehemently against rendering music digital, claiming that the digital music was "dead", not quite capturing the rich nuances included in the analog recordings on LP's. While I still have a few friends of that opinion, most of the world has gleefully accepted the tradeoff: by making recordings digital, access to music has soared, and music has become an everyday commodity[85]. Most people are happy to stream anything they want to listen, anywhere they want to listen, anytime they want to listen, even if it means that what is listened is a somewhat pale representation of the richer, analog version – not to mention the even more nuanced version of a live music concert.

What has happened to the music is happening to everything. We are becoming increasingly better at capturing and digitizing any form of signals, be they sound, light, movement, material (as gas, fluid or solid). Even our thoughts and dreams as brainwaves can be captured and digitized.

On the one hand this means that everything becomes data. It is by no means misleading to call this emerging period in the human history the Information age. Capturing the signals through increasingly sophisticated sensor technology is the first building block, followed by the developments in the data emission, connectivity, storage and processing capabilities. We are well on our way of creating digital representations of not only our physical world but of all our activities, thoughts and dreams – subsequently followed by convergence of an unforeseeable scale and scope.

In the realm of business, this means that any decisions previously made based on data scarcity can now be made based on data abundance. The limits to the data availability are drawn by the resources and capabilities of the firm to gather and process the available Big Data – and subsequent Little Data. Customer data, process data, product data, market data – everything can be collected in minutiae detail. While the human processing power isn't enough in handling all that data, the sophisticated algorithms, the artificial intelligence can sort through immense amounts of data, looking for patterns we don't even know exist. In addition, AI is not subject to any

[85] This has of course also the impact on music as a livelihood: as the costs of copying and diffusion have become minimal, fewer people are willing to compensate the musicians for their original input. Enter the ongoing IPR battles, the results of which will emerge in few years.

of the human decision-making biases or heuristics, instead carrying out logically the very task it is asked to perform.

There are some caveats to this: while abundant data is available to anyone with an online access, the processing capability, access or the ability to create sorting algorithms is more difficult to come by. This means that the sheer amount of data becomes a problem for some, while providing competitive advantage to others. Within the business sphere, the winners are the players who can not only access Big and Little Data, but who have the means and acumen to harness the data through having a developed enough AI at their disposal, and through being able to ask the AI to find out answers to the right questions[86]. So far, we humans are still needed in figuring out the right problems that the narrow AI can help solve through the access to abundant data.

Without the help in processing the data, the amount of data becomes a problem. This is at its most evident in the sphere of mundane activities: everyone with an online access has at his/her fingertips essentially all the knowledge accumulated by the humanity. However, equipped with only human intellect, highly variant in quality and disposition, riddled with bias and heuristics, pestered by fatigue and stress, swayed by emotions and colored by judgement, the amount of data befuddles more than enlightens the average individual.

This is evident in the so called filter bubbles and echo chambers: as we as individuals lack the adequate processing capabilities to sort the available information into gems and gunk, we do what we have as humans always done. We choose someone to believe in, and rely on him of her to sort out the information for us. That someone can be our friend, a cult leader or the president we chose to elect because he told us what we wanted to hear.

On the other hand, while we are well on our way to creating a digital representation of all three worlds of reality, they are still merely just that: digital, binary renditions of the three world entities (Popper, 1979). This means that the digital realm leaves out a lot of what constitutes the whole of our life. Even in terms of the physical world one, even in terms of us being able to binarify continuously smaller and smaller entities, there will always be something in between the zero and the one. To what

[86] The importance of judgement doesn't go away as illustrated by the recent United Airlines fiasco ending in guards dragging a doctor violently from an airplane. This series of events resulted from a series of logical decisions made by diverse AI, without the filtering of human judgement, see the story here: https://medium.com/intuitionmachine/how-algorithms-and-authoritarianism-created-a-corporate-nightmare-at-united-92d9bbdf1144 or here: http://globalguerrillas.typepad.com/globalguerrillas/2017/04/algorithmic-dystopia.html

extent this matters, I don't know. However, few are the times in human history when seeing something as black and white has been purely beneficial.

In turning to the worlds two and three, we can digitally identify and represent the brainwaves evidenced when we feel sad, but there is no representing how that world two phenomenon actually feels – so far we humans still do the feeling itself. The impact of digitalization seeps into our perceptions, self-awareness and deeper interaction: when we are feeling sad, we communicate that by a crying emoji and hope that the recipient understands the exact shade of blue we are feeling, and responses fittingly. In receiving a mere thumbs up emoji, we feel left down. The quickness of communication and expression provided by digital simplification trades off the depth and nuances of genuine human interaction.

The impact of digitalization on the world three constructs is interesting. The whole digital realm is a human construct, a world three artefact made physical. But in pinning down the human creativity into binary codes, a lot is left out. Anyone who has ever written or read a novel understands how much there is in between the lines, how much implicit information is conveyed – either to be understood or misunderstood.

These implicit parts, like our intuitive understanding of the act of picking up a hammer, cannot be digitally represented, and as such, they cannot by algorithmic intelligence be processed – unless the algorithm is first fed with all the possible implications any act may in diverse contexts mean. This is a vast feat, which would require us being cognizant of all of those potential implications, however in our increasing reliance on the binarified information, even we are losing sight of these nuances (as is evidenced by the fierce battles fought on internet over diverse misunderstandings about the unsaid in-between lines).

So, lack of knowledge as a source of uncertainty is eradicated if we equate binary data with knowledge. The benefits are most prominent when the entity being digitally represented can be adequately captured in binary form, and be processed through algorithmic intelligence, meaning that the problem to be solved can be written into a code (necessary at the outset even when dealing with machine learning, i.e. an algorithm programmed to teach itself). The feats include major achievements in medical diagnostics, with AI having been able to diagnose rare illnesses through access to vast databases.

The abundance of data could be a force for equality, as information has traditionally been a source of power. However, the sheer amount of data, without the accompanying processing abilities (be they computational, present in algorithmic form, or organic, gained through education) is also a source of inequality – both within the business sphere or within the sphere of mundane life. The actors with access to the

full digital representation of reality, equipped with adequate data processing resources and abilities wield power beyond the might of the most ambitious emperors in the past. However the actors left to sort out the tsunami of data on their own simply drown, be they firms, individuals, organizations, coalitions or nations.

Discussed in more abstract terms, the impact of digitalization on the lack of knowledge facet of uncertainty consisting of open and closed sets of options and outcomes is the annihilation of uncertainty of the type of closed options and closed outcomes. When we are dealing with finite sets, as long as the variables are known, no matter how complex and volatile, the algorithmic intelligence will be capable of processing the data to deliver answers to the chosen questions.

For example, if choosing the entry mode in internationalization is indeed about calculating the costs and benefits of various green or brown field options based on identifiable measures, there is no need to waste the expensive time of the CEO in making that decision, as the AI can deliver the right choice in matter of seconds. AI can even assist in coming up with the right measures, by sorting through a mass of information about the target market, about previous choices made by different players, seeking patterns in the levels of performance of other players and comparing those with the capabilities of the focal firm. In short, anyone dealing with risk[87] will become obsolete, as AI is vastly better than human in anything that can be given numeric representations.

Digitalization has also an impact on the two middle types of this lack of knowledge uncertainty, open options and closed outcomes, or closed options and open outcomes. In the case of creative uncertainty (Packard *et al.*, 2017), in human hands realized as diverse pieces of art resulting from the closed outcome definition of "compose a piece of music" and the open set of options enabling the composition of exquisite uniqueness still meeting the demands of the closed set of outcomes, digitalization can mimic the process, however a composing AI is by its algorithmic nature bound by the closed set of options initially programmed into it. The end result may be pleasing to the ear, however ultimately AI didn't engage in creative uncertainty, but functioned under the limits of closed sets.

In addition, through the pleasant outcomes created by the AI mimicking the process of human creativity the value of human creativity becomes blurred: if an AI can put together a piece of music nice enough to listen, why would we need the composers, producing contemporary classical music no-one wants to hear and asking us to support their work in doing so? Substituting enough of the human creatives

[87] Risk = closed set of options and outcomes, known distribution of variables, see previous discussion or Knight, 1921 or Packard *et al*, 2017.

with mimicked AI creativity leads towards a society, where nothing genuinely new or creative is no longer valued in itself, as anything *a priori* found preferential can be produced by means of AI.

The process is the same in the closed options, open outcomes setting: programming AI with a set of preferences allows it to pursue outcomes it by some mechanism deems more preferable. What possible outcomes fall out of the scope of the programmed perception, will remain out. As such, also in this type of uncertainty, AI serves to artificially limit the open set into a closed set. And what the AI doesn't take into account, fewer and fewer humans will either.

Full uncertainty, meaning open sets of options and outcomes, will remain untouched, however digitalization impacts the scope of options and outcomes perceived open or closed. Only recently we thought that our sexual preferences were private, something known only to us and those we chose to reveal them to. However with the advances in facial recognition AI, coupled with large enough databases has allowed researchers to create AI that can with astonishing accuracy tell the sexual orientation of an individual through only looking at the image of that individual (Coldewey, 2017). This example serves as illustration of the changing boundary between what we consider unknowable, the shifting line between the open and closed sets.

To summarize the impact of digitalization on the lack of knowledge dimension of uncertainty, the outcomes are threefold. First of all, with adequate resources the closed-closed type of lack of knowledge is obliterated: with advanced enough datafication, convergence and processing power, any sets of knowledge consisting of closed set of options and closed set of outcomes will be available.

Secondly, the boundary between open and closed sets of options and outcomes shifts and blurs: what has been considered beyond datafying becomes data, closing previously open sets, and on the other hand, the open sets can be masked as closed due to the expansion of the closed sets.

Thirdly, the closedness and openness of sets of options and outcomes are tightly dependent on the level of resources at hand: while knowledge and information have never been equally distributed within societies, the superhuman powers of massive data harvesting and processing systems will increase this inequality to unpredictable levels.

6.2 Impact on the standards of desirability

So, in order to reap the benefits of ubiquitous data, we need to know what we want to find out. Additionally we need to know how those answers relate to the ends we're

pursuing, which means that we need to have those ends. Underpinning those ends is a standard of desirability, delineating why one potential end would be better than another.

In the economic sphere, the contributions to the economic growth have traditionally provided the standard of desirability and the end. On the level of an individual and a firm, it may well be about the money itself, however the engine of economic growth is grounded on a more fundamental notion than mere money as credit or commodity. Economic growth represents faith in the future.

The fundamental paradigm shift of renaissance was to refocus the target of human activity from the life beyond death to life before death (Ahonen, 2001, Freeman, 2002, Fremantle, 1992, Harari, 2014). While there has always been kings, pharaohs and emperors focusing on accumulating wealth and power beyond what a mere mortal can in his lifetime consume, most of the humanity was more or less satisfied in toiling for the everyday sustenance and shelter, in the promise of being rewarded for a life well lived in the life after. Sure, there were the few entrepreneurial spirits who, if born in right circumstances, could improve their lot in this life, but they were the exceptions, not the norm.

When the rewards of the daily life were conceived to be realized in the afterlife, there was little incentive to embark on tasking initiatives promising years of hardship with potential benefits emerging only years later – it was easier to focus on the immediate task of feeding one and kin. However, accompanied by the diffusion of money, as both a means to ease exchange, and as an enabler of credit (Ali, 2014), this perception began to change. My neighbor might not promise to feed my family (as he doesn't know how much they eat and how should he therefore define the compensation he wants from me) while I toiled to invent a better plough, but he might well lend me money to do that if he believed in my abilities, in return for receiving back that money with a surplus after I managed to increase my productivity through the adoption of that new plough.

Put simply, this is the idea of economic growth. We collectively believe that if we put effort into improving our lives before death, we come up with things that increase our productivity. We borrow from our future selves to finance these activities of improving our productivity because we believe in our ability to do so: we believe in the manifold returning of these investments. The few past centuries have indeed proven this faith in human innovativeness right so far. In other words, stopping the turning of the wheel of economic growth would signal loss of faith in the future: it would be tantamount to saying that we humans have now reached the end of our abilities, with nothing left to improve.

However, as by now is evident, the churning of this wheel has yielded not only major improvements in the average existence of human life, but dire negative externalities, most notably the ones threatening the whole livability of our planet. One of the problems contributing to these problems is the decoupling of money from the underpinning real life phenomena it was created to represent. The monetary economy and the real economy have become exceedingly detached, which means that the pursuit of money no longer reflects the developments in the real economy (amply illustrated in the financial crisis of the 2008-2010). Therefore using money as the standard of desirability, without understanding the connections that pursuit of money has to the unfolding of events in the real life, is dangerous.

I don't know how money or monetary system could be transformed to assist in pursuing ends positioned on the standard of desirability of sustainability. However, the emergence of social enterprises[88] (Lee and Jones, 2015, Mair and Marti, 2006, Zahra *et al.*, 2009) shows that it is possible to engage in economic activity without aligning the undertakings on mere monetary scale. Equally, supported by digitalization in the form of diverse platforms and general connectivity, sharing economy[89] is a rising trend. These signals, while still drops in the ocean of corporations, however highlight the fact that through digitalization, economic activity can be more firmly rooted in the real life events and activities, than in the monetary economics, spinning in a reality of its own.

To summarize, the impact of digitalization on the standards of desirability may be experienced in the positive development of aligning the economic activities better with the underlying real life phenomena, than can currently be done by using the monetary scale as the standard of desirability. However, this has a caveat: the brilliance of money was in decoupling the discussion of valuing from the representation of that value. The sellers of oranges no longer needed to engage in lengthy debates about the respective value of oranges against apples: a fixed price speeded up the exchange.

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[88] While the concept of social entrepreneurship or social enterprises are plural and somewhat fuzzy, essentially they refer to such economic activities that are primarily motivated by the need to "*catalyze social change and/or address social needs*" (Mair and Marti, 2004, p.3), either through channeling the profits (of not necessary social business) to that end or through grounding the economic actions in pursuing those aims.

[89] Sharing economy refers to the emerging phenomenon, where collectives of individuals engage in barter of skills and goods, mainly through a digital platform (Hamari, Sjöklint and Ukkonen, 2016). An example could be a part of a town, with its own Facebook group, exchanging haircuts for moving the lawn, baby sitting to web design, or the like, without money being used.

So, in weakening the power of money as the standard of desirability, we will again need to find other ways of measuring the value of diverse needs and offerings. However, the connectivity and flexibility created by digitalization means that an entity doesn't need to have one single value for all possible stakeholders, but that value can be tailor-made in each interaction. In the scholarly realm, this notion is captured in the increasing adoption of service-dominant logic (Vargo and Lusch, 2004, 2009). Mainly focused on the value negotiations between customers and producers, the overarching notion however applies also to the realm of the mundane. If I don't need or want a swing in my backyard, it has no value to me. However if I had kids who had been pestering me for a swing, I would gladly value highly the swing in exchange for making my kids happy.

Digitalization creates connectivity and platforms on which we can engage in value negotiations, both in our everyday life, and within business. As such it can serve to increase the awareness of diverse standards of desirables – or it can ossify our taken-for-granted standards by amplifying the voices of the likeminded. The latter phenomenon, the filter bubbles and echo chambers already mentioned, are in themselves not new. All human collectives have ended up in creating formal and informal institutions that serve to enable and restrict collective action, in addition to drawing the boundaries of us and them (Opotow, 1990).

What is new in these digitally created institution forming collectives is the fact that they do not follow the traditional boundaries of geography, socio-economic group, age or ethnicity, to name a few. Instead, they form around specific social objects that give the collective a reason to talk to each other, instead of to someone else. The previously mentioned the Facebook group called "I'll park on the bicycle lane", is a harmless example, however the social object of Donald Trump may prove out to be something else.

In addition to providing alternative measures of value in situations of exchange, the impact of digitalization on the uncertainty emerging from the diversity of standards of desirability is the fragmentation and multiplication of institutional forces that need taking into account. Few actions of the individuals can be predicted by their national culture, but by knowing their participation in the bicycle activist group, they become far more predictable. In short, digitalization breeds a plethora of informal institutions, which shape the standards of desirability guiding the individual level actions aggregating onto collective level outcomes.

Our current understandings of institutions are simply not fine-grained enough to account for the new digital reality that shapes the individual level judgements. Therefore the uncertainty emerging from the difficulty of choosing between stan-

dards of desirability – either in business or mundane life – increases in the advance of digitalization.

To summarize the impact of digitalization on the uncertainty dimension of choosing between diverse standards of desirability, there are three main outcomes. Firstly, in the economic sphere the digitalization provides means for direct value negotiations between small entities (even individuals), without the need for relying only on intermediate institutions, or the mechanism of price. This means increase in the barter type negotiations of standards of desirability where the mechanism of price is disconnected from the value-in-use of the object of negotiations.

Secondly, digitalization creates a plethora of new types of collectives that develop (normative) institutions. These microinstitutions subsequently shape the standards of desirability within those collectives, further influencing the shape of the standards of desirability of the individuals constituting those collectives, with ripple effects to the other collectives those individuals are a part of. This means that the diversity of standards multiply and their sources become more difficult to trace, making it difficult to predict the behavior of individuals based on the understanding of the old institutional mechanisms.

Thirdly, counteracting the fragmenting impact of the multiplying microinstitutions, the Little Data based tracking of individual behavior enables unprecedented level of predictive accuracy on the level of the individual. So, while the behavior of an individual cannot be anticipated through his/her institutional biography, the behavior of an individual as a Meadian "me" can be extrapolated from his/her previous actions. This enables artificial manipulation of the standards of desirability: by personalizing the worldview presented by the internet, the standards of desirability can be nudged.

6.3 Impact on the meaning making mechanisms

By rendering both routines and institutions into strawmen, both can be conceived as constraints and enablers of specific kind of action – bracketing the doxic behavior from the reflective behavior. As ample evidence from the behavioral sciences shows, most of our activities are undertaken in this realm of the "fast brain" (Kahneman, 2011). We are exceptionally good at saving cognitive energy – and as Alfread Whitehead noted[90]: "*It is a profoundly erroneous truism, repeated by all copy-books and by eminent people when they are making speeches, that we should cultivate the habit of*

[90] As quoted in Hayek, 1945, p. 528.

thinking about what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them." Ultimately this means that the more we can rely on the taken-for-granted, the more energy we have for thinking and doing something beyond the obvious – advancing ourselves or the society.

The area where this, in itself valence-less tendency is most hazardous is the area of values, morality and ethics, especially considering the self-image upholding biases responsible for our beliefs of ourselves as more moral than our actions would suggest (Drumwright, Prentice and Biasucci, 2015). Questions of right and wrong are notoriously difficult, especially considering that the answers are mainly just written in different shades of grey (Cairns and As-Saber, 2017). As a solution, we leave the moral discussions to the philosophers in their ivory towers, and get on with our lives and mundane worries, guided by our institutional biographies and idiosyncratic personal features, preferences and tastes. We willingly embrace the uncertainty inherent in the construction of the meaning making mechanisms shaping our lives.

Before digitalization the need for each individual to engage in deep philosophical ponderings of the credibility and righteousness of these meaning making mechanisms was indeed scant: the institutions of the society, responsible for the churning of the wheel, did indeed emerge, stabilize, change and disappear without the input of any singular individual. However, digitalization changes this through three different mechanisms.

The first mechanism was already scratched in the previous chapters: through digitalization and connectivity, we have access to more information, however lacking the means to process it meaningfully, we cluster around certain social objects that profess sorting it out for us, either in full or in regards to a specific area of life. These collectives create their own institutions, standards of desirability and underpinning meaning structures. This results in a plethora of diverse institutions each individual adopts as part of their institutional biography constituting the contact lenses through which that individual views and interprets the world. We are recreating the foundations based on which we deem some as "us" and some as "them" (Opotow, 1990).

The second mechanism underpins the first. Since the shift in the target of human activity from the afterlife to our lived life, the grand narratives based on the faith on some omniscient entity owning the ultimate truth about right and wrong, have gradually eroded. What happened to God is happening now to Market (albeit in both cases, it takes the deceased a while to acknowledge the fact). Digitalization, as a representative of man's power over nature, further contributes to the unveiling of such secrets previously considered as proof of the existence of something beyond our

physical reality. When a machine can read minds (Hutson, 2017), who needs god? In short, humanity is no longer guided by any metanarrative, only by myriad individual narratives, nurtured in smaller and smaller collectives.

However, it is the third mechanism that has the most notable impact. Like before discussed, even the most sophisticated artificial intelligence isn't capable of creating anything new (yes, it can process the extant material in ways that result in unforeseen constellations, but it cannot introduce new elements into the melee – or detect the underlying value mechanisms that for example make something art or not (Frey and Osborne, 2017)). This means that an artificial intelligence has no inherent goals, ethical guidelines or preferences. All of those need feeding into it by humans (Weinberger, 2018b), a theme well discussed in the research stream of ethics of artificial intelligence (Bostrom and Yudkowsky, 2014, Yampolskiy, 2013). This is also a rich source of dystopian fantasies resulting in the doom of humanity by for example an AI programmed to write the most beautiful signature possible ending up causing the destruction of the humanity in its desire to increase the resources for doing so (Urban, 2015).

These discussions are, and rightly should be, a focal theme in the artificial intelligence research. However the implications do not end with the initial programmers. Machine learning is defined as an algorithm programmed to source relevant data and to continue developing its own algorithms through pattern identification in that data. When these kinds of algorithms are given access to internet, the data they use to develop themselves further is ultimately everything we have ever written online. Additionally, what is known about us online is not limited to our deliberate actions[91], but to the diverse sensors identifying our offline activities and emitting that data to further contribute to the full digital convergence (Newell and Marabelli, 2015).

What this means for the individual is that whatever we do, deem right or wrong will be the material that an AI uses in developing itself. Unlike humans, AI doesn't (yet?) possess the abilities to distinguish the diverse nuances of our utterances, jokes, sarcasm, cynicism, dramatization, but takes everything at face value. Facial recognition AI can detect that we are sad, but cannot know how that feels, or deduce why we are feeling it, is it good sadness of nostalgia or bad sadness of loss. It can identify us smiling, but doesn't know if that is because we are being mischievous, happy for getting a puppy or maybe successful in plotting a heist.

[91] Currently Netflix is working on two-way transmission and facial recognition AI that would enable it to monitor our emotions while we are watching a streamed movie. This was heard in a key note speech by Thimon De Jong, however was not sourced, so I cannot vouch for the reliability of this piece of information.

Lacking the understanding of these nuances and the accompanying ethical valences means that whatever the machine learning AI learns is a direct outcome of our identifiable actions, deliberately posted online, traceable through our use of our devices or gleaned through the increasingly ubiquitous sensors. This means that the less we consider the ethical nuances of our actions, the less ethical (defined in any which way) artificial intelligence we end up with. When we then, in business or in mundane life, give this AI a task, it will do it very efficiently according to the guidelines it has learned from us. And remembering the brief discussion about behavioral ethics, we are aware of only a minor portion of ethical issues (those in our immediate vicinity (T. M. Jones, 1991)), but have knee-jerk judgements (Haidt, 2001), and primarily reflect only issues regarding the "us" (Opotow, 1990), and even those mainly through their immediate impacts on ourselves, not through principles (Rest *et al.*, 1999).

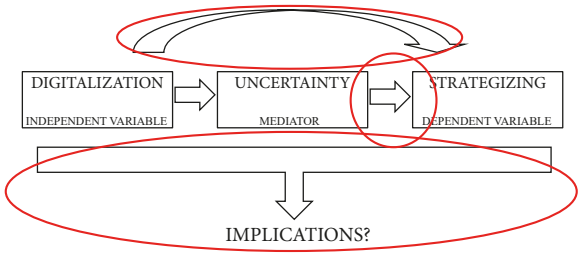
To summarize the impact of digitalization on the uncertainty dimension of the meaning making mechanisms, a main outcome emerges. First of all, while we may explicitly ponder between choosing diverse goals, we relatively seldom reflect on why those goals have meaning, value; instead the meaning making mechanisms mainly reside in the realm of doxa, and as such are primarily based on our assumptions, on what we take for granted. This means that our doxa is invisible to us, yet visible in our resulting actions (the choices of goals and the means we pursue them), and as such, detectable by the pattern recognition algorithms. Also, the more the technology becomes invisible, taken for granted in shaping our lives, the more traces we leave, and the more accurate the patterns of our standards of desirability and goals become for an algorithm.

If all of our activities result from such meaning making mechanisms with which we can fully as individuals and collectives agree when subjected to reflective analysis, this is not a problem: with algorithmic aid we can reach our outspoken goals more efficiently. However, as we human beings tend to be conflicted in underpinning our actions with an invisible doxa, it may well be that our pursuits based on reflective thinking would be quite different than the pursuits based on doxic behavior. The imperfection of human processes may be a blessing in these cases: if we realize in midstream the undesirability of our initial target, the slow human processes can be halted, slowed down, and the direction can be changed. Not so with the algorithms, which take all our actions at face value even when we act in ways we would not prefer were we to just stop and reflect on our choices.

The impact of digitalization on our meaning making mechanism is that our implicit, unreflected, vague assumptions ossify into explicit guidelines. So far, we humans have primarily been progressing by fumbling forwards, rationalizing afterwards, and

incrementally changing our trajectories whenever the fumbling has become stumbling. Now (or soon enough) we wield technology that can take us anywhere we ask, however the fundamental questions of where we want to go and why are still as fuzzy as ever. The uncertainty inherent in our meaning making mechanisms will not vanish through digitalization, but becomes a critical reflection point – in dire need of discussing before we end up wherever we unwittingly assume wanting to go. This third type of uncertainty can be reduced only by us humans. Otherwise we may well end up getting what we wish for.

7 MY THREE THESES



"Territorial sovereignty is not historically privileged. There have been other bases for the organization of political and economic authority in the past. There may well be in the future."
(Stephen Kobrin: Back to the Future)

In the following subchapters I will outline the three main theses of this dissertation, and discuss both their theoretical and practical implications. However, before diving in to the discussions, a caveat for the scholarly reader is in order.

It is customary that a research concludes with the theoretical contributions and managerial implications – and thus will also this book be finished, but only in the ultimate chapter. In this penultimate chapter, the concept of implications should be taken more verbatim, without the scholarly connotations: the implications here should be understood more as reverberations, echoes, ripple effects. Writing in metaphor, the following discussions can be perceived to follow the shape of casting a stone into water, stones being the theses, and the ripple effects the implications. The stones consist of the ossified representations of the insights and discussions in the preceding chapters, and the ripple effect implications are both the realized and potential outcomes and experiences ensuing from the currently perceivable trajectories of the stones.

Put simply, the discussions in this chapter provide some answers to the research questions of this dissertation. The validity and worth of these answers will be discussed in the final chapter.

7.1 Thesis 1: Digitalization obliterates one type of uncertainty, the risk

The first thesis of this dissertation is that the digitalization obliterates a speficic kind of uncertainty: the one typically defined as risk (Knight, 1921), meaning the quantifiable uncertainty under circumstances where both options and outcomes consist of

closed sets (Packard *et al.*, 2017). This weak uncertainty (Dequech, 2011) can be both substantive and procedural (Dosi and Egidi, 1991), also experienced as Ellsbergian ambiguity (Ellsberg, 1961).

This type of uncertainty refers to the lack of knowledge of such entities that do exist and as such could be quantified, yet because of the complexity or volatility of that knowledge, or the inability to access and process that knowledge, circumstancial uncertainty, risk or Ellsbergian ambiguity exists. This is the type of uncertainty most impacted by digitalization.

First of all, the acts of datafying and digitizing widen the scope of quantifiable knowledge. The advances in the data storage and transfer capabilities enable a wide diffusion of that knowledge. Together these drivers reduce the substantive uncertainty, ie. the lack of extant knowledge. Furthermore, the developments in the algorithmic processing capabilities, the artificial intelligence, facilitates processing even highly voluminous, variant and volatile (ie. data that accumulates and changes with high velocity), reducing the procedural uncertainty.

The disappearance of this one type of uncertainty is however strongly dependent on the availability of resources to source, harness and process the theoretically existing knowledge. As long as the sensor technology is imperfect (in the sense of it not being possible to datafy and digitize all entities from the all three realms of reality), as long as the data storage and transfer technologies are insufficient (in the sense of it being possible to store indefinitely all digital data, and it being possible to transfer that data seamlessly between diverse storages), and as long as the technologies are not fully converged (in the sense of it truly being possible to process any type of digital data with any type of digital technology), this type of uncertainty as risk and Ellsbergian ambiguity exists.

However, even now this type of uncertainty can, within certain boundaries, be reduced to irrelevancy. In well-defined problem settings, where there can be a reasonable amount of certainty of the closedness of both the sets of options and outcomes, this type of uncertainty doesn't need consideration, as its impact is negligible. The examples of such settings emerge from the success stories of algorithmic prowess in games like chess or go, and in the successful automatization and autonomization of certain operational processes, evidenced in Smart Factories or to an extent in autonomous transportation advances.

To summarize, currently digitalization can obliterate this type of uncertainty in clearly defined settings. However, the trajectory of contemporary technological advances points towards a future, where these diverse pockets void of this type of uncertainty may become fused together, gradually growing to encompass most if not all

elements of the physical, world one entities, and enough of the world two and three entities to obliterate this type of uncertainty.

7.1.1 Practical implications of thesis one

The increasing irrelevance of this one type of uncertainty, risk, has notable implications for the types of capabilities and rationalities required in the organizations. The roles of explorative, exploitative and ambidextrous capabilities require reassessing, as do the underpinning choices of problem-solving logic.

To outline concisely, exploitation drives efficiency, incremental improvements and profitable utilization of the existing assets and capabilities, in short, ensures the current profitability of the firm. The problems within the realm of exploitation are somewhat defined, requiring process improvements and incremental developments of efficiency: most of the uncertainty dealt with in this dimension consists of closed sets of both options and outcomes. This means that they are dealt with causal rationality, the human version of the algorithmic processing. However, with the accelerating developments in the computerized algorithmic decision-making, many of the problems heretofore focused on in the pursuit of exploitative excellence can be solved by artificial intelligence – provided that the required resources and capabilities exist.

Exploration in turn has an impact on the survival of the firm in the long run, under changed circumstances. It consists of innovation, entrepreneurial skills (as discussed already by Penrose in 1959 or later by Sarasvathy in 2001), of planting several seeds without knowing which will bear fruit. Therefore, exploratory excellence hinges on human creativity, the ability of the human to introduce new elements, by envisioning completely novel entities, uncovering previously unidentified entities or by transforming extant entities into novelties beyond the sums of their components. This is an area where the algorithmic decision-making cannot assist, because the required rationality is of a completely different nature than the causal, computational rationality.

Digitalization impacts the way that firms need to deal with this paradox tension of exploitation and exploration. In creating the digital enablers, the technological systems, firms need exploitative engineering excellence, whereas in figuring out how to monetize those enablers, explorative entrepreneurial excellence is required. In addition, the firm level benefits of digitalization are realized through the exploitative benefits gained from increasing efficiency, and the explorative benefits reached through coming up with new offerings and business models.

The impact of digitalization on this paradox is the shift of balance between exploitative and explorative capabilities. Like already March noted, firms typically em-

phasize the exploitative excellence – necessary even in highly digitalized settings. The execution of digital transformation within for example a multinational enterprise is by no means a simple feat, consisting of the dimensions of developing (or sourcing) and implementing the technological systems, tackling legacy issues, teaching and encouraging the personnel in adopting the digital technology and in changing the processes and routines accordingly.

However, due to the complexities involved on the exploitative side, it is easy to focus on the problems of creating the digital enablers and lose the sight of what they enable – or to not even pay attention to envisioning the possibilities. The stories of Nokia (Bouwman *et al.*, 2014) and Kodak (Lucas and Goh, 2009) are often used as warning examples of how even the mightiest may fall if they fail to see the new business models emerging from the technological changes. Essentially the stories pivot on how the excellence in the exploitative capabilities blinded the organization from such needs best addressed with explorative approaches. And as the stories show, merely excelling in exploitation is not enough – nor is it enough to try to maintain a balance between the two types of capabilities with increasing digitalization: the emphasis needs to shift to primarily supporting the explorative capabilities.

Ultimately what is needed is a change in the mainstream rationality in organizations. Causal, managerial rationality excels in delivering exploitative targets, but effectual, entrepreneurial or creative rationality is required in figuring out those targets – and more importantly, in figuring out why those targets should be pursued in the first place.

It is not enough to allocate entrepreneurial rationality into a specific function, like R&D or IT, but the role of top management needs reconfiguring. Digitalization impacts the scope of top management decision making as many of the current top management decisions based on analyzing the costs and benefits of diverse trajectories can be made based on big data, processed through algorithms (naturally provided that the digital systems are implemented): in short, the activities grounded on dealing with the specific type of lack of knowledge uncertainty. This means that the focus of top management should be on the explorative side, on exploring the new opportunities created by digital technology. To sum, the uncertainty with which the managerial regime should be preoccupied with, should shift from computational analyses of the closed sets of options and outcomes to dealing with the open sets of lack of knowledge – and more importantly towards assessing the goals and the mechanisms that make them valuable, worth pursuing, addressing the two other dimensions of uncertainty.

To summarize, digitalization contributes to both the exploitative ends of efficiency seek and the explorative ends of new business models and offerings – and the requisite rationalities in reaching either end are different. A big challenge of organizational ambidextrousness is in identifying which of the dimensions of digitalization require processing with causal rationality, and which ones need to be tackled with effectual rationality – and nurturing both types of rationalities throughout the organization.

However, the even bigger challenge goes beyond ambidexterity: the role of the top management should move away from dealing with such types of uncertainty that the algorithms render irrelevant, and towards dealing with such types of uncertainty only humans can reduce. In short, the top management must excel in exploration, underpinned by such creative and ethical rationalities that enable reducing the types of uncertainty increasingly relevant in the digitalizing world.

7.1.2 Theoretical implications of thesis one

In this dissertation, uncertainty has been used as an umbrella concept that captures six different issues: the first four types are subtypes to the dimension here named lack of knowledge, consisting of closed and open sets of options and outcomes, and the two remaining types refer to the difficulties in choosing the standards of desirability along which a goal could be positioned, and to the difficulties in trying to understand how those standards emerge in the first place, the meaning making mechanisms underpinning them. Of these six types, one is rendered relatively irrelevant due to the advances in datafying, digitizing, connecting and algorithmic processing.

As has become painstakingly obvious, these themes captured here under the concept of uncertainty are in the literature discussed through several concepts (risk, ambiguity, Knightian uncertainty, equivocality, complexity, isotropy, volatility, unpredictability to name but few) and perspectives. While this conceptual unclarity cannot by a mere dissertation be clarified, the implications of the potential disappearance of the type of uncertainty most often referred to as risk merit further exploring.

Risk in this context refers to such uncertainty that results from the lack of knowledge of all the knowable options and outcomes in a specific setting (as such it can also be named as Ellsbergian ambiguity, meaning that the knowledge exists but isn't known to the decision-maker), in short the closed sets of options and outcomes rendered unknown through the complexity and volatility of that information. Its disappearance is a theoretical possibility, grounded on datafication of everything (and the subsequent data processing capabilities), however defining the boundaries of those closed sets would need further theoretical exploring.

What are the contexts in which the sets of options and outcomes can ultimately be defined as closed, without any vagueness about the potential of opening either set? For example, if we believe in the equilibrium seeking tendencies of the market, does that mean that the market is a closed system, and as such, could theoretically be a system within which this type of uncertainty, risk could theoretically be eliminated? Defining in more detail the circumstances in which the decision-maker is dealing with closed sets of options and outcomes would enable theorizing in more depth about such types of uncertainty not rendered irrelevant through digitalization.

It should be noted that when algorithmic processing is utilized in delivering little data oriented predictions of the behavior of an individual (as based on the extrapolations of the past behavior of the individual and the analytical comparisons against the accumulated big data based insights), the predictions are ultimately made based on the behavior of the Meadian me. This means that any set of options and outcomes anticipating the human behavior are by definition open, because of the surprising potential of the behavior of the Meadian I.

So, while the datafying, digitizing and data processing capabilities reduce the relevance of a specific type of uncertainty, the boundary conditions within which this may happen warrant specific focus. The literature within the uncertainty umbrella would benefit from perusing through these lenses, focused on explicating when it is genuinely possible to rely on the closedness of both sets. Identifying the boundary conditions and eliminating the type of uncertainty that may become irrelevant from the analyses of uncertainty, would enable deeper theorizing about such dimensions of uncertainty that are here to stay.

7.2 Thesis 2: Digitalization erodes the boundaries of old entities and creates new entities

The second thesis of this dissertation is that the digitalization erodes the boundaries of previously envisioned entities, while simultaneously creating mechanisms that enable forming new entities. These entities may be goals, standards, collectives (such as groups, firms or nations), variables or even the definition of what constitutes reality.

As mentioned several times, the focal aspects of digitalization are the datafying of everything, the act of digitizing that data, rendering it uniform, and the connectedness of that digital data. Additionally, the mechanisms of datafying enable also feedback: we are not merely creating a digital representation of the three Popperian realities, but also creating mechanisms through which the digital representation shapes the other ontological realities. As a result, based on the malleability of the dig-

ital representation, the malleability of the entities of the other realities increases. This happens, because in a non-data form, the entities are of diverse ontological qualities, which means that processing them, changing them requires diverse technologies to do that, whereas when the main processing is done on the entities in data form, the changes on the other realities are easier to execute – through the connection points between the digital representation and the entity in another reality.

This requires two examples. First of all, consider a lump of metal that needs to be fashioned into a part of a vessel. Before digitalization the requirements for realizing that transformation were first to have a set of suitable tools that enable bending and molding of that lump of metal, secondly to have the acumen to beforehand envision the exact shape that lump of metal should be changed to, and thirdly the skills to mold the metal accordingly – and all of these requirements were necessary for each individual piece of metal. If the tools malfunctioned, the envisioning was flawed, or the skills lacking, nothing more than beginning anew was possible.

With digitalization one still needs the tools to actually bend the metal. However, the envisioning can be done and redone in the realm of digital representations, so that any potential flaws can be speedily corrected before any metal is wasted. Additionally, also the skills needed in the molding of the metal can be practiced in the digital realm – or automatized, again based on the existence of the lump of metal in the digital realm. As a result, the malleability of the lump of metal is increased and the processing speeded up.

Another example pertains to opinions. Before digitalization, if you wanted to change the opinion of a group of people, first you needed to gather those people together, requiring effort and pre-existing power – a bit later an access to television. Then you needed to deliver your message in a persuading way, with exquisite oratorical prowess in order to trigger a desired reaction in the cognitive processes of an individual. If you wanted your message to truly stick, you would afterwards dispatch a set of messengers (or buy more television time) with a task to continue repeating your message to the targeted individuals.

Digitalization, and especially the emergence of social media has created a digital representation of social presence of multitudes. No longer are oratorical skills necessary, as in the digital reality, you can convey your message in a personalized way to each targeted individual, based on the digital representation of their preferences and idiosyncratic features captured through their interactions with digital technology or sourced through sensors. The actual changes in the opinions still hinge on the cognitive processes of the individual (just like when giving a speech on the podium), however through the ease of reaching the individuals, the potential of infinite number of

repetitions of the message, and the ease of personalizing the message simultaneously to the individuals of the mass, the malleability of the opinions increases.

This increase in the malleability[92] of the entities in the three Popperian realities influences the entity boundaries previously formed based on the limitations of space, time, power – or based on the ontologically distinct nature of those original entities. Of these boundary creating elements, only power remains relevant – and exceedingly so. The impact of physical space decreases, as everything resides in the spatially unlimited digital reality. The changes in time are evident in the exceeding speed with which the previously disconnected entities become connected, and in the continuous activity of the digital reality – whatever is there exists whenever it is accessed. In addition, when the physical, subjective and intersubjective entities are given a dataform representation through digital indexing, the indexed entities become ontologically convergent, even when the entities being indexed remain distinct.

To summarize, datafying and digitizing the entities from the three ontological realms of Popper makes the digital representations of those entities uniform. The dataform entities are malleable, and through the feedback channels from the digital reality to the other realities, also the entities in other realities increase in malleability. This erodes the boundaries based on space, time, power or ontological qualities. Subsequently, the boundaries of the entities can be formed based on novel mechanisms – and the old mechanism of power, coalesced and wielded through new mechanisms.

7.2.1 Practical implications of thesis two

The practical implications of the second thesis are best explained through examples. One notable boundary being in the process of blurring, is the boundary between physical and virtual reality, in itself responsible for the increasing malleability of physical reality. Research on social media shows that the digital persona inhabiting the social media sphere is no less "real" than the persona inhabiting the physical reality (Mäntymäki and Islam, 2016); the Internet-of-Things based industrial operations cannot be divided into separate digital and physical components, as the entity of an IoT is different than the sum of its components (Hermann *et al.*, 2016); money is but an amalgam of trust (entities of Popperian worlds two and three) and binary digits, residing in the digital realm.

[92] With advances in the augmented reality (Azuma, 2017), the malleability increases further: the idea of augmented reality is that the entities augmenting the experienced reality are not mere digital representations of physically extant entities, but originate in the digital realm, being projected into the physical realm in ways that enable our senses to experience them as real. While the current applications are still in their early form, the future possibilities seem quite remarkable in their potential effects on what we perceive real (Ewalt, 2016).

This blurring is interestingly exemplified in the increasing servitization, ie. shifting the focus from selling objects to selling what the objects do (Akaka, Vargo and Lusch, 2013). This has resulted from the possibility of datafying the services of a specific physical entity, and the subsequent possibility of utilizing that data as grounds for the business models. The product and the service it offers have entwined into data, which means that the offerings exist as hybrids.

Another interesting boundary being eroded is that of a nation – and all it has traditionally encompassed. A nation is a geography-bound entity, based on the notion that the power of sovereignty can be tied into physical location (Kobrin, 1998, 2009). The Popperian world three entity of national identity is a construct, enforcing this geography based sovereignty and the accompanying power over the inhabitants of that specific area. National identity in turn is supported by constructs such as culture, ethnicity (and in some cases also religion), which emerge from the human need to create shared understandings within a collectivity, to have a notion of "us" and "them" (Opotow, 1990). When physical distances mattered (more), the collectives formed based on the geographical boundaries, thus giving birth to the institutions (of e.g. culture) supporting the national identity and subsequently the notion of sovereignty and accompanying power.

With digitalization, the physical location of an individual and the self-identification with a collective become decoupled. An individual does no longer need to reside in same space and time with such other individuals, with whom he/she identifies as belonging in a same collective. Instead, the collectives are formed around social objects, residing and accessed in the digital realm. While culture, as a Scheinian pyramid of representive artefacts, explicitly espoused values, and underlying shared basic assumptions (Schein, 1985), is by no means of diminishing importance as a social, collective level phenomenon, the cultures need no longer be coupled with geography – the nationality. This means that the cultural habits, values and assumptions of two neighbors may be completely different, based on the collectives they connect and identify with in the digital reality[93]. In short, the boundaries between moral inclusion and moral exclusion (Opotow, 1990) shift.

This means that as the microfoundational pillars of the sovereignty of a nation, the nationality with its supportive normative institutions (like the notion of national culture), is eroded, it may well be that in the future, the political power grounded on the

[93] To additionally complicate the issue, the social forces impacting an individual rarely result from the interactions within a single collective, but instead emerge as an amalgam of the institutional biography (Vaara and Whittington, 2012) of the individual, being shaped simultaneously by both online collectives and offline collectives, such as the neighborhood or the physical work place.

notion of geography-bound national sovereignty vanishes. This in turn means that the power is relocated, grounded on new mechanisms, potentially underpinned by the data access, ownership and processing capabilities. To exemplify through speculation, envision a world where the global geopolitical forces were China, Facebook and Alphabet: if data (access to it, ownership of it and its processing capabilities) will increasingly drive the coalescence of power, we may end up in a world where the power is wielded by entities of different quality (in this example a nation and two firms) instead of entities of similar quality (e.g. the USA and USSR of select past decades).

Another relevant example is the firm. The boundaries of the firm are traditionally considered to form along the divide between whether it is more cost-efficient to utilize the control mechanism of hierarchy or the control mechanism of price (Buckley, 2016). Additionally it has been suggested that instead of the control mechanism of hierarchy, the entity of the firm is shaped according to the boundaries within which knowledge can be diffused to create capabilities (Kogut and Zander, 1992, 1996) that can then provide advantages in market interactions. Both of these approaches rely on the notion of firm specific advantages (created either through the mechanism of hierarchy and subsequent capabilities, or through the mechanisms of learning and subsequent capabilities), embedded in the organizational resources and capabilities, both explicit and tacit (Nonaka and Takeuchi, 1995).

Digitalization blurs these boundaries through two mechanisms: first of all, through converged digital systems, such as digital platforms, the firm can access and exploit external resources, without needing to control or own them (Shivakumar, 2014) – in short the firm can leverage available resources without committing to ownership liabilities. The stories of Rovio Entertainment (most notably known for Angry Birds) and subsequently Supercell (with the game hits HayDay, Clash of Clans and Clash Royale) highlight the phenomenon well: founded in 2005, in 2009 Rovio decided to focus on leveraging the relatively recently established Apple ecosystem by developing games for iPhone. Five months after the release of Angry Birds, the game was the most downloaded application in the App store. Three years later Supercell repeated the feat with its game HayDay.

While the subsequent trajectories of the firms have been different[94], the initial success of both firms resulted from their ability to leverage the Apple ecosystem in two ways: first of all the application development interface provided production re-

[94] Supercell has become a privately owned unicorn (Chinese Tencent acquired 72,2% of the firm in 2016 with 6,45 billion euros), whereas Rovio has undergone some struggles, finally becoming a listed company in 2017 with a turnover of 266 million euros.

lated resources, and secondly, the App Store, pre-installed in each iPhone and iPad, provided a vast distribution channel, impossible for a start-up to gain in other means. In short, both Rovio and Supercell had access to external resources and competences that were integral in their success without needing to own or develop them internally. What this means is that it becomes more difficult to assess the boundary of the firm through its available resources and control over them, or distinct capabilities, as digitalization enables essentially outsourcing almost any activities traditionally kept in-house.

The second mechanism is related to the first and blurs the boundaries of the firms even more. While inter-firm organizations (Ghoshal and Bartlett, 1990) and business networks (Möller and Halinen, 2017) are not a new phenomenon, the increasing race of creating such ecosystems (Basole *et al.*, 2015, Iansiti and Levien, 2004) within which all the possibilities of digital convergence emerge, the network strategy has become a critical issue (Aarikka-Stenroos and Ritala, 2017, Vesalainen, Valkokari and Hellström, 2017). It may well be that in the near future the competitive advantages (Barney, 1991) rely on choosing the right ecosystem to participate and the might of that chosen ecosystem, and the best the firms can achieve independently is competitive parity, the chance of staying in the game as a useful component of the ecosystem.

What this means is that as the boundaries of the firm become porous, strategizing needs to be underpinned by an understanding of the relevant scope of strategizing, both in terms of what can be controlled by any strategizing agent, and what are the interdependencies subsequently subjected to. Each firm needs to define for themselves what constitutes their "firm-ness".

Yet another implication pertains to the notions of work and leisure, entities previously envisioned as distinct. While traditional employment still exists, digitalization has enabled increasing flexibility to both individuals and employees through several mechanisms. The advanced communication technologies have decoupled work from a specific time and place even in traditionally contracted employment (Jarvenpaa and Leidner, 1999).

But more profoundly, digitalization enables parceling work to microtasks[95], individual actions that fulfill a specific need without contractual obligations reaching beyond that specific task (Lehdonvirta, 2016). This microwork is most often not the primary source of livelihood, but is carried out by individuals who wish to transform

[95] One of the most known digital microwork platforms is the Amazon Mechanical Turk (www.mturk.com). It is an online "*marketplace for work that needs human intelligence*" (Amazon Mechanical Turk Inc, 2015-2018), where the customers of the marketplace can have specific tasks, such as transcriptions, photo tagging, or categorizing done by individuals with time to fill in exchange for carrying out such tasks for (minor) compensation.

their extra time into added income. In a way, the business logic of Über is similar: the idea of the digital platform is to connect the individuals in need of a ride with individuals who have a car and time to fulfill the transportation need in exchange for a compensation.

While this microwork through digital platforms (such as the Amazon Mechanical Turk or Über) is compensated, all crowdsourcing (Wikipedia, 2018a) activities exploitable by firms are necessarily not. Crowdsourcing means utilizing a mass of individuals reachable through internet in sourcing an idea, solution, or even funding (known as crowdfunding) (Estellés-Arolas and González-Ladrón-De-Guevara, 2012).

This has implications for both the definition of a firm through the changes in the available resource bases of the firm, and for the definition of work itself. Not only is work something carried out for a specific employer at a specific time and place, or something conducted entrepreneurially, but also the self-employment (in itself not a new phenomenon) realized in increasingly fluid ways, and in diminishing individual quantities. Furthermore, the existence of non-compensated crowdsourcing addles the definition even more: while the crowdsources may end up with such material it then uses in pursuing monetary aims, the providers of the crowdsourced material are not necessarily financially compensated for their efforts. However, the individual efforts of the crowd may well take such forms that in other contexts could be perceived as work.

The examples of this subchapter by no means cover all of the entities having their boundaries eroded due to digitalization. However, by using as example the blurring divide between cyber and physical realities, the distinction of product and service, the concept of a nation, the definition of the firm, and the understanding of work, I have hopefully argued for my case from sufficiently several perspectives. What these practical implications further highlight are the theoretical implications, relevant for us scholars in pursuing knowledge about such entities we no longer can (if we ever could) neatly delineate. This is discussed in the next subchapter.

7.2.2 Theoretical implications of thesis two

The eroding boundaries of old entities and the emerging shapes of new entities mean that as scholars, we must reconsider our units of analysis. The difficulties experienced in trying to agree on the definitions of business networks, business ecosystems, clusters or even industries highlight the increasingly complexity of the economic realm no longer inhabited by mere firms and markets.

Revising the old discussion underpinning the distinction of firm and market in the transaction cost economics and the internalization theory, Hayek's point about the importance of knowledge is helpful. The underpinning idea of markets is that the relative prices of the offerings of any vendor reflect the overarching supply and demand of those offerings in a system where no entity possesses full knowledge of all the elements contributing to the supply and demand. Instead, a firm relies on the control mechanism of hierarchy, essentially based on the availability of all relevant pieces of knowledge within a closed system.

Hayek, and subsequent scholars discussing the dichotomy of firm and market (Williamson, 1975, 1999, 2003, Buckley and Casson, 1976, Buckley, 2016) ground their argumentation on the assumption that there will never be a single entity in possession of all knowledge relevant to economic activity, ranging from the personal level preferences to the political situations, resource quantity and quality, process intelligence, organizational dynamics and the power dynamics between diverse economic agents. Instead, within a closed context, a hierarchy, with adequate knowledge concentrated at the top, constitutes a controllable entity of the firm. But how does the firm control, and what does it control, when its utilization of resources is no longer coupled with ownership or even personnel: networks and ecosystems provide resources and access to customers, and the workforce ranges from individuals enjoying the full scope of traditional employment, to subcontracted entrepreneurs or to the "mechanical turks", providing services through microwork or crowdsourcing?

The control mechanism of hierarchy (Buckley, 2016) or the boundary mechanism of learning (Kogut and Zander, 1996) are both insufficient in drawing the boundaries of the firm in the digitalizing reality. First of all, control suffers from three decouplings: the firms may utilize and exploit resources and capabilities they can only access and leverage, not control (like the game producers within the mobile ecosystems); secondly, the firms may control such resources they don't directly utilize themselves but exploit through the firms utilizing those provided resources (the digital platform companies like Amazon, Facebook, Alphabet); and thirdly, control is no longer coupled with the power over physical realm entities (like salaries or the proverbial whips), but becomes increasingly tied to the access to (personalized) data. Additionally, a firm is no longer bound by its ability to diffuse knowledge internally: the possibility of diversifying the workforce to encompass not only stable personnel (costly, however necessary in some tasks), but also to include the external resources of microworkers increases the resource-base of the firm beyond its capability to diffuse knowledge.

So, the boundaries of the concept firm are elusive. Maybe even more dramatic is the potential transformation in the notion of markets. As we remember, markets reign when no actor possesses all knowledge pertinent to a transaction. But what if we are entering an era, where such omniscience was possible? What if the increasing digitalization, with the accompanying data sourcing, storing and processing abilities will develop into a full digital representation of all our resources, activities and preferences, traceable and analyzable with the aid of sophisticated artificial intelligence?

This type of all-encompassing knowledge would not be available to all, but it could well be available to a few notable entities. That would mean that instead of the disappearance of the hierarchy and the reign of markets, the market would dissolve into a planned economy in the hands of few – either explicitly acknowledged by all, or implicitly built in to our everyday actions. The requisite technology is almost here, and the Chinese Social Credit Rating experiment will yield interesting insights about its impacts on the Chinese market.

Considering the huge amount of data already in possession of Facebook and Alphabet (the mother company of Google), further enriched by the available satellite monitoring data and the data feeds of the already omnipresent surveillance cameras, it is not science fiction to envision an entity that could not only acquire all that data but also develop such levels of artificial intelligence that would allow it to process all of that data into individualized little data, which would ultimately destroy the whole notion of markets – at least from the perspective of that actor. This actor would not be a hierarchy, as the control would not be explicit, but nor would it be a market unto itself, as it would possess all relevant information and could thus design its economic actions accordingly.

This actually leads to the discussion of the sovereignty of the nations (Kobrin, 2009), which needs revisiting: as the current economy and social influences are increasingly taking place and forming in the digital reality, what are the new mechanisms of power thus emerging? The increasing difficulty of the nations to tax the digital economy through the increasing decoupling of the economy from physical space and time and the simultaneously increasing integration of global financial economy (Kobrin, 2015, 2017b) erode the economic power of the nations. Simultaneously, the increasing decoupling of the individual identity and social collectives from the geographic boundaries erode the socio-political influence of the nations. The institutions no longer emerge from within collectives delineated through geography, ethnicity, religion or something as elusive as a national culture, but coalesce within the digital reality around the social objects individuals find valuable, meaningful and identity-enforcing.

While the economic realm is in flux due to the complex restructuring of the economic agents and their relationships, the socio-political realm is undergoing similar turbulence due to the new ways of forming collectives or creating self-identity. The theoretical constructs such as culture and institutions continue being valid as labels, however what are the entities to which they refer to, and how do they emerge need new understandings. The Hofstedean dimensions (Hofstede, 1984, Hofstede, Pedersen and Hofstede, 2002) may yet be relevant, but those dimensions no longer define a culture primarily bound by geography – instead a certain cluster of individuals bound together by their appreciation of cycling may well be found to have more feminist than masculine features, or to have less power distance, no matter their geographic origins.

Summarizing, we need new conceptual definitions of the constructs we use as units of analysis as digitalization erodes also the existing connections between the signified and the signifier. Additionally, we need more nuanced methods of accounting for the new types of social collectives – and more insights into the mechanisms responsible for creating them.

7.3 Digitalization changes the shape and impact of doxa

The third thesis of this dissertation is that the digitalization will change the shape and impact of doxa, what we take for granted and consider normal. It is through these changes in what is taken for granted that the most profound impact of digitalization occurs. As we know from the research on decision-making, we make most of our decisions unwittingly, engaging in reflective thinking only after countless of decisions made in the sphere of doxa. This means that no decision escapes being filtered through doxa, and subsequently, all changes in doxa have an impact on all the decisions.

To begin with the changes in the shape of doxa, digitalization changes our perception of normal through three mechanisms. First of all, the ubiquitous presence of digital technology normalizes that technology to the extent that it becomes invisible: we no longer perceive using technology, only living our lives (Yoo, 2010). Secondly, as we rely increasingly on internet to provide us a view to the external world, what we see through the internet shapes our perception of what is happening. However, as what we see through the internet is personalized for us, based on our previous digital interactions and embedded sensor technologies, each one of us is granted a highly specific visibility to the external world, responsible for endowing us with an idiosyncratic worldview (McNamee, 2018, Newell and Marabelli, 2015).

Thirdly, as the digital social networks enable social interactions decoupled from space and time, yet relying on the very human features of wanting to belong, have a tribe, relate and interact, cluster around something perceived meaningful, digital collectives emerge. Within these digital collectives, the personalized views to the external reality converge, creating shared understandings further looped back to strengthen the collective specific worldviews of the individuals within the collective (Engeström, 2005, Flaxman *et al.*, 2016, Pariser, 2011, Sunstein, 2009, 2018).

Taken together, what we consider normal and take for granted changes. The impact of these changes is profound, as we cannot escape making our decisions based on them – even the wisest among us have a doxa through which they first must wade before engaging in reflective thinking (Eagleton and Bourdieu, 1992, Kahneman, 2011, Thaler and Sunstein, 2008). This saves valuable cognitive energy, as, in theory, we can focus on reflectively pondering such issues that are notable, instead of wasting our moments in choosing which foot to put forward first.

However, not all of the decisions undertaken within the realm of doxa are as unimportant as the choice of left or right foot first. Many of the decisions we make in the realm of doxa are realized in for example organizational routines, coalesced into organizational capabilities, further aggregated into organizational outcomes (Dionysiou and Tsoukas, 2013, Feldman and Pentland, 2003, Nelson and Winter, 1982, 2002, Rerup and Feldman, 2011). The way that we deal with this dominance of doxa is that we primarily act first and rationalize our actions later – as captured in the sensemaking approach introduced by Weick (1979, 2005).

Weick's analysis of a crisis situation in a power plant highlights the profoundness of this mechanism: even when the urgency of the situation would have needed genuine prospective reflection, the actions were entrenched in doxa and retrospectively rationalized in ways that actually allowed the situation to escalate into even worse (Weick, 1988).

However, the sensemaking mechanism is not only a negative force, but quite quintessential to human action. At any given moment we are not only dealing with the inherent uncertainty of tomorrow, but also with equivocality, the retrospective lack of knowledge of open set of options and closed set of outcomes: meaning that given an outcome we cannot deduce the options that led to it. Sensemaking enables moving forward incrementally, benefitting from the knowledge emerging through actions, through the time-bound unfolding, gradually revealing some aspects of the future uncertainty that may additionally reduce equivocality. In contrast, if we needed to have reduced all uncertainty before engaging in action, we would never move.

The relative slowness of this process is a blessing. First of all, it enables integrating new, emerging knowledge (resulting either from the actions or the unveiling of the future as it becomes present) to the ongoing process. This new knowledge has the potential of incrementally changing the trajectory of the action, either through gradually changing the doxa or through reflection. Secondly, it enables creating shared understandings, essential in the alignment of collective action. Individuals enter a shared situation with their idiosyncratic features, assumptions and expectations, which are through the process of collective sensemaking negotiated into shared understandings of the situation – the individual doxa converge in regards to the specific circumstances through the mechanism of symbolic interactionism, the mirroring of oneself in the mirrors of the others mirroring themselves on the mirror of oneself.

In programmed action, these processes are obliterated. An algorithm acts based on its programming, which is grounded on what is known, and neglects the uncertainties of tomorrow and the equivocality of past: it functions under the assumption of full rationality and full knowledge, in an artificial environment where all but one type of uncertainty are ignored and the remaining one rendered irrelevant through the increase in knowledge. This means that the insights revealed through the unfolding action cannot be integrated into the action – unless *a priori* specifically programmed, however the unknown unknowns cannot be programmed, as the surprises that can be pre-programmed need to be known. Furthermore, algorithmic action does not enable creating shared understandings during a process, as the programming depends on the understandings of the programmer; it is not the same as having two algorithms pursue a same outcome from diverse perspectives with a command to negotiate the optimal solution.

So, the algorithms excel in achieving the goals given to them, but on the other hand, eliminate the beneficial slowness of human processes that enable changing the goals in midstream and creating shared understandings that allow for aligning collective action towards a mutually acceptable outcome. This is one of the two main reasons why the impact of doxa becomes exceedingly important: the machines take us wherever we think we want to go, based on our doxic and reflective understanding of a given, specific moment, even when that is not where we should (by some assessment) be going.

The other reason is embedded in the mechanism of machine learning, increasingly used in developing artificial intelligence. The algorithms cannot create new, only process extant material by identifying patterns. The original material their learning is based on is created by us humans, and one of the patterns to be recognized pertain to our doxic understandings of standards of desirability and the meaning making

mechanisms underpinning them. This means that even if we ourselves do not engage in ethical discussions of right and wrong, or acknowledge our standards or the underpinning meaning making mechanisms, they are fed into the learning processes of the machines.

Currently this discussion pivots around the closed data sets used in machine learning, as some of the inherent biases within those data sets have had explicit and identifiable outcomes[96]. Controlling for biases in specific, closed data sets is however but one example, paling in comparison of what the algorithms can learn when the whole digital reality, or even only the internet, is used as the learning data set.

We are shaping the algorithms in our image, and if we do not reflect on the image we are currently leaving, that image reflects the internet as it now exists – full of not only such activities we humans can be proud of, but also the very murky depths of humanity, the racism, bigotry, selfishness, greed to name but few. Unfortunately, as we humans tend to react stronger to negative news and sentiments of horror or disgust than to good news, and through reacting stronger more likely to engage in interaction based on those reactions (Hornik *et al.*, 2015), the mechanisms of current internet geared towards maximizing the engagement through personalized and filtered feeds support disseminating the negative more than the positive. What is notable, is that this dissemination of the negative, while supported by the technological mechanisms, is ultimately more dependent on the behavior of us humans. You are more likely to read and pass on posts from your acquaintances than the posts automatically shown to you (Flaxman *et al.*, 2016), and a hundred times more likely to pass on false news[97] than truths (Vosoughi, Roy and Aral, 2018).

So, if we are to teach the algorithms based on the representation of humanity as it currently exists online, the educational material would consist primarily of the outcomes of the baser instincts of us humans, as filtered through our doxic behavior supporting the dissemination of the bad over the good. The more we accept and take for granted the current constitution and mechanisms of the internet, the more emphatically we allow the formation of such standards of desirability and meaning making mechanisms that a) are extrapolations based on our past digital behavior, and

[96] For example, black people are more likely to be turned down when applying for a loan when there is an AI making the decisions: as the data sets these AI use consist of criminal records among others, and as due to historical and social reasons the black people are overrepresented in those records, the AI has deduced that the black people are inherently less trustworthy and thus are endowed with a lower credit reliability rating merely based on skin color (Weinberger, 2018a)

[97] In an 11 year study of almost 3 million Twitter users, Vosoughi, Roy and Aral (2018) found that the top false news diffused between 1000-100 000 people, whereas the truth rarely reached 1000.

b) can through algorithmic pattern detection mechanisms be identified, and used as grounds for further algorithmic decision-making, as the standards of desirability.

As the history of humanity shows, we are capable of marvelous feats and inexplicable goodness, and equally capable of horrendous acts and limitless evil. While few of our actions come close to either end of the spectrum, it is our doxic acceptance of what we take for granted and consider normal that provides the soil for the seeds of any type of action in either end to flourish. Interestingly, the most notable achievements of humanity consist of such technologies that have the potential to even expand either end of the spectrum – to deliver dreams or nightmares. With datafication, digitizing, connectivity and algorithmic processing we have taken an additional step in strengthening the linkage between what we doxicly accept and are tangibly delivered.

To summarize the third thesis, digitalization shapes our doxa in three ways, and increases its impact in two ways. The changes result from the increasing invisibility of technology in shaping our daily activities, from the personalized worldview it provides, and from the new forms of collectives that contribute to our institutional biographies. The increasing impact arises from the elimination of the slow human sensemaking processes that enable gradual changes in our trajectories and the creation of shared understandings, which means that the future outcomes of algorithmic actions are grounded on the past doxa even when that doxa is outdated, and from the fact that the outcomes of algorithmic learning processes are grounded on the digital representation of our collective doxa evidenced in the data sets used in machine learning.

7.3.1 Practical implications of thesis three

The so called "Cambridge Analytica" case (Guardian, 2018) revealed in March 2018 highlights the practical implications of this thesis from several vantages. In 2014, a firm harvested legally Facebook data through an app used by 320 000 consenting individuals who ended up giving an access to the public Facebook data of their friends, ultimately aggregating to a dataset of 50 million US voters. Combined with psychological research findings (Kosinski, Stillwell and Graepel, 2013) that could identify the political preferences of an individual through behavioral patterns expressed in random Facebook "likes" (by default public at the time of data harvesting), this data was used in creating such algorithms that enabled so called microtargeting of advertisements (Cadwallar and Graham-Harrison, 2018).

This microtargeting was subsequently used in the US presidential elections of 2016 by a set of proponents of Donald Trump. The advertisements were tailor made

to trigger such reactions of the target voters that would make them more susceptible to the Trump campaign message by triggering sentiments of hate and revulsion, or feeding the fears of the targeted individuals, initially identified (through the psychological profiling algorithm) as eg. harboring negative sentiments towards foreigners (Cadwallar, 2018). Again, lacking counter-factual evidence (ie. there is no knowledge of the election outcome had the algorithms not been used), and pending further investigation, the genuine impact of this type of campaigning remains debated, however for illustrating my third thesis, this example is fearfully appropriate.

On the level of the individual, the implications of the third thesis highlight the importance of being aware of a) the fact that through the internet, one is presented with a personalized worldview, b) of the fact that each digital action creates a trace, which converge into an image of one as the digital representation of one, both enabling even deeper personalization and becoming a constitutive part of the humanity as understood by the algorithms, and c) the tradeoffs embedded in digital technology: privacy vs convenience and collective security, freedom vs control and independence vs dependence.

In the Cambridge Analytica case, the seemingly innocuous online activities (like "liking" Kitkat chocolate) created digital traces that when amassed in big data quantities, could be used in not only creating algorithms that could identify patterns between those "likes" and the political leanings of the individual, but also in tailoring such advertisements, personalizing such worldviews that would prey on the fears and hopes of those same individuals, having (most likely) an impact on their offline election behavior. The case also exemplifies the tradeoff between freedom and control: while no overt coercion happened, the ability of digital technology to control the individuals' offline behavior is quite serious.

On the level of the collectives, in the firm context, the implications are twofold: firstly, the goals of the firm require reflection more urgently than ever (including but not limited to the ethical perspective). With the increasing speed of execution enabled by digital technology, the "wrong" goals become costly, as they are reached effectively – the slowness accompanying human processes disappears, and with it the ability to change the trajectory midstream. Additionally, with the increasing complexity of the digital economy, the ripple effects of the "wrong" goals diffuse fast and wide – in terms of economic, environmental, social and ethical effects.

The ripple effects of the Cambridge Analytica case entail for example a) (potentially) Trump as a president, with its accompanying impacts, b) the visibility and diffusion of the increasing capability to manipulate individuals through their online presence and activities, c) the increasing criticism towards Facebook and other social

media with its potential implications, d) the possible legal convictions and penalties, and e) the impacts on the brand equity of all firms involved (this may play out as either financially lucrative or destructive). While the valence of these outcomes again depends on the perspective of the viewer, it is likely that while drafting the initial goals of the core activity of the firm (microtargeted political advertising), the ensuing ripple effects were not all intended or even conceived[98].

Secondly, when the goals are agreed upon, the execution of their pursuit is firmly coupled with the ability of the firm to shape such firm specific doxa that accounts for the datafication of everything – the eroding and changing boundaries of the entities discussed in the second thesis. If the doxa of a firm is shaped to perceive physical products and humans as the focal components of the firm activities, enabling and bounding its operations, the firm may well face disruptive competition from a firm that perceives all primarily as malleable data, which only subsequently takes the physical form of products and human actions. The Cambridge Analytica perceived humans as data of their digital traces, and through exploiting the malleability of the data shaped the subsequent physical realm actions. In contrast, creating an advertisement based on the product features arises from the perception of the product having an ontological precedence over its data form representation.

On the level of collectives, in the political setting, the tradeoffs accompanying digitalization are highly dependent on the standards of desirability of the represented collective. The problem is that while the political decisions and regulations are regional, the digital reality and the technological advances are not. For example, with the realization of the GDPR, the EU will value individual privacy more than technological supremacy, as the data protection regulation has an impact on the ability of the developers of the artificial intelligence to access and use the internet data bases (Weinberger, 2018a). China has a different set of underpinning values, which means that it in turn chooses differently in regards to this tradeoff: this in turn may lead to such developments that lead to China being the dominant actor in the artificial intelligence technology, with impacts reaching also the citizens of the EU (Macaes, 2018).

To return to the case of example, it is notable that the actions of the Cambridge Analytica were legal as individual steps; it is only the aggregated results of those actions that have roused legal and ethical questions. This implies that with the advances

[98] I encountered a good nutshell of consequences of technology a while ago somewhere online, but cannot unfortunately recall the source. I will however mention it here, because it captures this issue well: all technological advances (and widely thinking, actually any actions) can have four types of potential outcomes. First, the intended consequences of benevolent use/action; secondly, the unintended consequences of benevolent use/action; thirdly, the intended consequences of malevolent use/action; and fourthly, the unintended consequences of malevolent use/action. My thanks go to the unremembered source for coining this typology!

of technology, it is very hard for the legislation to address such developmental stages that are at the moment of legislating unforeseeable – especially as any regulations or laws are fashioned under the doxa of the moment, underpinned by elements taken for granted, also in terms of their ethical valences.

This means that ultimately the collective level legislative mechanisms are somewhat impotent in trying to create such overarching regulations that would tangibly protect the individuals from the negative implications of digitalization, the datafication of everything – especially as what are the negative, and what are the positive implications is also a point of debate. In turn, the only actors with the power to influence the future evolution of our algorithmic future, are the individuals. It is through our individual actions, choices, "likes" and interactions in the digital realm that the digital representation of reality, underpinned by our individual and collective doxa, forms.

That is why the main message of my third thesis can also be translated to an appeal: the ethical discussions about our meaning making mechanisms and standards of desirables should become mundane, routine – not something only discussed in the ivory towers of the philosophers, but something any lay individual could exchange a few words about when having a leisurely cup of coffee with friends.

7.3.2 Theoretical implications of thesis three

The idea of the third thesis is ultimately very simple: we should pay attention to why it is that we want whatever it is that we think we want. However, in practice this is the most difficult question humanity has always been dealing with. What is the meaning of our existence here?

But, taking the discussion a few notches closer to earth, yet another example highlighting the complexity of this theme is in order. With the climate change well on its way, increasing attention has been given to the importance of economic growth: should we really be pursuing profit when the future of the whole globe is at stake? Put this way, the answer is quite blindingly obvious, however there is more to the notion of economic growth than the mere monetary outcomes accumulating on the bank accounts of the shareholders.

As previously discussed, the economic growth represents the human faith in the future: it is beneficial to toil today in order for the tomorrow to be better. In the churning of the economic wheel of faith in the future, humans have had a two-fold role: on the one hand they have as employees participated in the productivity side of the equation, and on the other hand they have as customers participated in the financing of the process. Being unemployed, aside from being an individual level source of anxiety, has meant not participating in this wheel of progress in either side.

As the productivity increase driven by the industrial revolution required human labor, the societies addressed this issue by education resulting in the rise of the middle classes honed to perform well on both sides the equation. On the individual level this was grounded on the appeal of the spirit of enlightenment (underpinned by the paradigm shift of renaissance bringing the goals of human endeavors from the afterlife to the present life), which promised better life for an individual and an increasingly better life for their offspring through the continuing individual level improvement and increasing effort: study and work hard and you and your children will benefit. This doxa constituted the meaning making mechanisms and subsequent standards of desirability that shaped the economy for the most part of the past century.

While working is often accompanied by complaints about the work, it has however been an invaluable meaning making mechanism, a source of identity and a sense of belonging – all aspects essential for the mental well-being of the individual (Ahonen, 2001, Park, 2010). Additionally, the collective doxa of our contemporary western societies is grounded on the meaning making mechanism in which the productivity of the individual is firmly coupled with the collective good of the society. We take it for granted that unless one is too young, old or ill, it is the meaning of the human to contribute to the upholding of the collective society as an economic entity, which in turn provides the structures within which that human can execute that upholding. Within such doxa, work has existed as a coupling of both the role of an individual in the society as the bipolar component of the wheel of the economy, and a meaning making mechanism.

However, we are now in the western societies witnessing an era where the new generations will never reach the level of the income of their elders, never mind the possibility of outpacing the rate of increase in the material wealth (Siltala, 2016). In addition, the advance of digitalization will render most humans unnecessary as employees (Arthur, 2017). So, in the twin engine of productivity and financing spinning the wheel of economic growth, humans are, on the side of productivity being replaced by machines to a notable extent (Frey and Osborne, 2017, McKinsey Global Institute, 2017, World Economic Forum, 2016). However, on the other side, as the consumers ultimately financing the relentless turning of the wheel, humans are still needed – but with dwindling incomes[99], becoming increasingly inefficient in even that. Addition-

[99] The more the material wealth is concentrated in the hands of the few, the less of it is fed back to the system to continue spinning the wheel. The concentration of wealth has always happened in human societies (Piketty, 2015), and our era is no exception – actually quite the contrary, according to several scholars (Chomsky, 2017, Elliott and Pilkington, 2015), as the increasingly developed technology creates even more inequality in between its owners and users. This means that the few employed bear an increasing burden in financing the spinning of the wheel.

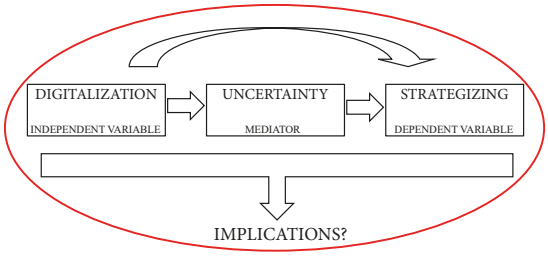
ally, humans as data sources serve both the process of distilling each last drop of the consumer utility from the individual (contributing to the side of financing), and the process of reaching full digital convergence, creating an encompassing digital representation of the physical reality (contributing to the side of productivity).

So, considering that this is the path the wheel of economy ploughs, how do we solve the paradox of human redundancy on the side of productivity, and human necessity (and growing inefficiency) on the side of financing the future? And maybe more importantly, how do we deal with the decoupling of work-as-a-component-of-economy from work-as-meaning-making-mechanism? On the level of the individual, this of course translates first to the mundane worry of shelter and sustenance: as the linkage of work between the two poles is being severed, how will the unemployed find food? However, the more pertinent question is, how do the individual unemployed find meaning for their lives in a society allotting them only the roles of data sources and consumers?

Therefore the questions of the future of work in the digitalized future and the importance of economic growth are actually questions that pertain to the very grand narratives that shape widely our collective doxa. What are the meaning making mechanisms with which we argue the meaningfulness of our actions as societies and individuals in hundred years?

The technological developments of today promise to deliver us answers to many of the practical questions we can think of asking, to transport us to wherever it is we want to go. However the questions even the most advanced artificial intelligence will never know to answer, or even ask, relate to our choices of our destinations, and the reasons of why do we want to go there in the first place? To me the most critical implication of all of these three theses relates to the fundamental need to reassess the meanings of an individual and the society. If we cannot come up with a new grand narrative to carry us through the next century, the least we should aim at would be to on an individual level penetrate our individual doxa to ask these questions as they relate to our personal lives. This goes beyond the morality of defining right and wrong, into the core of ethics questioning why would the what is right be right and for whom, and why would the what is wrong be wrong and for whom?

8 CONCLUSION



"Everything is connected."
(Douglas Adams: Dirk Gently's holistic detective agency)

The research question this dissertation has been answering is "How does digitalization impact strategizing?" The premises from which the inquiry begun were that a) strategizing consists of individual actions and decisions, fused together in social action, aggregated onto collective level outcomes, b) strategizing is in big part dealing with uncertainty, either within the realm of the reflective or in the realm of the doxa, and c) digitalization as changes in the technological systems, in its usage and users, and in the perceptions has an impact on the nature of the uncertainty.

These premises underlie the secondary research questions: How does digitalization change the constitution of uncertainty, how are those changes reflected in strategizing, and what are the theoretical and practical implications emerging from the changes in the uncertainty and subsequently in strategizing?

In order to answer the research questions, the first discussion in the thesis pertained to the diverse ontological perspectives from which extant knowledge has been created. This discussion grounded the approach of trying to integrate diverse streams of knowledge, underpinned by different philosophical positions, into more comprehensive entities, in order to explore the relationships of those entities.

The second discussion focused on outlining the concept of strategizing as understood in this dissertation, by integrating select insights from the rich research streams in decision-making, strategy and strategizing. Subsequently, the third discussion of uncertainty presented a new conceptualization of uncertainty, built on the extant insights of uncertainty from several philosophical positions. The fourth discussion sketched the contours of digitalization understood as the amalgam of digitized technological systems, humans as objects and subjects of change, and perceptions.

These integrated insights were then further processed, first in observing how digitalization influences uncertainty, and secondly by outlining the three theses of this dissertation, including their theoretical and practical implications. The following

subchapters outline the outcomes, identify the contributions and limitations of this thesis, and ultimately delineate some potential avenues of future research.

8.1 Outcomes: how does digitalization impact strategizing?

The fundamental drivers of digitalization are the idea of datafication, transforming the entities from all three Popperian realms into the ontological form of data, digitizing, rendering all types of data uniform, into binary digits, and connectivity, bringing all of that uniform data together. While the representations of digitalization are manifold, captured in myriad concepts, ultimately the unfolding of digitalization is not dependent on the developments and diffusions of any specific technologies, applications or even infrastructural standards. Digitalization entails a paradigm shift where the previously ontologically distinct entities gain an ontologically same representation as uniform data in the digital reality.

The elemental technological advances that drive digitalization consist of a) developments in sensor technology that enable the datafication of physical realm entities, b) the developments of internet and telecommunications technologies that enable not only connectivity but also the datafication of subjective and intersubjective realm entities (in the form of human online action), c) the advances in the storage capabilities of data, and d) the advances in the algorithmic processing of that data, the artificial intelligence. While the individual technological advancements drive the developments to an extent within any given area, the overall trajectories of these drivers of digitalization is not dependent on any individual solutions or applications.

Data is malleable. This means that through the two-directional connections between the entities in their other ontological forms, and their digital form, the malleability of the entities also in the other ontological realms increases. This malleability is hindered by the lack of full convergence, meaning that while the data is in theory uniform, the technologies with which it can be dealt with, are not (yet?) so. This has two main outcomes: firstly, as the realization of the possibilities of the increased malleability depend on the scope of convergence, the actors in digital economy pursue creating pockets of convergence in increasing scope. Secondly, the possibilities emerging due to the malleability of the entities within the convergent area require identifying and seizing. If the reality-as-data can be fashioned, how should it be fashioned?

Strategizing, as individual level actions and decisions, fused together in social action to aggregate into collective level outcomes, is primarily dealing with uncertainty. This uncertainty arises from not only the lack of knowledge of all the relevant ele-

ments influencing the pursuit of a goal, but also from the choices between diverse standards of desirability along which we can position those goals, and the fundamentally ephemeral nature of the meaning making mechanisms responsible for constructing those standards of the desirability in the first place. In strategizing, we deal with these uncertainties to an extent through reflection, but to a large extent through relying on our doxa, our understanding of what is normal, can be taken for granted and doesn't need to be reflected.

As I have in this dissertation adopted a microfoundational perspective in the sense that there are no collective level causalities, also the impact of digitalization on both the act of strategizing and its collective level outcomes are perceived to be realized on the individual level. The following figure, as an adaptation of a previous Coleman's tub of strategizing, illustrates the notion.

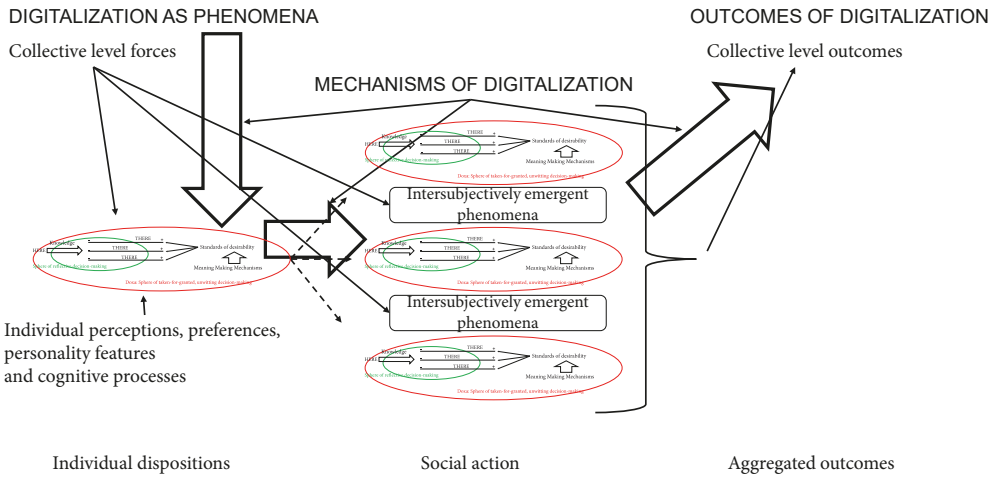


Figure 15: Digitalization in the Coleman's tub of strategizing

The mechanisms of digitalization constitute the three theses of this dissertation. First of all, within a zone of convergence where any relevant entities have been datafied, and adequate data sourcing, storage and processing resources and capabilities exist, one type of uncertainty becomes irrelevant. This type of uncertainty consists of lack of knowledge of a finite number of options and outcomes, in literature often defined as risk. The substantive part of this uncertainty is diminished through the encompassing datafication, and the procedural part through the excellence in algorithmic processing.

Secondly, as the dataform entities are no longer by their representations in the other ontological realms bound through the boundaries ontologically extant in those

other realms (time, geography, flesh, thought, machine), the old boundaries are eroded and the boundaries of the dataform entities formed anew. This means that the distinctions such as cyber-physical, local-global, firm-market, national-international become increasingly blurred, with implications to both the practitioners and the theorists.

Thirdly, as the digital representation of other ontological realms isn't limited to only the physical realm entities, but encompasses also entities of subjective and intersubjective nature, the ensuing digital representation of reality consists also of such building blocks as emotions, assumptions, standards of desirability, meaning making mechanisms – values and doxa. On one hand this means that the ensuing digital reality reflects our doxa and values as datafiable through sensors or through our digital activities. On the other hand this means that our doxa and values become exceedingly malleable through the increasing fusion of digital reality in terms of continually more ubiquitous and invisible technology and our mundane activities.

These mechanisms play out on the individual level, however their implications reach beyond that, influencing the whole collective shape of our society. Currently lacking any of such grand narratives the majority of humanity could agree as meaning making mechanisms, enabling such standards of desirability that would allow aligning our collective activities, digitalization is a force of fragmentation. However, with the increasing pursuit of convergence this may change.

Currently, the lack of convergence due to the technological imperfections and incompatibilities means that the near future will be riddled with power plays between such agents that endeavor to create, master and expand pockets of convergence. If full convergence is ever reached, it may, in theory, lead to full global democracy or full global autocracy. Either way, however, it is still too early to predict whether full convergence can be realized, but in the meanwhile, its pursuit will impact us all, as individuals, citizens and economic actors. Equally, in the meanwhile, it is our actions and assumptions, our explicitly expressed values and implicitly impactful doxa that create the digital representation of reality that even before technological convergence shapes our realities also in the realms of the physical, subjective and intersubjective.

8.2 Theoretical contributions

This dissertation is not built on the theoretical approach Alvesson and Sandberg (2011) name as "gap spotting", i.e. the approach relying on identifying a void in between known entities then through research filled. Nor is it based on what the same authors call "problematizing", which means questioning the underlying assumptions

of a theory and recreating the theory on new foundations. Instead, this research can be understood as phenomenon-based (Doh, 2017, Von Krogh, Rossi-Lamastra and Haefliger, 2012), in the sense that the object of enquiry is an existing phenomenon, understood in piecemeal from diverse perspectives, but so far lacking in integrative understandings. As such, the theoretical contribution aims of this dissertation fall into the category of conceptual contributions that MacInnis (2011) identifies as integration, with the aim to "*see previously distinct pieces… in terms of a unified whole whose meaning is different from its constitutive parts*" (MacInnis 2011, p. 138). In pursuing this aim, I have, hopefully adequately, employed what Gardner (2008) calls a "synthesizing mind", made sense of distinct pieces of extant valuable knowledge as they relate to one-another, and crafted new entities that hopefully enable seeing some issues from new and more holistic perspectives. In short, I have engaged in building edifices, not bricks (Forscher, 1963), with the hope that my choices of bricks and my architectural design are sound enough in constructing a solid, self-standing structure.

The main theoretical contributions are the three theses, in addition to some smaller contributions mainly resulting from the integrative efforts of this dissertation. The theses recently explicated in the previous chapter, the smaller contributions merit listing before embarking on the reflection of the respective values of the attempted contributions.

Addressing the smaller contributions in the order of appearance, the first is the identification of the six ontological questions underpinning the epistemological and methodological choices in social sciences, depicted in the table 1. The second contribution is the integration of diverse aspects of decision-making, strategy and strategizing literatures into the diagrams of strategizing, captured in the figure 9. The third contribution is the novel conceptualization of uncertainty, the three dimensions of uncertainty residing in different ontological realities. While the building blocks of the conceptualization of digitalization are in themselves not new, potentially the integrative discussion and the explication of the fundamental enablers of datafication and digitizing count as a fourth contribution.

Each of the following subchapters focuses on one contribution, and assesses it through reflecting the definitions of theoretical contributions as outlined by Whetten (1989). According to Whetten, the pertinent questions to ask in evaluating a theoretical contribution are 1) What's new? (Is there a significant, value-added contribution to current thinking?), 2) So what? (Will the contributions change anything in the thinking of the scholars of practitioners?), 3) Why so? (Is the logic sound?), 4) Well done? (Are the grounding discussions thorough and well-rounded?), 5) Done well? (Is the writing

smooth?), 6) Why now? (Is the topic timely and relevant?), 7) Who cares? (Would the academic or lay readers be interested?) (Whetten 1989, p. 494-495).

Of these questions, I will leave the Well done and Done well -questions for the reader to answer, as in assessing them from the perspective of having tried to do well the well done, my reflections are by nature too biased. While the ultimate evaluation of the merits of this dissertation are naturally up to the readers, I will however next try to argue for my insights through the questions proposed by Whetten (1989).

8.2.1 Theoretical contributions of the thesis one, eradication of risk

What's new? While risk (Knight, 1921) and Ellsbergian ambiguity (Ellsberg, 1961) constitute what Packard *et al* (2017) name weak uncertainty, the volume, complexity and volatility of the entities forming the closed sets of options and outcomes has however been such that even considering the finiteness of those options and outcomes, both the substantive knowledge about all entities involved, and the procedural knowledge (Dosi and Egidi, 1991) required in processing it has been lacking to the extent of it being impossible to dismiss even this type of uncertainty in decision-making. With datafication, digitizing, connectivity and enough technological convergence, it is now possible to obliterate this type of weak uncertainty, the quantifiable, probabilistic risk. As uncertainty as a whole is not eradicated with the increase of knowledge, this obliteration of one specific type of knowledge has not been discussed – most likely because in the uncertainty literature, this type of uncertainty is conflated with other types of uncertainty (Packard *et al.,* 2017).

So what? In order to address such obstinate types of uncertainty not removed with digitalization, delineating the type of uncertainty rendered irrelevant would be beneficial. In addition, through the advances in datafication and algorithmic processing, some of the entities previously by nature unknowable (other people's thoughts) and therefore by nature always before forming open sets, are now moving into closed set, through becoming data. On the other hand, the ability to shape the entities within the closed sets further muddles the water as what may seem new (an entity from the open side) is actually a combination of entities within the closed set. In short, some things of previously unknown qualities become known, widening the closed sets of options and outcomes – and blurring the distinction of what can be considered a closed, what an open set. This has notable implications in decision-making.

Why so? With the increase in computing power to enable storage of massive data, the developments in sensor technology in datafying physical realm entities, the ubiquity of personal digital devices connected through the internet and the subsequent sourcing of the worlds two and three entities evidenced in human digital interaction,

the advances in the processing capabilities of algorithms, and the trajectories of convergence grounded on the uniform nature of the data, there is both substantive and procedural knowledge that enables closing sets of options and outcomes, and processing the entities within to an extent when the uncertainty is removed.

Why now? We are at early stages of this development: first of all, technologies are imperfect and incompatible, grounded on even less perfect legacy technologies, secondly they rely on limited natural resources and energy, and thirdly utilizing the possibilities requires such changes in mindsets that creates disparity between those who do and don't exploit the potential. Additionally, the power unleashed through these technological advances is still looking for a home – currently the digital sphere is dominated by some players, but due to the early stages, the battle of dominance will continue. This means that if we want to change this trajectory, now we still can – and if we don't now is the moment to focus on the implications of what happens if this theoretically possible future comes to be.

Who cares? In the scholarly realm of information systems, there is call for increased research on the digital infrastructures and convergence (Herzhoff, 2009, Tilson *et al.*, 2010a, 2010b), in addition to call for understanding more deeply the experiential computing (Lyytinen and Yoo, 2002, Yoo, 2010). In the research streams of strategic management, entrepreneurship and organization theory, the understanding of uncertainty is fragmented and overlapping. The introduction of open and closed sets of options and outcomes by Packard *et al* (2017) is in my view a notable opening in organizing the knowledge about such uncertainty that arises from lack of knowledge, and the discussions in this dissertation contribute to further developing that line of thinking.

In the realm of the practitioners, the firms should care, as many of their operational issues currently pertain to dealing with risk and weak uncertainty, and their capabilities are accordingly oriented. Understanding what may no longer be the most acute problem and what will be the new problems has implications for the orientation of firm capabilities: question what issues need exploitative and what explorative capabilities becomes increasingly relevant. Additionally, the firms might want to understand the ensuing power battles in and in between industries.

In the realm of the individual, it will do no harm to understand that what has traditionally been considered personal, can to an extent be datafied and processed.

8.2.2 Theoretical contributions of the thesis two, blurring of boundaries

What's new? In theorizing, we need clearly defined and delineated units of analysis, and much research has been done on for example on the boundaries of the firm: how

can it be delineated in ways that enable researching it as a unit of analysis? The research on networks (Möller and Halinen, 2017) has paved the way for understanding the nuanced relationships between the firm and the market, but with the decouplings (of ownership and utilization of resources, of control and hierarchy, of assets and control over them, of available capabilities and contractual employment) following from digitalization, this dissertation suggests the need to dig even deeper into the question of what is a firm – and what will happen to the markets if it is fathomable that there are omniscient entities that dominate certain areas through their presence in the digital realm?

Additionally, in the research stream of international business, ample emphasis has been given to the internationalization of the firms (Buckley and Casson, 1976, Buckley, 2016, Johanson and Vahlne, 1977, 2009, Oviatt and McDougall, 2005). While the few decades old models have been criticized (Axinn and Matthyssens, 2002) through for example the research on the phenomenon of born globals (Knight, 1996), less attention has been given to the question of what does internationalization mean, if the nations as geographically bound clusters of socio-political tendencies and power lose their entityness (Kobrin, 2009, 2015, 2017b)? The novelty in this thesis furthers these discussions through highlighting the decouplings created by digitalization, and the couplings of such entities previously separate.

So what? While we are currently still living in a world of firms, nations, cultures, industries and markets, what we have traditionally understood as being referred to with these conceptual labels, is changing. This means that as scholars, we can no longer take for granted that the connections between the phenomena being signified, and the concepts used as signifiers are similar to what they were just few decades ago. Subsequently, when we engage in building new knowledge on top of old knowledge, the newness of these constellations need to be highlighted. When the firm is used as a unit of analysis, defining the concept must be done with care, as what was a firm a mere while ago no longer applies to all entities we can now conceive as constituting a firm.

Why so? Digitalization creates a data form representation of worlds one, two and three entities. As data is malleable, and the interfaces between the digital representation of reality and the three other realities are bidirectional, the entities of worlds one, two and three become more malleable, as the boundaries previously formed along space, time, or ontological differences (flesh, thought, machine, story) do not apply in the dataform digital reality. This means that the social groups form in different ways than bound through geography, control over humans or assets is realized through different mechanisms, and the power coalesces differently – to name a few examples.

Why now? We are only beginning to see the malleability of everything, and as such can still have an impact on the new entities being shaped. However, in order to do that we urgently need to understand the impacts of that malleability resulting from the digital representation of the entities from not only the physical realm, but also from the realms of the subjective and the intersubjective.

Who cares? In the scholarly realm of international business, the changing landscape of international economy has been acknowledged and calls have been made to focus on the relevance of the IB research in the changing world (Buckley, 2002, Buckley and Lessard, 2005, Buckley, Doh and Benischke, 2017, Peng, 2004). The call for redefining some of the central units of analysis in the field of IB done in this dissertation contributes to that discussion, as addressing the new phenomena with concepts shaped to define older phenomena risks ignoring the new features through conceptualization based on the old features (using irrelevant variables), explaining such issues that are no longer the most relevant.

8.2.3 Theoretical contributions of the thesis three, importance of doxa

What's new? The impact of what I have here referred to as doxa in decision-making has been known for a long time (Benartzi and Thaler, 2007, Cyert and March, 1963, Drumwright *et al.*, 2015, Eagleton and Bourdieu, 1992, Haidt, 2001, Kahneman and Tversky, 1979, Kahneman, 2011, Lindblom, 1959, 1979, Myles, 2004, Simon, 1947, Tversky and Kahneman, 1973). With doxa I mean the notion of normal, the zone of taken for granted assumptions that unwittingly shape our decisions before we engage in reflection, born out of both vital individual level psychological mechanisms (Sokka *et al.*, 2016), and equally vital social mechanisms (Joas, 1997, Mead, 1934, Maitlis and Christianson, 2014, Weick, 1979, Wood, 2000, Wu *et al.*, 2016) that enable first of all pursuing any reflective action undisturbed by irrelevant signals and secondly any collectively aligned action. The novelty in this theses consists of suggesting that not only does the digitalization create new mechanisms that shape this doxa (personalized worldview, social objects), but that our doxa, our unwitting actions, preferences, decisions shape the digital representation of reality under construction. Subsequently, when that digital reality is used in programming such algorithms that make decisions on behalf of humans, our doxic values and meaning making mechanisms become ossified – whether they represent such values and meaning making mechanisms we would reflectively prefer or not.

So what? The ability to shape our doxa has immense power, as exemplified in the recent case of US presidential elections (Apuzzo and LaFraniere, 2018, Cadwallar and Graham-Harrison, 2018, Cadwallar, 2016, 2018, McNamee, 2018). Currently,

this power is explicitly wielded still by relatively few agents, however as the technology exists, there is no reason to doubt that it will be increasingly used both overtly (as in the China Social Credit Rating System) and covertly (as it was in the Cambridge Analytica case). This means that the geopolitical power and the socio-political systems backing it are changing dramatically, and as scholars, these power battles should be a focal focus of analysis.

In addition, the constitution of the digital representation of reality grounded on our doxic elements requires scrutiny: what are the values we are currently constructing this mechanism of dominance on? What are the unfolding tradeoffs (Newell and Marabelli, 2015) that we are willing to live with, and what can be done to enable deliberate choosing between those emerging tradeoffs? These are some of the focus areas in urgent need of increased scholarly attention.

Why so? Digital technology is increasingly ubiquitous and invisible: we are creating digital traces of not only our physical actions, but also our subjective and intersubjective preferences and values with both our deliberate digital actions and interactions and through the developing sensor technology. This dataform representation of reality is accessed and used in further increasing our engagement with digital reality (by tailoring personalized worldviews and enabling social grouping based on social objects), and in programming such data processing algorithms that can utilize their pattern identification capabilities in realizing such commands as are by their wielders given. The more traces we leave, the more the algorithms "learn" about us, and the more efficient they become in executing the tasks given to them.

Not only is this a problem in (by some definition) malicious desires of the controllers of the algorithms, but also an inherent uncertainty in benevolent programming. Lacking the human slowness in execution, the extant knowledge, values and preferences of the moment of programming the algorithm, are carried swiftly to the ensuing outcomes. This means that the changes in knowledge, preferences of values cannot be embedded in the processes during the process, subsequently meaning that if the *a priori* understanding of the desired outcomes proves out to be faulty, it will still be reached effectively. This means that not being aware of such doxa at the moment of programming that will at the moment of outcomes turn out having negative consequences, will have dire effects.

Why now? The advances in artificial intelligence are exceedingly rapid – as are the developments in sensor technology. This means that it is time to deeply ponder the underlying meaning making mechanisms and standards of desirability constituting our doxa and shaping our reflective actions. There is immense power potential in this mechanism, and reflecting who, why and what for that power is used is highly essential.

Who cares? In the scholarly realm of information systems, for example Newell and Marabelli (2015) have initiated the discussion of the ensuing tradeoffs that digitalization has for the individual in terms of privacy-security, freedom-control and independence-dependence – in short the emergence of the Big Other as conceptualized by Zuboff (2015). The discussions of this thesis continue and contribute to that line of thinking. In addition, the political debates around the tradeoffs of technological prowess vs individual rights (Macaes, 2018), for example in relation to the EU General Data Protection Regulation (Goodman and Flaxman, 2016, Weinberger, 2018b), might be enriched by some of the presented insights of this thesis. Furthermore, the discussions in this thesis are related to the themes in the field of ethics of artificial intelligence (Bostrom and Yudkowsky, 2014, Dignum, 2018, Sandler, 2016, Taylor, Schroeder and Cowls, 2014, Yampolskiy, 2013), with the contribution of highlighting the impact of doxa: it is not enough to reflectively fashion ethical guidelines, as also our doxa travels to the digital reality.

Fundamentally, in my view, everyone should care. We are all contributing to the creation of digital representation of reality, and we are all impacted by how this creation subsequently shapes our lives.

8.2.4 Theoretical contributions of the six ontological choices

What's new? Philosophy of science is a vast area, and new contributions in that field are far beyond the scope of this research. However, the identification and integration of the six relevant ontological questions in social sciences have some novelty value in the limited sphere of business and management studies, as the previous discussions have mainly been focused on the more epistemological and methodological pluralities, and on the arguments of choosing one -ism over another. The novelty stems from illustrating that the divide between the objective and subjective isn't absolute, but instead, depending on the understanding of reality, it is not illogical to pursue research from the vantage of moderate realism and moderate constructionism. Ultimately the contribution is that of integration (MacInnis, 2011).

So what? In at least the research fields of international business (Welch *et al.*, 2011, Welch and Piekkari, 2017), accounting (Hines, 1988b, Kakkuri-Knuuttila *et al.*, 2008, Lukka and Modell, 2010), information systems (Volkoff and Strong, 2013), and international relations (Friedrichs and Kratochwil, 2009), there is a similar problem in terms of the philosophical underpinnings of research: offsprings of on the one hand positivist economics and on the other hand constructivist sociology (to render both simplified strawmen), there is a growing concern of both the positivist approaches ability to capture the nuanced social phenomena, and the constructivist approaches

denying the underlying reality of the outcomes of those constructive processes. Following the objective-subjective divide of Burrell and Morgan (1979) or Morgan and Smircich (1980), offers unappealing tradeoffs, as the merits of idiographic methods even about entities considered objectively real seem valuable. The solutions for this shared problem differ in name, but not in nature: in the fields of international business and information systems, the introduction of critical realism seems to provide a way to combine the best of both worlds, and the same promise is accepted from pragmatism in the fields of accounting and international relations.

My integrative framework of ontological questions highlights that it is possible to detach the philosophical underpinnings from the straightjacket of the subjective-objective divide, as the nature of reality is nuanced enough to provide foundations for several types of epistemological or methodological choices. On the other hand, my integrative framework can also be used in deducing the illogical combination of underlying ontological choices and the epistemological and methodological choices. For example, it is possible to utilize idiographic methods even with realistic ontology, however in that case the understanding of reality needs to be different than the naïve realism that doesn't logically accept such methods.

Why so? These six ontological questions capture the essence of the higher level debates of epistemology and methodology. Without being a philosopher, and thus having perused the whole of western philosophy, these questions are addressed in different ways in all business and management literature, and in the subsequent arguments between diverse choices of -isms. The logical argumentation I can here provide is merely inductive, and even as such, limited to my limited exposure to philosophy: this means that even one ontological question beyond these that I have distilled, renders the construct incomplete. However, even in that case, this may be a start of a comprehensive list of ontological choices that can be used in trying to align the personal ontological worldview with the methods best suited to addressing the research topic at hand.

Why now? There is growing interest in the fields several business and management studies to identify such methodologies that enable capturing the complex social phenomena impossible to render into quantifiable variables, exemplified in the founding of a research method group in the Academy of International Business, the main international association of the field. This is underpinned by the increasing calls for relevance, and phenomenon based research (Doh, 2017), in order to not only try to create such knowledge the predictively explains through generalizations, but also aims at understanding the contextually relevant issues in the increasingly fragmented and complex economic environment.

Additionally, this integration of ontological perspectives was necessary for this research, approaching the objects of enquiry through literatures viewing those objects from different philosophical vantages. In highlighting the diversity of choices I could hopefully draw logically from diverse streams of research, without succumbing to the threat of mistaking some of the fruits of wisdom as offsprings of such trees they did not grow in, thus ending up treating apples as oranges. Instead by doing this, I hoped to illustrate that in understanding fruits, seeing both apples and oranges is necessary.

Who cares? Depending on the area of socialization, some of these ontological questions are taken as more for granted than others, including what the "right" answers to such questions are. It is my hope that through showing the available choices for founding one's research, some of the unfruitful tensions emerging from the debates between diverse -isms can be dissolved and the energy focused on more pertinent questions. In the field of international business, Welch and colleagues (2011, 2017) have initiated a rich discussion of the widening sphere of different methodological possibilities that enable understanding more of the complex environment within the field scrutinized. This integrative framework is a contribution from the sidelines to that discussion.

8.2.5 Theoretical contributions of the integrative framework of strategizing

What's new? None of the components of the framework are new, however the framework in itself weaves a comprehensive picture of the diverse streams of decision-making, strategic management (including industry, institution and resource based views, and the microfoundational approach of the last) and strategy-as-practice (strategizing), again proposing an integrative contribution, as discussed by MacInnis (2011), sketched in the previous subchapter. Through Coleman's tub, I showed how the different discussions each illustrate some parts of what I have here called strategizing, the individual level actions and decisions, fused together in social action, shaped by the collective forces, aggregating into collective level outcomes.

So what? Pursuing knowledge of the same phenomena from several philosophical, disciplinary and historical perspectives at the same time creates a huge overarching accumulation of detailed knowledge, and makes seeing, relating and understanding that knowledge difficult. What from one perspective may be new, has already been known elsewhere: there is a risk of keeping constructing similar bricks without at any given time giving thought and effort to the edifice being built (Forscher, 1963).

Why so? Decision-making and strategic management have long been at the very core of business and management studies, because they pertain to the very elemental

activity of business operations: what to do next? This means that knowledge in these fields has been pursued from nigh all available philosophical perspectives. Therefore there are rich treasures of knowledge within each paradigm, making it less tempting to venture out from one's own paradigm, as the pursuit of knowledge within each school of thought is already extensive.

However, looking at the vast fields from outside, in order to see such shapes that could provide understanding as part of an entity, not as an entity of exploration *per se*, highlights that brutally ignoring some of the paradigmatic tensions allows seeing such shapes and patterns. For example, the importance of doxa, the unwitting, the subconscious is identifiable within each stream. The logic by which this integrative edifice was built was based on this type of pattern recognition: what are the smallest common denominators that enable trying to see this mass of knowledge as a structurable entity?

Why now? In an era of transformation, like ours, thinking about future possibilities is grounded on what we know about how the past possibilities were envisioned, realized and seized. Therefore synthesizing an integrative framework of strategizing can be helpful, as it may create understanding of which of the past ways of dealing the with inherent uncertainty of future were context and circumstance dependent, and which of what has been learned can be transferred into the new and changing contexts and circumstances.

Who cares? In information systems research there is call for integrating the digital strategy with the overall business strategy (Bharadwaj *et al.*, 2013), encompassing also the understanding of strategy-as-practice (Peppard *et al.*, 2014). In international business research there is call for increased understanding of the role of institutions in strategy and the underpinning capabilities, elemental in the resource based view (Dunning and Lundan, 2010, Peng *et al.*, 2008). In addition, there is a crescendoing call for microfoundational research (Felin and Foss, 2005, Felin *et al.*, 2012, Felin *et al.*, 2015), resonating yet clashing with the widening diffusion of strategy-as-practice and the narrative turn to strategic thinking (Milojević and Inayatullah, 2015, Vaara and Whittington, 2012). The integrative framework of strategizing might contribute to the scholarly understanding of these various perspectives by illustrating the interfaces, overlaps and commonalities of diverse discussions.

8.2.6 Theoretical contributions of the new conceptualization of uncertainty

What's new? The new contribution in the threefold conceptualization of uncertainty is the integration of such types of uncertainty that reside in different ontological

realities, into one framework. Previously, the literatures of uncertainty, grounded in the paradigms of decision-making and strategy fields have discussed primarily the types of uncertainty here defined as the lack of knowledge (consisting of the open and closed sets of options and outcomes), and sometimes also touching the type of uncertainty arising from the choices of the standards of the desirability. However, the third type of uncertainty, the unfathomability of the meaning making mechanisms has not been explicitly understood as a type of uncertainty, but discussed separately in primarily post-modernism influenced literature.

So what? With the creation of the digital representation of other realm realities, the impact of this third type of uncertainty becomes pronounced. Especially as the most familiar type of uncertainty, risk (and Ellsbergian ambiguity), will lose its relevance, this third type of uncertainty needs to be addressed also beyond the discussions of ethics. Tastes, values and preferences can no longer be taken as the points of origin (Bowles, 1998), but the mechanisms through which they emerge require deeper delving.

Why so? In this dissertation uncertainty is defined as not only lack of knowledge, but as all of the elements responsible for making the dealing with the future difficult. This includes the diverse types of lack of knowledge (of both prospective and retrospective nature, eg. probabilities and equivocality), but also the difficulty of choosing between the standards of desirability that are ultimately non-objective, of a fundamentally constructed nature (making the choice of a goal always ultimately not objectively arguable), and the impossibility of tracing all possible meaning making mechanisms that result in the constructed standards of desirability.

Why now? Digitalization makes reaching goals faster and more efficient. Therefore, scrutinizing those goals, and the reasons for their goal-ness, needs attention. The increase in data and its processing capabilities does not remove all types of uncertainty, but makes the sticky ones even trickier. Information in itself is not enough to evaporate the haze of uncertainty enveloping every future moment.

Who cares? On a theoretical level, the scholars of uncertainty have been focused on the first types of uncertainties, but neglected the last type. This is most likely due to the different ontological nature of the third type of uncertainty, but should be remedied. The discussions pertaining to the dimension of lack of knowledge build on and further develop the typology of uncertainty created by Packard *et al* (2017). The discussions of the standards of desirability continue the argument of Bowles (1998) in assessing the non-given nature of the endogenous values and preferences, in addition to touching the themes of ethical decision-making (As-Saber and Cairns, 2015, Drumwright *et al.*, 2015, Kolk, 2016, Treviño *et al.*, 2006) and morality (Graham *et*

al., 2013). In short, understanding that the ethical and moral discussions do not only constitute a specific sphere, but are through their impact on the meaning making mechanisms linked firmly to the uncertainty we deal with whenever engaging in future-oriented action, could contribute to not only the literatures of uncertainty and decision-making but also to the ethical debates tied to the technological advances, geopolitical turbulence and environmental condition.

8.2.7 Theoretical contributions of the enablers of digitalization

What's new? The discussions of the advances of digital technology and for example fourth industrial revolution are primarily focused on the explicit appearances and outcomes of technological change, but the fundamental drivers of datafication, uniformization of that data through digitizing, and connecting of that uniform data have been paid less attention. Sociotechnical and sociomaterial research have made valuable contributions to understanding the amalgam of technology and humans within the organizational context, however the discussions pertaining to this amalgam in wider societal context are scant. This research addressed both of these facets in trying to integrate existing knowledge about both the social aspects and the technological advances into a bigger picture.

So what? The various discussions of the specific individual technological advances (Linturi *et al.*, 2014, 2016) cloud the fact that the emergence of digitalization is not dependent on any single technology, standard, solution or application. While individual technologies and standards have an impact on the speed and scope of the theoretically possible full convergence, the trajectory leading towards it is no longer dependent on any single agent or structure. Therefore in addition to observing the developments within each layer of technological solutions, attention should also be paid to the emerging wider picture: how do the three worlds of Popper look like when coupled with the digital representations of them?

Why so? Analyzing two previous "revolutions" in human history reveals that when an enabling technological idea is born, the subsequent changes in the level of the worldview, social causes and litany follow in its wake – slower or faster. The technological ideas of datafication and digitizing, and the unification of that data, can be such enablers that, independent of any single solutions have the power to drive such paradigmatic change.

Why now? The previous industrial revolutions were identified *ex post*, whereas the revolutionary nature of the current technological changes is still speculative, as ultimately it is not possible to predict the future. However, should the identified enablers drive changes of paradigmatic, revolutionary scale and scope, understanding

and continuously assessing their developments, and the subsequent impacts on the humanity is a valuable undertaking.

Who cares? The literatures of K-waves (Wilenius and Casti, 2015), Industry 4.0 (Hermann *et al.*, 2015), future of work (Arthur, 2017), digital infrastructures (Tilson *et al.,* 2010a, 2010b), individual level tradeoffs (Newell and Marabelli, 2015) and the emergence of Big Other (Zuboff, 2015) each deal with the implicated outcomes of the technological trajectory driven by these enablers. While most of the insights written here are familiar in one or few of these literatures, it is again the integration of these knowledges that contains the possibility of contribution to these diverse streams.

8.3 Practical contributions: Twelve Tips for the Managers

This chapter is deliberately written in managementese, not as a scholarly piece of writing.

1. Digitalization consists of creating technological capabilities and of figuring out how to utilize them in making profit. Because the creation of the capabilities is important and complicated, it is easy to get lost in the practical difficulties involved in realizing them. However, do not lose sight of what it is that you actually wish to do with those new capabilities. This is extra difficult, because there are some technologies you need to install just to stay in the game, even before you quite know what to do with them, but also technologies that you will have no use for. So, tip number one: try to begin by figuring out the potential use and business model of the new technological capabilities before committing to creating them.

2. Are your offerings products, services or data? Doesn't matter, as you will anyway need to be able to create hybrids of them: if you are selling products, you might want to think if instead of selling them as physical stuff, you might sell what the stuff does? Instead of selling a car, sell the possibility of transportation (the costs of which you naturally calculate based on digital data) – or, depending on your brand, sell the experience of driving a particular car. In addition, your customers will have learned to expect that because you already have data about them, you will use that data in providing them with such offerings you know they like. The want you to save them the effort of going through the whole list of possibilities: think Netflix. While this applies also to products, it is essential in services.

3. You need a data strategy. First of all, figure out whether your business needs big data or little data: would your business benefit from being able to see patterns in different data sets (like a furniture firm who found out that there was a peak in incoming customers always a day after it had rained: deduced from comparing their customer data with other data sets and finding a correlation between weather and how rapidly their front door opened), or from being able to anticipate the behavior of an individual (like the insurance company that installs a tracking device on the cars of its customers and gives them discount if they drive carefully). When you know this, figure out whether you can get all the data from your own customers and operations or whether you would need to get data from other sources – and whether you have the capabilities to analyze the data in-house or whether you might want to have someone else analyze it for you. And finally, think about the data that you routinely harness and generate: how much of it can you utilize in your own business? Could someone else benefit from that data? If so, you might have a new business area.

4. You may have noticed that your industry is changing, and even fear that new entrants from other industries may steal your customers. One of the ways that this can be tackled is by offering the customers a turnkey solution, through one door: this drives what you know as ecosystems. By joining forces with other firms with partially collaborative and partially competitive aims, it is possible to combine different types of offerings in a way that strengthens the customer's relationship to your ecosystem. Can you identify ecosystems or potential future ecosystems in your field of business?

5. It may well be that when digitalization continues, these ecosystems actually hold the power and provide the competitive advantage – the best you can do as the decision-maker of an individual firm is to try to create or latch on to an ecosystem. But there are different roles you can play, depending on how much you want to commit to an ecosystem and to what extent you want your business offerings be based on the potential of the one ecosystem. If you want to be at the core of an ecosystem, you will be highly committed to it and bear the risk of its downfall – but at the same time the ecosystem provides you with rich business benefits (think Apple ecosystem or Samsung in the Android ecosystem). On the other hand, if you have the right kind of business (like a game development firm), you can exploit the benefits of several ecosystems (offering your games in both Google Play and AppStore), without suffering too much if one of the ecosystems fails.

6. With the digital technologies it is possible to reach many operational goals much more rapidly than before. This is of course a good thing – provided that you could fashion such goals that you consider desirable also at the time of reaching them. Also, reaching the "wrong" goals will most likely have far more wide spread implications than before: nothing stays hidden in the digital realm, which means that once you have reached a goal that enough people consider bad (think case Cambridge Analytica), the damage to your business can be lethal.

7. The problem of wrong goals is not limited to reputational damage, however. You may be aware that the human induced climate change is well on its way, and with it the whole future of our globe is threatened. This means that you have a chance of being remembered by your posterity as one of the people who speeded up the destruction of the only planet on which the humans can (so far) live, or one of the people who helped saving it. Ignoring this choice won't make it go away.

8. With digital technology, you can control and monitor your employees in unprecedented ways. You can for example have them wear identification badges that track their movements, record their conversations and analyze the level of enthusiasm they expressed in those conversations. However, before ordering a set of these, you might want to think about how do you perceive humans: do you believe that we are ultimately untrustworthy and will only do what is necessary when coerced, or do you believe that we can be trusted, and come up with our best ideas, do our best work when given free reign? If your choice is the first one, and you see people as untrustworthy, the tradeoff is that in that case your organization will not excel in anything that requires creativity, as that managerial perception (and its accompanying enforcements) have been proven to destroy creativity and innovation. But if you genuinely just need efficiency and your firm can live without new ideas, go ahead and call Hitachi for the monitoring badges.

9. Now that we are discussing employees, you might have a think about what do you need them for in the future? It is old news that any routine manual labor can be automatized, and increasingly also cognitive routine work. This means that your accountants and lawyers will become as redundant as your factory line workers. Indeed, the only areas where humans will be needed are jobs that require human interaction (as we people just need other humans to show care)

and human creativity (as even the most advanced algorithms can only work on what has been given to them). This might even shake your chair as a CEO, if your daily routines consist of such profit analysis that, honestly, an algorithm can do better. However, if you are a constant source of new business ideas and models, or an invigorating presence in the work lives of your employees, you are invaluable (and might reconsider ordering the Hitachi monitor badges).

10. Of course, with the possibilities offered by microwork or crowdsourcing, you might be able to externalize also the ideating, and need to employ only such individuals who can sort out the ideas, and show good judgement in assessing which ideas are worth pursuing. Then the human skills your firm needs are, in addition to good judgement, good organizational skills, and the ability to exploit the external resources accessible through digitalization – maybe in terms of creating a digital platform (think AirBnB or Amazon), which you control and exploit in leveraging the resources and assets of the other participants in that platform.

11. No matter where you are physically located, your competition is no longer regional, because whatever you are offering, someone else is offering also – online. You have essentially two choices: either to create such local offerings that appeal to the need of physical human interaction of people and their specific desires (for example a deli of local field-to-fork food), or to get involved in the power play of ecosystems, platforms, networks and global value chains in one role or another.

12. If you end up at the top power position, please remember the words of the children's book character Peppi Pitkätossu (Pippi Longstocking by Astrid Lindgren): "With great power comes great responsibility". In shaping your goals and pursuing them from that position, remember that all actions have at least four types of consequences[100]: 1) the intended consequences driven by benevolent intentions, 2) the unintended consequences driven by benevolent intentions, 3) the intended consequences driven by malevolent intentions, and 4) the unintended consequences driven by malevolent intentions. Take care in the goals you shape and the actions that you take from that position – be a force for the good.

[100] As already before mentioned, I cannot take the credit for this fourfould insight of consequences as I stumbled upon it somewhere online quite some while ago. Unfortunately I have been unable to retrace the source, but my sincerest thanks go to the anonymous thinker responsible for this brilliant nutshell.

8.4 Limitations of the research

The main limitation of this research follows from its integrative aims: as it has been my primary goal to combine extant knowledge from several areas in order to draw a bigger picture of the impacts of digitalization, the individual areas of knowledge have mandatorily remained more or less superficial. As such, the contributions of this dissertation rest on the potential benefits of integration, instead of creating completely novel deep insights in regards to the individual themes here discussed.

This limitation is evident in the method of data gathering: instead of carrying out extensive and comprehensive literature reviews of the vast literatures each of the focal themes here are grounded in, the data was collected based on a pre-existing understanding of some key areas and literatures, which were then expanded through snowball sampling – ie. from the diverse articles, the relevant seeming references were selected and perused, which led the investigation further. As such, while I naturally hope that the data used in this dissertation provides sufficient groundings for my argumentation, none of the central chapters (strategizing, uncertainty, digitalization) should be read as attempts at full scholarly literature reviews covering all potential aspects and "state of the art" within the sectors.

In addition, as there exists relatively little scholarly material pertaining to some technology related themes and phenomena, the sources in such cases were online articles or blogs, documenting the phenomenon not from a scholarly perspective but from the personal view of the authors. However, care was taken in trying to utilize this material in a way where this type of material was considered as case examples, documenting a phenomenon of interest, instead of using the opinions expressed in the material as grounds for argumentation.

Furthermore, as the phenomena of this dissertation is currently unfolding, there simply is not data about such developments or events that have as of now not yet happened. Therefore, the argumentation is grounded on the so far recognizable trajectories, which, as we know from future research, may or may not be reliably extrapolated to illustrate the future developments. However, while this pertains to the focal theme of digitalization and its impacts, the themes of strategizing and uncertainty are not time sensitive in this sense. Even if digital technology vanished overnight, we might still benefit from paying more attention to our doxa.

Yet another limitation pertains to the limits of this dissertation: as widely as it arches, there are still several relevant themes that would merit addressing and discussing in this context. In addition, many of the arising themes were discussed primarily as thought triggers and conversation starters, without deeper scholarly delv-

ing. For example the future of work was merely cursorily noted while it may well be one of the most impactful changes arising from digitalization.

The ultimate big limitation of this dissertation is its lack of clear positioning. While some individual themes contribute to some individual scholarly discussions, as a whole, this dissertation falls in between diverse fields, disciplines and categories. It is up to the reader to decide the severity of this limitation.

8.5 Future research avenues

At this point, writing this dissertation has awoken more questions than it has answered them. First of all, the nature of uncertainty is all but clear, and would merit deep scholarly engagement: my threefold conceptualization requires additional scholarly attention, and understanding the boundaries of the closed sets would have already now practical relevance. Secondly, what has here been synthetized and referred to as doxa, would warrant intense scrutiny both from the vantages of extant knowledge about its constitution and more importantly, from the perspective of its impacts in creating the digital representation of reality – or from its role in creating such social problems currently discussed as issues of cultural clashes, as the concept of culture is too coarse to capture the more nuanced differences better explained through doxa. Additionally, many of the integrative frameworks here drafted would benefit from deeper scrutiny and empirically driven reflections.

However, in this final chapter, instead of zooming into theoretical avenues, I will point out some of the big questions this research has awoken in at least me. The unfolding of digitalization is underway, and as a phenomenon offers ample research avenues – either through the macro level perspective or within diverse micro level phenomena, aggregating into the (potentially) paradigmatic level change. I will finish this dissertation by pointing out a few areas I personally find interesting and relevant from a very macro perspective – however acknowledging that they are but a drop in the ocean of research opportunities and needs emerging from the ongoing, datafication, digitizing and connectivity driven transformation.

Distribution of the benefits of economic activity. This is a theme that should be (and luckily, increasingly is) at the core of global political discussions right now. Advances in digitalization will severe the linkage of work from between the activities of individual humans and their ability to care about their sustenance. In short, we will, in the following decades, most likely enter an era of such structural unemployment that will make it impossible for most humans to transform their effort into material

benefits through work. As a ripple effect, the meaning of work as an individual level meaning making mechanism will necessarily undergo changes.

This requires serious discussions of the inherent value of human life, the roles of humans and society, and the roles of humans and firms. Does the society exist for the individual human, or do the humans exist for the society at large? Do the firms engage in economic activity in order to create better daily lives for the humans, or do humans exist in order to contribute to the bottom line of the firms, ie. the economic growth, either through consuming or through employment?

How do we view material and power inequality – do we accept is an eternal part of human civilizations, or something to be eradicated? If we wish to eradicate it, what are the new material wealth distribution mechanisms – and should they be globally overarching or regionally bound? If we accept it, how do we judge the value and entitlement of the individuals in the different ladders of that pyramid? What are the post-work mechanisms through which individuals can climb that ladder?

What will be the new meaning making mechanisms of an individual – from which building blocks will the individuals create their identity and meaningfulness? If the economic growth is a macro level representation of the human faith in progress, how can that faith in progress be realized on the individual level without work? Or should it be realized – how important is it for an individual to have a feeling of going forward, towards something else than the (currently) inevitable death?

Narratives enabling collective existence on a limited globe. Recent times are characterized by the shattering of any shared narratives, faiths in Gods, Enlightenment or Market. Instead, through the increasing connectivity, and its restrictions, we witness the emergence of a cornucopia of miniature institutions driving, enabling and restricting human action in smaller spheres. Even a diet can be a source of nigh religious behavior.

At the same time the limitations of what our globe can tolerate are daily becoming more evident. How can we construct such shared meaning structures that would enable creating such standards of desirability that would support such collective actions as would be necessary to ensure the continuity of our shared co-existence on this planet?

What would the new stories be and where would they emerge from? If we accept that the time of grand narratives is gone, and mininarratives reign, can those smaller stories create enough shared understandings to enable harmonious co-existence and globally non-destructive actions?

Looking anew the roles and impacts of geographically, economically and socially bound entities – exploring the new coalescences of power. Geographically

bound entities include nations, regions and sub-regions, economically bound entities consist of firms, value chains, production networks and ecosystems, and socially bound entities are formed around the diverse nodes of social objects, including political opinions, diets, individuals, hobbies, animal rights, vocations, skill-sets… the list goes on.

In looking at the global socio-political sphere, which entities wield the most power? What are the power dynamics between the diverse collectives? What should we be paying attention to and how? Who will hold the power in the future: will it be coupled with financial wealth or official position (as a head of a geographically bound entity for example); with the access, ownership and processing capabilities of data, or maybe with a messiah-type presence that becomes an iconic social object that draws enough masses together?

For example, can we envision a future where the global socio-political power will be held by entities of different nature: China, Alphabet, EU, Putin, Facebook (if it survives the Cambridge Analytica scandal) to pick a few? At what arenas will the global negotiations be then undertaken? How will the economic, social and political structures then look like: for example, what will happen to markets and nations?

These types of changes, if they emerge, will emerge in an unforeseeably distant future. However, in identifying some of the trajectories leading to one or another alternative, we can either stay informed about how the future will shape out to be, or even try to change those trajectories with the capability of surprises engrained in us humans.

Seeing the big picture. I have a personal compulsion of trying to connect the dots whenever I see them. This compulsion was in part realized in writing this book, but beyond my personal disposition, I do believe that with all the knowledge we now have, we should understand more. We should be wiser.

If we scholars don't at times look up and release our rigorous grip on seeking more and more detailed knowledge, I fear that we may never become wise. And wisdom is what the world most need amidst the crescendoing tumult of data.

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