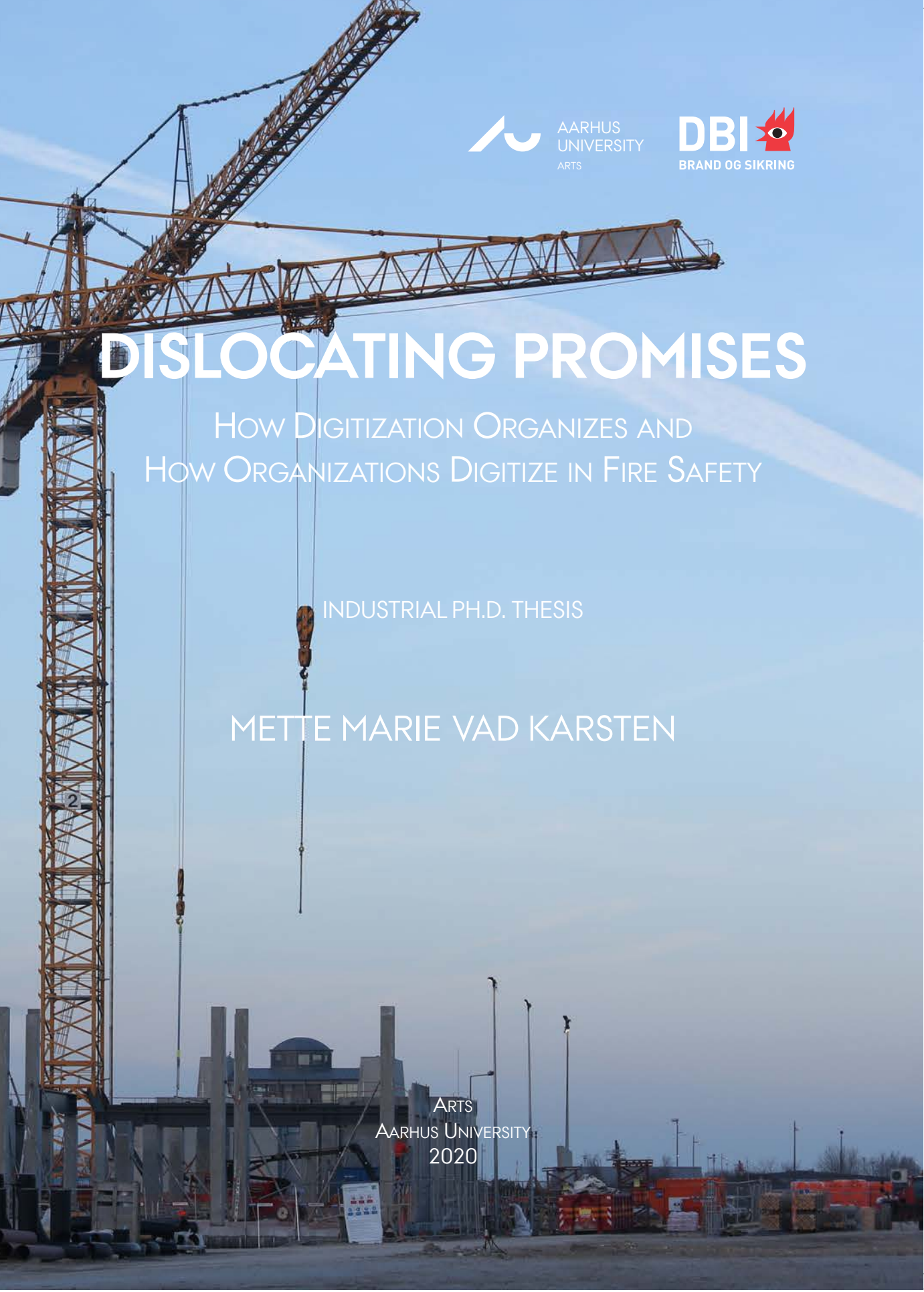

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DISLOCATING PROMISES

How Digitization Organizes and How Organizations Digitize in Fire Safety

INDUSTRIAL PH.D. THESIS

METTE MARIE VAD KARSTEN

Arts
Aarhus University
2020

DISLOCATING PROMISES

How Digitization Organizes and How Organizations Digitize in Fire Safety

Industrial Ph.D. thesis

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2020

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CONTENTS

SUMMARY (IN ENGLISH)

The aim of this thesis is to produce new anthropological knowledge on the digitization of complex knowledge areas – in this case fire safety in the Danish architecture, engineering, and construction (AEC) industry. As the thesis reflects an industrial Ph.D.-process, the aims and success criteria have been both academic as well as commercial and overlap in this thesis. With a vantage point in organizational anthropology, the project has taken great interest in investigating how digitization may be conceptualized as a social, professional and organizational practice, and how digitization and organization of knowledge and expertise crisscross, merge and mutually affect each other. Based on these anthropological interests, the thesis further investigates how the digitization of knowledge and expertise in complex areas such as fire safety is carried out, and how risk assessments may be digitized in a way so that the users of the digital tools have confidence in both fire safety professionals and the digital tools.

The majority of anthropological research on digitization in or across organizations focuses on how users of the digital tools appropriate, shape and use these tools. In short, these analyses most often focus on everyday use, on implementation, and the impact of such implementation for the end-users of these tools. Conversely, there is little anthropological research on the preceding development of these tools, let alone about how professionals yield a piece of their knowledge and expertise to a digital program, which they themselves help develop. There are some studies of given groups of professionals who develop digital tools, but rarely of the encompassing organization that orchestrate the digitization process. This dissertation unfolds here – in the nexus between digitization and organization – and seeks to illuminate how digitization organize expertise, and how organizations organize such expertise and shape digitization accordingly. Thus, the thesis delves into what constitutes professional expertise in complex, knowledge-intensive, powerful and politically shaped professional fields like fire safety. Fire safety expertise is juxtaposed with the agendas of digitization, and this

produces a nexus between digitizing and organizing which points towards various challenges and concerns. I suggest that these issues form the basis for why digitization in the architecture, engineering and construction is experienced as slack, difficult and problematic.

This thesis not only presents an anthropological analysis of digitization in an organizational context, but it is also a testimony to the professional learning process that junior anthropologists and researchers undergo. The issues presented in this thesis are discussed against a backdrop of methodological and ethical circumstances and conditions prevailing during fieldwork. As an industrial PhD-fellow, I was employed by Danish Institute of Fire and Security Technology (DBI) to study internal relations and settings in the organization as well as external relations with clients. In the process, it transpired that my access and participation in the processes and projects I was employed to understand was predetermined by a collaborative engagement as a colleague rather than a researcher. Thus, the methodological and ethical circumstances of the fieldwork constitute a substantial part of this thesis.

The thesis ends with six concrete recommendations directed to DBI, as well as other organizations facing digitization of expertise and knowledge among their employees. The recommendations include suggestions for how transdisciplinary collaborations during digitization can be built; suggestions for how organizations can initiate internal discussions about which kind of digitization process they want to help avoid challenges later on; and an invitation to top management to hold self-critical conversations and discussions about the intentions behind digitization and who it benefits.

RESUMÉ (IN DANISH)

Målet for denne afhandling er at tilvejebringe ny antropologisk viden om digitalisering af komplekse vidensområder – i dette tilfælde brandsikkerhed inden for den danske arkitekt-, ingeniør- og byggebranche. Da afhandlingen afspejler et erhvervs-ph.d. forløb, har målene og succeskriterierne haft akademiske såvel som erhvervsmæssige karakter, der overlapper i denne afhandling. Projektets har med organisationsantropologisk sigte haft stor interesse for at undersøge, hvordan digitalisering kan forstås og begrebsliggøres som en social, professionel og organisatorisk praksis, og hvordan digitalisering og organisering af viden og ekspertise krydser, sammenflettes og gensidigt påvirker hinanden. Med afsæt i disse antropologiske interesser undersøger afhandlingen endvidere, hvordan digitalisering af ekspertviden inden for komplekse områder såsom brandsikkerhed udføres, og hvordan risikovurderinger kan digitaliseres på en måde, så brugerne af de digitale værktøjer har tillid til både den brandfaglige ekspert og det digitale værktøj.

Størstedelen af antropologisk forskning i digitalisering i eller på tværs af organisationer fokuserer på, hvordan brugerne af de digitale værktøjer anvender, former og bruger disse værktøjer. Kort sagt har disse undersøgelser som oftest fokus på hverdagsbrug, implementering og konsekvenserne af denne implementering for slutbrugere af de digitale værktøjer. Derimod er det begrænset hvad der findes af antropologisk forskning i den forudgående udvikling af disse værktøjer, særligt viden om fagfolk der oplever at skulle afgive dele af deres faglige viden og ekspertise til digitale værktøjer, som de også selv hjælper med at udvikle. Der findes en del studier af givne faggrupper, der udvikler digitale værktøjer - men sjældent af den omgivende organisation, der driver denne udvikling. Denne afhandling placerer sig hér – i krydsfeltet mellem digitalisering og organisationer – og forsøger at give et bud på, hvordan digitalisering organiserer ekspertise, og hvordan organisationer organiserer denne ekspertise

og former digitaliseringen herefter. Afhandlingen dykker således ned i, hvad det konstituerer professionel ekspertise i komplekse, videnstunge, magtfulde og politisk formede fagfelter såsom brandsikkerhed. Belysningen af brandekspertise sættes i relief i forhold til digitaliseringens dagsorden, og afhandlingen spænder et net ud mellem digitalisering og organisering, der peger på forskellige udfordringer og bekymringer, som jeg mener ligger til grund for, at digitalisering inden for arkitekt-, ingeniør- og byggebranchen ofte opleves som træg, svær og problemfyldt.

Afhandlingen er ikke blot en antropologisk analyse af digitalisering i en organisatorisk kontekst, men også et vidnesbyrd om den tidlige professionelle læringsproces, som unge antropologer og forskere gennemgår. Disse problematikker diskuteres på baggrund af de metodologiske og etiske forhold og forudsætninger, der gjorde sig gældende under feltarbejdet. Som erhvervs-ph.d.-studerende blev jeg ansat af Dansk Brand og sikringsteknisk Institut (DBI) til at studere interne forhold hos dem såvel som deres relationer til eksterne kunder. Undervejs viste det sig, at min adgang og deltagelse i de processer og projekter, som jeg var ansat til at forstå, var forudsat af, at jeg engagerede mig som deltagende kollega frem for forsker. Dermed udgør feltarbejdets metodologiske og etiske omstændigheder en stor del af denne afhandling.

Afhandlingen munder ud i seks konkrete anbefalinger rettet mod DBI såvel som andre organisationer, der står over for digitalisering af faglige ekspertise blandt deres ansatte. Anbefalingerne dækker over: forslag til hvordan tværfaglige samarbejder i forbindelse med digitaliseringsprojekter kan opbygges, forslag til hvordan organisationer kan igangsætte interne diskussioner af hvilken digitalisering man ønsker for at undgå udfordringer undervejs, og opfordringer til topledelsen i DBI og andre organisationer til at føre en selvkritisk samtale og diskussion af, hvad man ønsker med digitalisering og hvem det er godt for.

ACKNOWLEDGEMENTS

I am deeply grateful and indebted to all my colleagues at DBI, who have generously involved me in their work and projects – especially the fire safety professionals and colleagues in the R&D departments. Despite the fact that I was (and still am, sometimes) ignorant of engineering and fire safety, the fire safety professionals have been exceptional! They have tolerated my questions and presence, explained fire safety matters to me over and over again, brought me along on field visits, shared insights as well as concerns, and queried and reflected alongside with me in our common endeavour to understand digitization, DBI's role in it, and anthropology's place in fire safety.

I am particularly grateful to my company supervisor and manager Kim Damsgaard for his genuine interest and enthusiasm throughout this project, and for valuable discussions. Thank you for having my back and for believing in this project when others did not! I am also deeply thankful to my two academic supervisors, Professor Cathrine Hasse and Senior Lecturer Steffen Jöhncke. Without the two of you, I would not have been able to keep anthropologically on track and academically in shape during these years. Thank you for your excitement, knowledge, and unambiguous support throughout this process!

This project started as an exited talk between collaborators at a conference, while I was on maternity leave. Bettina Skaarup, thank you for keeping a watchful eye on connections, possibilities and synergies! Without your persistent work with project conceptualization and grant applications, this project would not have landed on my desk. Thanks to the Danish Innovation Fund for funding this research project.

A PhD thesis is the result of multiple collaborations and talks, countless cups of coffee, long discussions, disagreements and laughs with colleagues across organizations and countries. I wish to extend my thanks and gratitude to colleagues and PhD-peers at the

Department of Anthropology, University of Copenhagen where this adventure began. A special thanks to my writing group – Anette, Anna Maria and Frauke – for feedback and friendship! The thesis was finalized at the Department of Educational Anthropology at Aarhus University, where new and bright colleagues provided great feedback and help along the way. Through my involvement in the research programme 'Future Technologies, Culture and Learning', I experienced professional development, inspiration and wonderful collegial solidarity. A warm thanks to PhD-colleague Todd Wallenius for careful proof-reading on the final manuscript.

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Last, but not least, I am deeply grateful to friends and family. Thanks to my big brother for advice and encouragement, and to my parents for unconditional support. Finally, I am lucky and eternally grateful to have Svend and Ellen as my cheering team and as brilliant distracters from arguments, theories and work. And to Sebastian – where to start? No words can fully capture my gratitude for the irreplaceable role you have played throughout this project. You are my rock, always.

PREFACE

Imagine yourself set down in an enormous conference arena on the outskirts of a Scandinavian metropolis on a brisk September day. The place is packed with 3000 people in suits and trendy outfits with a light blue expo pass dangling around their necks. Once you enter, you find yourself immediately in a large exhibition area called the *'Digital Playground'*. The 'Playground' is filled with numerous stalls demonstrating robots, artificial intelligence, virtual reality technologies, and luxurious self-driving cars. There is a buzz of talk, and electronic DJ music, giant screens, spotlights, and shifting shimmering neon lights fill up the large area. Global billion dollar consultancies, banks and technology providers seek your attention and give out goodie bags, flash drives, webcam covers, and snacks. Next to the exhibition area is a gigantic stage, where array upon array of chairs stand in front. Throughout the day, you find a seat here to hear talks on management, business models of the future, growth, disruption, agility, digital twins and the next technological and digital revolutions from world-renowned researchers, debaters and technology gurus.

The moderator of the day introduces to the talks and keynotes by saying: *"Think about some of the tech revolutions we have witnessed within just ten years. The global adoption of the Internet. Smartphones. Ever more agile robots. And the rapid rise of Artificial Intelligence. The digital future is now, meaning that many current business models – a lot of your business models, sorry! – will be shredded to pieces. Products will be obsolete; millions of jobs worldwide will disappear. However, new exciting and unimaginable business opportunities will arise. Today, we will discuss these opportunities and challenges. […] You will hear from a distinguished group of very gifted, very skilled speakers – national and international – who will share their experience, their insight, their vision, and their advice on the challenges ahead and how to deal with them. […] The power of technology is rapidly changing our world! Up in an exponential curve. This is what we have to be prepared for. So in order to face these changes, we*

have to change our mindset. In order to become winners of the future, instead of masters of the past – and we all want to be winners, don't we? [Moderator looks excited at the audience, who murmur indistinctly] *Don't we!?* [Audience insecurely and awkwardly replies 'yes'] *I'm so happy to hear that! Because before we get started at our exciting day together, I would like for us to do a little experiment to feel that winning vibe! Now, I wanna disrupt – in these disruption times - I'm gonna disrupt your comfort zone. Would all of you please stand up?* [Audience gets up]. *Lovely. Make a little space… Wow, it looks lovely! Now, arms up.* [Moderator raises her arms above her head] *You've just completes a 100 meter sprint and crossed the finish line. Yeaaahhh!* [Moderator raises arms even higher. The audience do the same while looking awkward and puzzled]. *This is called 'The Winning Pose'. Scientists at Harvard have proven that by imitating this spontaneous pose for just two minutes, your body starts releasing hormones that convinces your brain that you are in fact a winner. It's working, trust me! […] You guys look great! This has turned into a prayer meeting, haha! Fabulous!"*

I joined the business conference described above with a handful of colleagues. Before we boarded the plane to return to Copenhagen, we ate burgers in the airport. I asked Allan, Helena and Sofie, who sat opposite of me – and whom you'll meet again later in this thesis – what they thought about today's conference. Helena took a sip of her diet Coke before answering: *"I thought it was quite valuable to hear those talks about automation in the transport sector. It's evident that a lot will be changed with automation and digitization, and it will raise new and different demands, which we must respond to. For instance, there's an issue of safety once hacking and automated fire safety decisions enters the industry. There will also be radically different fires because of changes in how we produce and consume energy. There are plenty of possibilities and opportunities with digitization and automation! But also radical changes!"*

Allan emptied his basket of fries while reflecting on the day: *"I actually don't know what I've learned from today… I'm still trying to figure out what today was about.*

The talks and keynotes were excellent, but they didn't go into depth or provide any concrete examples of the transformations they talked about, or cases where they had succeeded? They mostly just scratched the surface." I nodded, and tried: *"But it might tell us something about where our clients come from, and what they think digitization can do for them?"* Allan sighed and shook his head: *"Nope. That's the point! Our clients do not have that perspective. They have no clue about what digitization is about or what it takes! So we need to start somewhere completely different."*

Sofie joined the talk: *"I thought it was pretty nice and educational. But Allan is right, it wasn't really very concrete. I learned about trends and tendencies, and I know more about the current state of affairs within automation, digitization, or artificial intelligence. The stuff we need to know something about as a research and development department. But I'm less sure about what to do from here?"*

The ethnographic snapshot from the business conference touches upon key themes. First, it illustrates the imaginaries and discourses of change and transformation that are seemingly ever-present in discussions about digitization in professional settings. Second, it shows how professionals like Allan, Sofie and Helena continuously grapple with digitization and its implications as they try to make it fit with DBI and their expertise in fire safety. Third, it speaks of an apparent imperative to change 'mindset', ways of working, expertise, services and potentially entire businesses. Fourth, it points towards the challenges of interconnecting the values and visions of digitization and the changes it foretells with everyday organizing in corporate organizations. In the following chapters and articles in this thesis, I shall take you through these themes, and a few more, in an anthropological investigation of how digitization organizes and how organizations digitize.

FIGURE 1. FROM MOLIO.

CHAPTER ONE.

INTRODUCTION

1.1. PROMISES AND POTENTIALS – RISKS AND CONCERNS

If you do not know about it, you might not spend any length of time thinking about it. Indeed, when it works as intended, we do not pay much attention to it. I mean digitization. It is just there, making our everyday lives and professional careers run smoothly, building connections, tying the knots of our social relations, supporting collaboration, and facilitating storing, exchange, and retrieval of astronomic amounts of information and data. Only rarely do we consider its workings when there is a power blackout or loss of internet connection. There is another phenomenon, which you

might not have given much thought to until reading these lines: fire safety. In many ways, it resembles digitization. When it works best, we do not notice it in our everyday lives or consider how our homes, offices, schools, cafés or hospitals are designed and built in very particular ways to avoid incidents of fire and ensure safe passage during emergencies. Perhaps the only time we think briefly about fire safety is when we board an airplane and a kind voice reminds us where the emergency exits are while we are busy settling in our seats, shuffling through the magazines in front of us and popping on headphones before the instructions are finished. Despite the seemingly different areas of focus, the two phenomena might gain enormously by joining forces, according to stakeholders and researchers in the Danish architecture, engineering and construction (AEC) industry. Combine digitization's excellent potentials of standardization, transparency, effective relocation of information, and facilitating collaboration with fire safety's need for rules, regulations and well-coordinated operations across organizations and departments, and you have a perfect combination.

However, this appealing fusion has turned out to be no easy task – neither globally nor locally in Denmark, where this thesis focuses its attention. Digitization is hard work, and simplicity and usability are not always easy money. In their book on the visions, imaginaries and practices of ubiquitous computing, computer scientist Peter Dourish and anthropologist Genevieve Bell write that technologies are sites of social and cultural production (Dourish and Bell, 2011, p. 42). They must actively be maintained, ordered, coordinated and built, and relationships to them and the information these technologies convene must continuously be negotiated, contested, and agreed upon (Dourish and Bell, 2011, p. 28,57). I consider the same to be true for digitization: that it is a site of social and cultural production due to the continuous practice of organizing, coordinating and building, which are inherent parts of digitized systems. As Dourish and Bell note, such production entails negotiations, contestations and agreements over what must be included in the digital systems, how it must be done, and what should be left out, just to name but a few questions.

What is negotiated, contested and argued about in the present case, is how to digitize fire safety knowledge. This thesis is about how fire safety professionals (FSPs) in the Danish AEC industry build, develop, engage with, interpret, and shape digitization of fire safety expertise. Fire safety denotes continuous efforts to plan for the worst while hoping for the best. Fire safety expertise rests upon professional knowledge, particular experiences, discretions, and profoundly context-dependent information. Much like infrastructures (Bowker and Star, 1999), both digitization and fire safety demand close and continuous collaboration between the involved parties, coordination, and trust in each other's abilities, skills and competencies. But once you get down to work with digitizing fire safety, agendas and work practices clash. Digital standards abhor analogue deviations, and regulations mismatch with embodied experiences; what is deemed risky by a fire safety professional (FSP) is not necessarily deemed risky by an algorithm and vice versa. I show that FSPs are deeply *concerned* about how the dialogue with clients and collaborators, which they have so carefully built to mitigate mistakes and flaws in order to prevent fire hazards, will transform in digital systems and whether it may crumble because their knowledge will be decontextualized and demolished.

Somewhere down the road, yet another powerful site of social and cultural production enters the stage: the organization where such digitization unfolds. The organization in question is the Danish Institute of Fire Safety and Security Technology (DBI), who is keen on exploring and harnessing the potentials in digitizing parts of their employees' fire safety knowledge for the benefit of small and medium sized enterprises in the Danish AEC industry. From an anthropological perspective, organizations are social formations enacted by its members, and thus bearers of meaning, intentions and agendas (Garsten and Nyqvist, 2013a, pp. 6–7; Nyqvist, 2015, p. 342). Thus, organizations are constituted by continuous processes of organizing and negotiating meaning, and of contestation and transformation (Wright, 1994, p. 20,24). Throughout 20 months of fieldwork on/off from April 2017 to December 2018, I traced digitization and digitalization from project conceptualization to design, building, and launching of

digital programs intended to assist with fire safety decision-making during design and construction processes. DBI seeks to digitize knowledge among FSPs, whose knowledge is believed by employees and management to be of great value and importance to DBI's clients and collaborators. However, it turned out that digitizing such knowledge was trickier to organize and do than first anticipated. Some project ideas remained in folders on employees' computer desktops as imagined, digital futures. Other digital programs left DBI as noticeably different from first imagined or as unfulfilled potentials, neither showcasing superb digitization according to some nor unleashing the full effect of digitized fire safety according to others. Indeed, the project collaborators on the digitization projects I traced did not agree on how fire safety knowledge was best digitized and disseminated, depending on how risky and context-bound they deemed the fire safety knowledge. Digitization was thus shaped by professional background, knowledge, ideas about clients' needs and perceptions of fire safety among the FSPs in the digitization teams. Conversely, an action like highlighting an escape route on a drawing is an easy task for a FSP, but turned out to be difficult for a computer program. In this way, digitization challenged a fundamental action in fire safety practice. The intention was to digitize fire safety regulations that are seen as stand-alone information and *knowledge* about these regulations. However, I show that these regulations were entangled with *expertise* in doing particular interpretations, constructing contexts, and performing risk assessments, which complicate digitization. Digitization is therefore not merely about arranging knowledge guidelines and regulations digitally in binary units, but more importantly about converting expertise in applying and interpreting these regulations, and about devising new ways of organizing this expertise in a digital format.

As I investigate digitization of fire safety knowledge through the lens of a corporate organization known as DBI, I consider wat happens when expertise is digitized and converted into information by the organization that wields such expertise. Put differently, I ask how digitization organizes and conversely, how organizations digitize.

These two focal points structure my investigation of how digitization organizes expertise held by knowledge experts, and why digitization in an organization is a challenging endeavor that does not work out as expected. I argue that in the process of converting knowledge into information made available to external clients/collaborators, knowledge is dislocated from the practices (i.e. expertise) that contextualizes it at DBI. The problem is that such dislocation has ripple effects: it affects not only the particular knowledge which digitization allegedly targets, but an entire area of expertise containing practices, workflows, and relations in and across DBI. As DBI digitize the FSPs' knowledge, they thus reduce or dislocate expertise and practices that make the organization flow and function in the first place. In this way, digitization changes professional expertise of the FSPs, while it also fuels the need for new kinds of expertise, which creates organizational ruptures and barriers in daily organizing. Thus, I show in this thesis how digitization in organizations like DBI is a challenging endeavor, which requires a continuous negotiation and balancing of powerful imaginaries with ways of organizing professional expertise.

1.2. "Digitalisering" in Fire Safety and the Construction Industry

DBI is one among several Danish engineering companies such as Rambøll, COWI, and Niras, who orchestrate and drive *"digitalisering"* in the Danish AEC industry. Thus, the *"digitalisering"* initiated and carried out at DBI is emblematic of general efforts in the AEC industry in recent years. In Danish, there is no discrimination between the nouns 'digitalization' and 'digitization' as in English, but only the noun *"digitalisering"*. In English, *digitalization* etymologically refers to the adoption or increased use of digital technology by an organization, whereas *digitization* denotes processes of conversion (Oxford English Dictionary, 2010b, 2010a). The Danish noun *"digitalisering"* refers to the increased use of digital technologies and expansion of computerized processes (similar to digitalization) *and* the conversion of data from analogue to digital format (similar to digitization) (Det Danske Sprog- og Litteraturselskab, 2011). Thus,

the daily use of the verb *"digitalisering"* at DBI refers to several different processes. One FSP believed *"digitalisering"* means that everything is doable by means of a computer and that machine learning[1] and artificial intelligence[2] (AI) eventually will take over his work. Another described *"digitalisering"* as the process whereby our ways of working and disseminating knowledge will change, but still demand expertise and skills. A third saw *"digitalisering"* as an optimization process, where you add value to existing practices or knowledge through the possibilities that digital technologies offer. Consequently, *"digitalisering"* at times implies the digitization of tasks that the FSPs deem easily and advantageously digitized, e.g. the marking of red or blue lines that indicate fire-separating compartments or walls on building drawings. Yet simultaneously, *"digitalisering"* denotes intentions to automate fire safety decision-making procedures, which makes the FSPs concerned about the consequences. Thus, the multivocal understanding of *"digitalisering"* at DBI denotes all aspects related to intensified development, use, and implementation of digital technologies based on continuous conversion of fire safety knowledge into information.

Across the entire industry, companies, researchers and stakeholders engage in building digital infrastructures that foster interoperability by exchanging data and information between collaborators and developers (Jensen and Jóhannesson, 2013, p. 102). It is argued that the advantages are better and more seamless collaboration during design and construction of buildings due to *"detailed, holistic, graphically expressive, and data-rich"* digital models and systems (Smith and Tardif, 2009, p. 111). The focus on improved collaboration through digital means is key. The AEC industry is marked by high degrees of interdisciplinary work and much effort is put into coordination, communication and collaboration during construction processes (Bråthen and Moum, 2016, p. 751; Turk, 2016, pp. 274–278). However, while interdisciplinarity is a

[1] 'Machine learning' refers to processes where a computer improves its performance through continuous incorporation of new data into existing statistical models and algorithms, thus learning and adapting without following explicit instructions.

[2] 'Artificial intelligence' roughly refers to the ability of a machine or computer to imitate or simulate cognitive functions or intelligent human behaviour, e.g. 'learning' or 'problem solving'.

prerequisite of construction processes in the AEC industry, it is also accused of creating many challenges. Indeed, the AEC industry is infamously known for low productivity and delays (Hardin and McCool, 2015, p. 40,104), poor collaboration (Sacks *et al.*, 2018, p. 87), lacking innovation and renewal due to a highly regulated setting (Håkansson and Ingemansson, 2013, pp. 40–41), poor communication and information sharing, and budget overruns (Georg and Tryggestad, 2009, p. 969). The field of fire safety is no exception. Here, collaboration across disciplines is also a challenge, and the FSPs sometimes feel that they are the only ones who care about fire safety.

In fire safety as well as other fields working with risk, such as aviation or the maritime industry, collaborative challenges are assumed to stem from human errors. Here, so-called 'human factors' are seen as immediate threats to safety, because accidents are seen as a direct or indirect result of human actions (Shappell and Wiegmann, 2000; Chen *et al.*, 2013, p. 106). 'Human factors' and the above-mentioned challenges are issues, which digitization and information and communication technologies (ICTs) promise to help overcome because these technologies are seen as enablers of swift and effective collaboration and coordination across distances (Baba, 1999, p. 332). Simply put, *"digitalisering"* may help solve or mitigate the negative, human consequences of bad collaboration in the AEC industry by cutting across departments, budgets, projects, organizations and disciplines as a frictionless digital infrastructure (i.e. BIM). For instance, a nationwide Danish journal read by +10.000 architects and construction professionals argues: *"'Digitalisering' is young in a large perspective, but in no way a utopian future scenario in the industry. Today, digital tools are a natural part of many projects because they ideally add new value – increased productivity, more sustainable solutions, closer collaboration across the value chain, better understanding of the construction during the process for the participants and positive impact on bottom line. But it is also a new technology and mindset which radically transforms the industry and presents challenges and pitfalls with respect to the way in which project parties usually collaborate."* (Jensen, 2018, my translation)

Thus, while *"digitalisering"* holds immense possibilities, the industry apparently fails to harness the full potential and reap the fruits of it. When attending conferences, meetings and after-work meetings in the industry, you will hear peers, colleagues and speakers saying that the industry needs to encourage a new culture; that there is a massive need for change in behavior and habits; and that the industry is in a deadlock and therefore lags behind compared to all other industries. On several occasions, I was presented with figures produced by McKinsey Global Institute showing that the AEC industry's "*productivity problem"* may be remedied i.e. by infusing digital BIM-technologies, automation, virtual reality[3] (VR) and augmented reality[4] (AR), and that the industry lags significantly behind due to underinvestment in digitization (Woetzel *et al.*, 2017, pp. 15,56,64-65). Oftentimes, scholars in the AEC industry – as well as colleagues at DBI – ascribe the challenges of *"digitalisering"* and ICT implementation to conservative attitudes in the industry (Håkansson and Ingemansson, 2013, p. 40); fear of losing one's job (Juma, 2016, p. 220); resistance towards changes (Davis and Songer, 2009, p. 1324); or an immature market (Smith and Tardif, 2009, p. 30,99). According to Moilo, a key stakeholder in the industry, the AEC industry ought to focus less on technicalities like data, software and programs, and more on social aspects like organization, humans, management, competencies, clients' needs, communication and dialogue in order to nurture better *"digitalisering"* throughout the value chain of a construction process (Andreasen, 2018). What this shift in focus implies for organizations

[3] 'Virtual reality' describes how people may be immersed in virtual, digital cyberspaces created by information, and made possible with help from audio-visual technologies and devices. Most often, virtual reality setups constitute a headset that a person will wear, and thus be presented with a three-dimensional virtual presentation of a given world, i.e. a virtual reality, and where his/her actions partially determine what happens in the virtual world. This is why such a setup is appealing as part of training or course sessions, like we also see in chapter seven.

[4] 'Augmented reality' is similar to virtual reality in that it presents a computer-mediated alternative of a given world. In augmented reality however, the person is presented with an enhanced or slightly changed version of his/her surroundings. This is not done by wearing any headset, but by use of technologies such as a smartphone camera, where information is superposed something being viewed through a device. The smartphone game trend 'Pokémon Go' is an example of this.

and professionals, or how this is done in practice is less evident from these recommendations. What all parties do seem to agree on is that one major obstacle for the use, expansion and implementation of digital programs, and increased *"digitalisering"* in the AEC industry, are humans and their social lives. This is as far as we get: unidimensional reasons such as 'conservatism', 'resistance' or 'immature markets', followed by well-meaning suggestions for actions. Such solutions may be to *"be open to collaborative processes"* or *"build a constructive dialogue"* (Andreasen, 2018, my translation), or calls for intensifying the shared information oversight to improve the common starting point and confidence in collaborations, thus reaching better and more true information (Smith and Tardif, 2009, pp. 112–113). In this thesis, I investigate different trajectories and seek out other explanations than resistance, apprehension or conservatism.

1.3. Studying Digitization Rather Than Digitalization

I approach the notion, practices and challenges of *"digitalisering"* by foregrounding processes of digitization. Digitization unfolds at DBI both within and across several departments, but also with the involvement of external collaborators working as software programmers and clients acting as sparring partners and members of an expert monitoring group. Such empirical setting fostered a uniquely insightful setup for anthropologically studying digitization, which enabled me to trace how digitization was built, imagined, and negotiated at DBI, and thus investigate how organizations do digitization prior to processes of digitalization. Interestingly, the original research agenda was to study 'digitalization' among DBI' clients and collaborators, and to understand what risks the users saw in using the programs developed by DBI. This turned out differently, as the digitization never got this far during my fieldwork, and since only early-stage beta versions of the programs reached the clients. Thus, the ethnographic data does not speak of digitalization, but of digitization. Therefore, this thesis is about how DBI organizes digitization, and how digitization organizes DBI as an organization.

However, while anthropologists oftentimes consider digital technologies' impact on and interweavement with social lives and organizations, we tend to focus primarily on digital devices and the appropriation of these (i.e. digitalization). Anthropologists seem much less concerned with scrutinizing how such technologies covert meaning and move it from one place to another (i.e. digitization). Thus, with its focus on exactly such digitization this thesis differs from the majority of other anthropological studies on digital technologies in relation to professionals and their practices in organizations. Such studies primarily focus on digitalization, i.e. the introduction of 'finished' digital products or automated procedures into work procedures in organizations (Eriksson-Zetterquist, Lindberg and Styhre, 2009; Buenza and Millo, 2015), or cross-organizational relationships e.g. between doctors/nurses-patients (Vikkelsø, 2005; Pors, 2018), teachers-students (Selwyn, 2011), social workers-citizens (Pors, 2015) or government-citizen (Schou and Hjelholt, 2017). Indeed, I wholeheartedly agree with Wiebe Bijker and John Law when they argue that *"technologies are not purely technological"*, but rather they *"embody trade-offs and compromises. In particular, they embody social, political, psychological, economic, and professional commitments, skills, prejudices, possibilities, and constraints"* (Bijker and Law, 1992, p. 7). My analyses is indebted to such research, as will be apparent throughout the thesis. However, my agenda in this thesis is slightly different. I wish to talk of *digitization*. Both 'digitalization' and 'digitization' speak clearly of transformations, changes and appropriations. Yet, there is an important difference. Digitization is about converting and translating information and knowledge from analogous to digital formats; meanwhile, digitalization is about implementing ready-made technology into organizational settings thus bringing about change (Plesner and Husted, 2020, p. 7). Put differently, we might say that digitalization describes cases of utilization or mundanization (Willim, 2017) among 'patients', 'citizens', 'users' or 'clients' in everyday contexts or situations, or the use of digital technologies to specifically change organizational practices. Digitization describe all the work and organizing unfolding prior to digitalization, so to speak, where 'real work' phenomena are transformed into digital information that is expected to generate some kind of value (Knox *et al.*, 2007, p. 27).

Digitization is not only a means to seamlessness, as researchers, politicians and stakeholders in the AEC industry argue (Smith and Tardif, 2009; Schober, Hoff and Nölling, 2016; Woetzel *et al.*, 2017; EU BIM Task Group, 2018). Importantly, it also exposes the very opposite: the seam*ful*ness (Dourish and Bell, 2011, p. 110,115; Gregg, 2015, p. 58; Koch, 2017b, p. 235) of social and cultural encounters. Digitization discloses how professional self-perceptions, notions of expertise, multiple agendas and ways of organizing, and organizational power and politics co-exist, overlap, break down and gets reshuffled in both expected and unexpected ways. Anthropology has an important contribution to make in helping unpack and understand such seamfulness. I am convinced that the solution to hampered *"digitalisering"* is not to enforce more of the same *"digitalisering"* upon the same organizations. And yet, this seems to be exactly the reasoning. Anthropologist Christo Sims and education scholar Jesper Balslev have observed that that when an implementation process fails, such failure is not believed to be due to technological or digital malfunctions – rather, the failure is ascribed to the people, the employees, and the organization, who ought to do better, work harder, and change more (Sims, 2017, p. 4; Balslev, 2020). The trouble with such reasoning is that it misses the point; it focus on digitalization, and neglects the messiness of everyday lives, the negotiations, the contested meanings and moments, and the complex lives that people live – all of which impacts, and are a part of, digitization. Anthropology's strength lies in foregrounding exactly such seam*ful*ness and messiness, not least in organizational contexts. Thus, this thesis offers an anthropological investigation of seam*ful* organizational digitization, which provides a basis for understanding the close connection between organizations and digitization in times when both seem at the core of societal challenges and of our intensified creation, use and dissemination of digital technologies. This investigation targets two aspects of such seamfulness. First, it shows on how digitization transforms and dislocates professional expertise, workflows and collaborations, which lead to concern among FSPs about digitization's dire implications for fire safety. Second, it illustrates how digitization is organized by politico-economic notions about 'knowledge' and by impactful ideas about

(fire safety) expertise, which creates ruptures and barriers in the course of digitization. Such focus on digitization is rare in organizational anthropology, and thus leaves much to be described and developed. It is my hope that achieving a better understanding of the nexus between digitization and organizations may pave the way for building more empathetic, productive and understanding collaborations within and across organizations during both digitization and digitalization.

1.4. Outline of the Thesis and Articles

The thesis is article-based, and consists of four research articles and one appendix article. Articles one, three and four all describe research methodology and the empirical context of the research, including DBI; thus, the reader may find sections in these articles to be repetitive in relation to what has already been written in previous chapters. In the following chapter, I introduce DBI as a central player in the politicized field of fire safety and risk assessments, followed by a consideration of what a corporate organization is. Then I move on to elaborate in chapter three what fire safety entails as a professional practice, including the Danish context, regulations, and how it is practiced within and by DBI. Finally, I describe the societal and industrial contexts of digitization in combination with anthropological conceptualizations in chapter four. Following these introductory chapters, I discuss my theoretical backdrop in chapter five. Here, I focus on the interactive relation between organization/organizing and digitization/digitizing.

Thereafter, I proceed to chapter six on methodology and ethics, which focuses particularly collaboration and correspondence as inherent parts of doing organizational anthropology and as prerequisites for advancing the arguments set forth in this thesis. Such matters were salient during fieldwork because the research was carried out as an industrial PhD project. Chapter two precedes two articles. **Article one** (Karsten, 2020b) is a methodological article speaking of the challenges of doing or-

ganizational ethnography in the organization you are also hired by. The article considers several of the topics usually covered in anthropological discussions of methodology, and which therefore are not included in chapter two. Thus, the article discusses positioning among informants who were also my colleagues, and on collaboration in digitization projects as a methodological means to gain access and trust, and ultimately as a driver for generating analytical insights on digitization. **Article two** (Karsten, Ruge and Hulin, 2020) is co-authored with colleagues/informants from DBI. Based on three cases, the article suggests merging anthropology and fire safety engineering into more holistic risk assessments. The article exemplifies one way of collaborating on projects during fieldwork and illustrates the demands raised by the field to prove the relevance and applicability of anthropology in a corporate, organizational setting. **The appendix article** (Karsten, 2019) serves as an add-on to the entire methodology chapter as well as articles 1 and 2. It addresses the needs for anthropologists to perform rapid forms of fieldwork in organizations, which I did as part of my employment at DBI (forming the basis for my contribution in article 2). It also addresses organizations' tendency to focus on external factors rather than internal workings as impediment for their products, services and strategies, which is also the case for DBI.

Chapter seven precede articles three and four. The chapter and the articles sharpens our attention on how digitization organizes and dislocates professional dialogue, and how the organizing of fire safety practices and expertise impacts digitization at DBI. Through these inquiries, the chapter and articles traces and suggest inherent challenges of digitization in organizations. **Article three** (Karsten, 2020a) focuses on FSPs' work practices, as these are the object of digitization at DBI. I argue that hesitance to engage with digitization among FSPs is not about technology resistance or apprehension. Rather, such cautiousness rests upon FSPs' concern based on their need for practicing and guarding dialogue in fire safety, which is defined by several competing knowledge forms, multiple risk assessments and political stakeholders. The concepts of *'dialogue'*, *'mētis'* and *'techne'*, and *'concern'* are applied as shared framework for understanding FSPs' anticipated negative consequences of organizational

digitization. **Article four** discusses notions about what constitutes *'knowledge'* and *'expertise'*, how these organize and shape digitization at DBI, and how the FSPs' expertise is transformed during digitization. I argue that while DBI aims to digitize *knowledge*, they are in fact trying to digitize *expertise*, which is entangled in organizational practices, professional background, and past experiences. During such transformations, questions about authority, validity and expertise take center stage, while demands for new kinds of expertise also arise. The article proposes three key challenges of digitization at DBI: (1) the magnitude of digitization is underestimated; (2) knowledge is confused with expertise; (3) and external clients/collaborators are unintentionally involved in assessing knowledge.

In chapter eight I conclude the arguments, insights and analyses accumulated in the previous chapters and articles into one chapter. In chapter nine, I reflect upon the thesis' implications and discuss the issue of recommendations in relation to anthropological practice, knowledge creation and professional impact. This discussion is followed by six recommendations in chapter ten on how to proceed with digitization at DBI as well as in the AEC industry in Denmark more generally.

FIGURE 2. DBI HEADQUATERS. PHOTO BY DBI.

CHAPTER TWO.

WHO IS DBI, AND WHAT IS AN ORGANIZATION?

In this chapter, I draw the contours of DBI as a corporate organization, who perceives itself as a broker between universities and industries for the benefit of society. Following the introduction to DBI as the ethnographic setting, I also introduce anthropological understandings of organizations, which question ideas of organizations as bounded entities with shared values, underscore complexities, and focus on processes, power and contested meanings.

2.1. Tracing the History

DBI describes itself as a *"knowledge company"* (Danish: *vidensvirksomhed*) offering products, consultancy, and services to both private and public small and medium-sized enterprises (SMEs), institutions and authorities within the fields of fire prevention, fire technologies and security (DBI, 2019a). In many ways, DBI is the end-result of a patchwork of various stakeholder initiatives and changing risk perceptions in Denmark. In 1907, what corresponds to an official fire test was performed by the State Testing Department (a branch of the later Technical University of Denmark) for the first time in history despite its existence since 1896. This testing marked the early beginnings of DBI's 100-year-long history. The department investigated how materials and constructions performed when exposed to fire (DBI, 2018, p. 15). In 1920, the Confederation of Danish Industry at that time formed the Danish Fire Prevention Committee, responsible for carrying out fire safety inspections to help bring down the number of fires at Danish factories where fire safety was miserable (DBI, 2018, p. 9). In addition to the inspection, the committee started to provide advice on constructions and publish educational materials for the general public and technical guidelines for industries, factories and electricians (DBI, 2018, p. 10). Thus, the first steps were taken during these years on knowledge dissemination and education, as the committee organized the first course on fire safety in 1925 and started touring the country to visit school classes and teach fire safety in the 1930s (DBI, 2018, p. 10). Simultaneously, during the 1920s and 1930s, companies began to install sprinkler systems in their facilities and therefore Danish insurance companies agreed to lower the companies' insurance premiums. Accordingly, the precursor for Insurance and Pension Denmark drafted regulations and guidelines for the set-up of these sprinklers: if companies wanted a discount on their premiums, they had to design according to the regulations, use approved companies and materials, and allow the systems to be inspected annually by the coinsurance company (DBI, 2018, p. 10,21).

In World War II and in the years that followed, the interest in fire safety matters exploded. The three fire safety stakeholders – the testing department, the inspectors

and the committee – were in for some busy times and years (DBI, 2018, p. 10,15). Thus, in 1948 the testing department joined the fire safety committee in both IMO (International Maritime Organization, red.) and ISO (International Organization for Standardization, red.) (DBI, 2018, p. 16). Furthermore, the insurance association drafted guidelines on fire alarm systems and ventilation, which were followed by additional requirements to use approved installers in 1944. This meant that the educational activities and company certifications increased and became a part of the services offered by insurance companies (DBI, 2018, pp. 21–22). In the post-war years from the 1960s onwards, the committee and testing department started to engage in more international collaborations, e.g. by formulating standardized tests across the Nordic countries. In 1978, the committee performed its first fire investigation to determine the origin and cause of fires in electrical installations – a service, which today also includes buildings, other appliances, vehicles, ships, airplanes etc. (DBI, 2018, p. 11,17). In 1991, the Danish Fire Prevention Committee, the State Testing Department and the fire safety subdivision in Insurance and Pension Denmark merged and became DBI. Thus, DBI as modern corporate organization is the result of merged competencies within design, planning, testing, teaching, detecting, and inspecting and closely-knit connections across industries, organizations and areas of interest.

Today, DBI employs 259 people of which a little more than two thirds are male, and nine out of ten employees have a Danish background. The employees work in the areas of teaching, education and training; fire testing of products; product certification of e.g. building materials; inspection of fire and detection installations; fire investigations in cooperation with the police; security and resilience consulting; and fire safety consulting. These various business areas are arranged in five business units managed by a responsible director. These five units structure the core services and activities in the organization. DBI is managed by its board, which is invested with the highest authority in all cases. The board members roughly reflect the make-up of DBI: they are male, Danish, and have a technical or engineering background.

2.2. Changing Organizational Self-Perceptions

Judged by the handful of organizational charts retrieved from DBI's drives, the organizational structure has changed six times in the past twenty years. This speaks of changing conceptualizations of what kind of organization DBI is or is supposed to be. These changes reflect changing perceptions of organizations over time from functionalist or mechanistic perspectives to more systemic perspectives seeing organizations as organisms, all of which seek balance between fixed hierarchies and flexible teamwork (Wright, 1994, p. 18; Krause-Jensen, 2010a, p. 62).

In the early 2000's, hierarchical charts were used to explain DBI's structure, with the CEO at the top and sales, economy, HR and marketing immediately below in staff functions to support the management of the five business units. Mars writes that hierarchical organizations are oftentimes concerned with regulations, marked divisions of labour, and bureaucratic procedures, and that such organizations share a sense of group identity where rules, order, and precedent are cherished by its members. Here, risk is assessed and acted on only if conservatively approved by prevailing authorities, and information is validates only when it flows via accepted conduits (Mars, 2013, pp. 194–195). Although the hierarchical charts are gone today, some of the organizational features described by Mars are still manifest at DBI. Risk assessments and fire safety strategies are devised according to an approved yet implicit and subtle *"DBI-opinion"* outlined by senior FSPs, and selected key persons and managers in the top of the organizational hierarchy are responsible for disseminating and validating all the information and communication that exits the organization. Rules and orders are followed and cherished; not just within DBI on a daily basis, but generally they are seen as a means to achieve better fire safety because it is assumed that fires happen because an order or regulation was not followed.

Years later, around 2010, matrix-inspired charts were used to explain the workings of DBI, highlighting the need for cross-organizational links and collaboration across silos. Matrix organizations pursue dual- or multiple-priority strategies, which

require the organization to be excellent simultaneously in two or three different areas, e.g. technical excellence and fast time to market or global integration and local responsiveness must be combined (Galbraith, 2009, pp. 1–2). Although this kind of organizing have also been abandoned, managers at DBI still discuss how DBI works best across departments and silos to serve clients and carry out projects, and the organizational strategies still have multiple priority areas. For instance, the recent strategy has three main priority areas, each with three to seven sub-areas in focus, which speaks to the multiplicity that matrix-diagrams intend to map.

When I came to DBI in 2017, the organization had returned to the hierarchical-style charts, only to leave it behind again and develop a bubble-inspired chart (DBI, 2020) during my fieldwork, where management and staff functions sit at the center, and the business units are placed in the peripheries of the bubble (see figure 2 below, in Danish). This organizational chart is inspired by fluid organization. These are seen as networked, self-managed to some extent, agile, diverse, improvised and thus able to transform quickly in a rapidly changing, globalized and digitized world, whereas hierarchical organizations are seen as formal, slow, similar, specialized, rigid and unable to keep up the pace with the technological developments (Schreyögg and Sydow, 2010, p. 1251). Keywords in this organizational understanding are speed, adaptability and transformation (Schreyögg and Sydow, 2010, p. 1251). The chart indicates how DBI management believes that the organization must respond to technological developments and live up to its task as a research and technology organization (I return to that below in section 2.3).

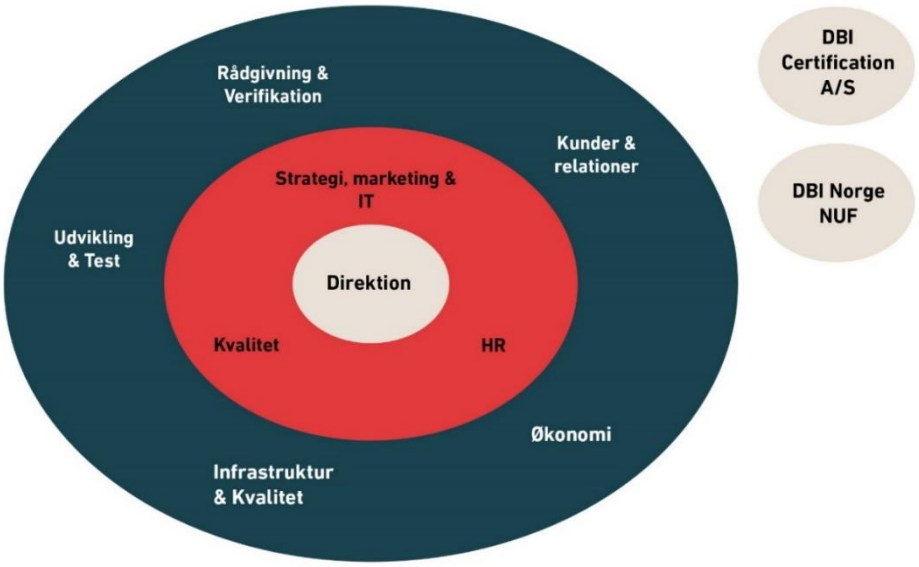


FIGURE 3. DBI ORGANIZAITONAL CHART. ILLUSTRATION BY DBI.

At the same time, the chart also signals that the different units at DBI work together as a united organizational entity, which is an understanding that otherwise appears as strikingly different from the network-based understandings of organizations. The chart thus supports the first of DBI's five values, which is *"One DBI: DBI is presented to customers as one single company"* (DBI, 2018, p. 68). Acting unified as 'one', DBI can more easily react to shifting societal needs, clients' needs and an increasingly technical agenda through better internal collaboration, coherent client-oriented processes and superb knowledge sharing. Interestingly, as I talked with colleagues and our conversation turned to DBI's values, not many could remember all five. They would name a few and then give up, or name a bunch that were not similar to the stated ones. Irrespective of their answers, one value was named consistently: *"One DBI"*. However, my colleagues did not mention it because they agreed with it. They mocked it, because it was the one value they did not think was true: they did not believe that DBI was 'one'. Thus, it seems that the current bubble-inspired organization chart speaks more about what DBI aspires to become, rather than depicting current affairs.

Summing up DBI's history and self-perception until today, one might say that in fire safety in Denmark, it all begins and ends with DBI one way or another. In the 1990s, DBI for instance had a monopoly on several fire protection inspections (DBI, 2018, p. 33). Today, some employees at DBI as well as competitors outside the organization claim that near-monopoly situation still exists and that transparency into DBI's workings and assessments is hard to achieve. An example could be some of the handbooks that DBI drafts and which the insurance companies use as guidelines in their insurance premiums. The ties with the insurance companies dates back almost a century. During the 1920s, insurance companies started to approve of DBI and granted discounts for companies that ensured regular fire safety inspections of their facilities and buildings. Consequently, DBI's work became very appealing to companies and the business grew rapidly (DBI, 2018, p. 10). In a lunch break, I heard how some industry associations had urged DBI to revise some of their guidelines, because their members found it difficult to understand DBI's guidelines. These members are not obliged to adhere to DBI's guidelines, but they are indirectly forced to, because their insurance companies will not provide insurance for them if they do not adhere to DBI standards. DBI is the only Danish organization drafting such guidelines, thus the insurance companies have nowhere else to turn to, as they do not draft these guidelines themselves. According to critical voices in the industry, this puts DBI in a monopoly position. Yet, during the lunch break, my colleagues did not see it this way – they merely noted that fire safety yet again had become the subject of a political debate, and that they could not understand why the companies were annoyed by these guidelines. As one senior manager said: *"They can just stop using our guidelines and make their own, they are totally free to do that!"* As a response to critique like this, DBI have focused increasingly on client satisfaction and transparency, on building closer collaboration and understanding with industrial associations, and on communicating that they work and compete on market terms like everybody else. Here, digitization and digitalization (of esoteric fire safety knowledge) satisfy public demands for transparency in information handling, information-sharing and accountability, which is seen as a means to govern organizations and assess their trustworthiness (Jiménez, 2011; Røyrvik and Almklov,

2012; Shore and Wright, 2015a). Notwithstanding the monopoly discussions and its relation to digitization, DBI is firmly in power and control of fire safety in Denmark. The organization is an influential player in the industry, and its employees takes pride in this position by claiming that it enables them to secure and preserve the best possible fire safety in society and industry.

2.3. Working for a Greater Good

The Danish Ministry of Higher Education & Science has approved DBI as one of seven Danish GTS institutes (da: *Godkendt Teknologisk Service*). This happened more than forty years ago in 1978 (DBI, 2018, p. 11). With such an appointment, DBI must be an independent, private, non-profit organization impartial and independent of business or political interests (GTS, 2020b). By reference to a Danish consolidated act on technology and innovation, DBI must provide knowledge, insights and facilities for all businesses on equal terms, and all profits must be reinvested in infrastructure, facilities and research targeted at creating new technological knowledge for the benefit of SMEs in Denmark (GTS, 2020b). Describing the motive powers for all GTS institutes[5], the network explains: *"For many businesses, keeping up with accelerating technological development and implementing new technologies in products and processes can be a major challenge. Investing in new technologies can be both expensive and uncertain – an uncertainty that is particularly difficult for small and medium-sized enterprises (SMEs) to handle. […] The GTS institutes therefore have a key role to play particularly for SMEs in the Danish innovation system, because they can ensure better and more efficient use of new research and technology by Danish businesses. In so doing they increase and promote innovation, productivity, and growth in Danish society"* (GTS,

[5] The GTS institutes form a national branch of an international cluster of Research and Technology Organizations (RTOs). RTOs, including the Danish ones in the GTS-network, are state-funded and engage in activities that promote innovation in industries and society in general (GTS, 2019a). RTOs consider it as their core task to help shape the Danish and European technological infrastructures through consultancy, training and research/development activities (ERATO, 2019).

2019a). The GTS term covers seven institutes engaged in in supporting and promoting this agenda. The institutes describe themselves as supporting, maintaining, building and developing the core of the technological infrastructure in Denmark in close collaboration with businesses, universities and other research institutions (GTS, 2020a). To carry out such agenda, they *"operate in the critical area between national basic research and commercialisation"* by working to accelerate innovation in businesses through research and development and to commission and collaborate in research with universities (GTS, 2020a).

DBI illustrates their endeavor as GTS institute in the following graph (see figure 4 below). In one end of the linear graph, one finds the research carried out by universities. The research is practiced in labs where so-called *"basic principles"* are investigated, which according to DBI are happening far from the so-called *"real world"*. In the opposite end of the scale, DBI places businesses applying technologies in *"the real world"*. Thus, the graph informs the reader that more you move into the realm of business and away from university, the more technology becomes applicable – judging by the graph, the reverse movement seems unthinkable. DBI perceives and portrays itself as a broker and translator moving from university to business, undertaking simulations and demonstrations of research outputs and reformulating these as potential business cases. Yet, if DBI is neither part of *"the real world"* (like businesses) nor part of a matching unreal world (where universities or labs find themselves), then what world is DBI part of might one ask? What possibilities, restraints or monopolies does it set up for DBI? What kind of organizational self-perception and professional narrative does that provide DBI? Here, the role and purpose as a GTS institute steps forward as a guiding story for the employees and managers, who genuinely believe that they fill a knowledge gap in society and industry in terms of fire safety. They also feel that with such a position comes great responsibility to educate the industry and society on matters of fire safety, as well as the absolute necessity of providing high-standard, high-quality independent risk assessments.

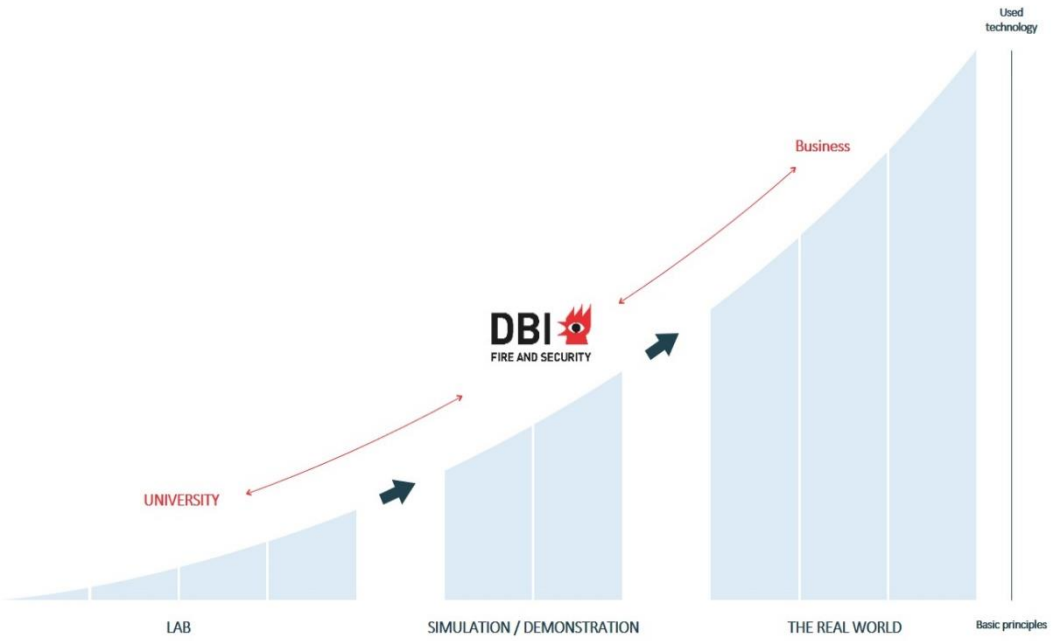


FIGURE 4. DBI'S POSITION AND WORK. GRAPH BY DBI.

I find that the graph in figure 4 illustrates how DBI portrays itself as sitting in a tri-lateral relationship between university, business and itself as partially state-funded institution, where all parties are united in a continuous transition towards future innovation, where basic research is linked to utilization through intermediate processes (Etzkowitz and Leydesdorff, 1998, p. 205) facilitated by DBI. The building of such relationships have been going on since the 1980's and are perceived as a particular source of economic growth and product innovation by securing niches of technological innovation and jobs in an increasingly globalized economy (Etzkowitz and Leydesdorff, 1998, pp. 204–205). The relationship is termed a triple helix constellation (Etzkowitz and Leydesdorff, 2000, p. 110). In a triple helix, hybrid organizations emerge at the interface and overlap between state, academia and industry (Etzkowitz and Leydesdorff, 2000, p. 111). DBI might be termed as one such hybrid organization seeking to bridge the three areas. Such organizations are often encouraged but not controlled by governments through new rules, direct or indirect financial support (such as the performance contracts which DBI's digitization projects are primarily

funded through) or other innovation promotion initiatives (Etzkowitz and Leydesdorff, 2000, p. 112).

With the research and development-oriented profile combined with training and education, consultancy, inspection, testing and other services, DBI is in contact with approximately 7.300 clients and 6.900 course participants each year. Out of these, 67% of their clients are SMEs, 20% are public institutions (e.g. authorities, the police, hospitals, schools etc.), and the remaining 12% are large corporations with more than 250 employees. This also means that the profiles of DBI's clients and users are extremely diverse, ranging from one-man companies seeking help with fire safety regulations to multinational companies seeking not only advice but also collaboration in developing new products and reducing their products' time to market. Due to their role as a GTS institute, approximately 20% of the activities at DBI are funded by the Danish Agency of Science, Technology and Innovation under the Ministry of Higher Education and Science, while the remaining 80% of the turnover originates from sales of knowledge and services on regular market terms (GTS, 2019b). Therefore, DBI is required to undertake applied research projects and develop new technologies aimed at Danish SMEs through so-called performance contract activities aimed at developing *"new technological services ahead of market demands and in areas where the market itself cannot or does not meet the need"* (GTS, 2018). The fieldwork carried out in this thesis traced performance contract activities in the period 2016-2018, and thus I consider the digitization projects as kinds of anticipatory, prototyping practices in that they were supposed to be ahead of market demands, foresee needs and inquire into future events. I shall not judge whether the digitization projects were ahead of their time or not, but I note that when technology development projects failed or were sidetracked, the stated reasons for this were that DBI had either misread the market or had been (way) ahead of the market demands or users' needs. As part of this reasoning, it was also often argued that *"users are stupid"*. One of the project managers in charge of devising and launching development projects told me that *"Users don't know what they want if we ask them. They need us to tell them. Think about Ford. If he asked*

people at that time what they wanted, they would have said wagons with bigger horse teams, not cars. Or think about the iPhone! People don't know what they want. We need to help them realize it." What these experiences and efforts to devise digital products for future needs reveal is that, in the words of Watts: *"Telling stories of the future is always a social, material, and political practice. It always has effects; it is always non-innocent"* (Watts, 2008, p. 188). The same goes for digitization and imagining futures in and for DBI. Doing digitization is a social, material and political practice and way of organizing that has ripple effects, both for digitization itself but also for the ones orchestrating it. Therefore, I now turn my attention to consider organizations from an anthropological perspective.

2.4. What Is An Organization?

When anthropological conversations turn to organizations, they set out from the verbal form of the noun; organizing (Wright, 1994, p. 1). Such organizing is manifold, and the organizing that takes place within organizations is no exception. In 1994, anthropologist Susan Wright edited a seminal book on the anthropology of organizations, where she charted its relationship with organization studies to date with a particular focus on the concept of culture and the fields' concern with consensus and conflict in the study of organizations (Wright, 1994). Wright departs from the widely accepted notion advanced by organization scholar Edgar Schein that culture is the property of a bounded and unitary (organizational) group, and that culture is stable and shared in consensus among the members of the group (Schein, 1992, pp. 8–14). Anthropologist Jakob Krause-Jensen notes how 'culture' (including notions of 'corporate culture') has been integral to management thinking and practice, applied to control employees, harness organizational workings, and serve as a common framework for working towards organizational goals (Krause-Jensen, 2010a, p. 54, 2011, p. 274). Indeed, during the 1990s, the interest in culture in organization studies focused in either 'corporate culture' as a managerial tool or 'organization culture' as a metaphor for organizations

seen as a village or tribe (Czarniawska, 2012, p. 126). Interestingly, there are several current mainstream examples where anthropologists build on this understanding in their efforts to make managers think more broadly and seriously about culture in organizations and among their consumers as a means to corporate success (Madsbjerg and Rasmussen, 2014; Braun and Kramer, 2019).

Wright – as well as anthropologists in general – takes a different stance than organizational scholars such as Edgar Schein by arguing that in-group sharedness implies common repertoires of ideas, which are continuously reworked. To Wright, ambiguity is essential in framing this reworking, and it is highly political as meanings are not fixed, but actively contested (Wright, 1994, p. 4). Influenced by the teachings from the Manchester School, Wright highlight issues of conflict and questions of context as central to studies of culture, also within organizations (Wright, 1994, p. 10). As opposed to the seminal Hawthorne studies[6] which focused on understanding consensus and sharedness in organizations, the Manchester shop-floor studies[7] assumed discord and divisions between workers and managers, and therefore focused on paradoxes, cross-cutting relationships, tensions and inequalities as continual processes in organ-

[6] Please see a more detailed description of the Hawthorne studies in note 4 in article four.

[7] During the 1950s and 1960s in Great Britain, anthropologist Max Gluckman and colleagues at University of Manchester carried out the seminal 'Manchester shop floor studies' (Moeran and Garsten, 2012, pp. 5–6). The eight studies not only entailed 'observation' of workers as in the Hawthorne studies, but also included 'participation' among the workers that the fieldworkers strived to understand (Wright in Luthans *et al.*, 2013, pp. 101–102). Furthermore, these studies did not separate the workers in experiments – instead, the researchers spent 6 months doing factory work on the shop floor with the workers. Participation and observation were thus given equal weight, and so were managers and workers (Wright in Luthans *et al.*, 2013, pp. 102–103). Unlike in the Hawthorne studies, the Manchester group did not accept managers' framing of problems, but included them in their studies and analyses, which enabled a focus on workers' forms of organizing on their own terms (Wright in Luthans *et al.*, 2013, p. 103). Thus, the Manchester studies focused on issues of conflict, class struggles, and unexpected alliances, rather than how organizations reached consensus (Wright in Luthans *et al.*, 2013, p. 103). To this day, these studies as well as the Hawthorne studies function as tales of 'origins' in the anthropological records of the discipline's engagement with businesses, industry and work (Moeran and Garsten, 2012, pp. 5–6).

izations (Wright in Luthans *et al.*, 2013, p. 103). Such approach was particularly inspired by Max Gluckman, who was the founder of the department of Anthropology in Manchester, and had carried out analyses of everyday social conflict in sub-Saharan Africa (Gluckman, 1958; Wright in Luthans *et al.*, 2013, p. 103). Echoing Gluckman's and the Manchester School's fundamental principles of focusing on complexities and differences, Wright argues that organizations must be understood as continuous processes of organizing and negotiating meaning, thus anthropological analyses oftentimes focus on issues of power (Wright, 1994, pp. 19–20). To tease apart cultures – and organizations – anthropology must study relations and processes, as these are key to understanding how people contest the meanings of a situation, how they use the economic and organizational resources available to try and make their definition of a situation 'stick', and how they seek to reap the benefits. In the analyses of such processes and relations in organizations, anthropology must focus on how a discourse becomes authoritative (Wright, 1994, p. 27). In other words, anthropological studies of organizations attend to how some stories and self-perceptions are more prevalent and pervasive than others.

Anthropologists Christina Garsten and Anette Nyqvist also consider process, constant negotiation and reshaping as core features of organizations and organizing. They argue that organizations are continuously in the making and under constant modification and reproduction. Organizations may, however, sometimes be temporarily stabilized and exhibit some kind of boundedness and tightness, which may enable us to encircle some sort of organized entity (Garsten and Nyqvist, 2013a, p. 10). Thus, organizations are made up of dynamic, shifting sets of connections and interdependent relationships that achieve varying degrees of stability (Garsten and Nyqvist, 2013a, pp. 10, 21n). With Wright and Garsten & Nyqvist, we may understand organizations as contested, contextual and powerful process of continuous organizing and modification. Over the course of the fieldwork, it became apparent that the digitization projects carried out at DBI were indeed deeply entwined in contested processes, continuous

negotiations and powerful modifications unfolding inside and outside the organization.

2.5. DBI As a Powerful Corporate Organization

DBI is neither a government institution regulating social activity – nor a typical business corporation dedicated to making financial profit. As a GTS institute, DBI it sits somewhere in between; dedicated to public service through state-funded projects and to profit making on regular market terms like other consulting engineering companies in the AEC industry. Therefore, as I also argue in article one, I consider DBI as a corporate organization, highlighting how DBI walks on a tight-rope between private interests in maximizing returns for the benefit of reinvesting in research and development for public benefit. Such balance permeates (and sometimes distort) the work DBI undertakes. Thus, talk of money, investments, returns, market-shares, marketing and value are dominant themes at DBI, also during digitization. These themes of value for money and design of products for consumers to use, along with my position in the organization as an employee, means that I include understandings and seek inspiration from the field of business anthropology (Baba, 2012, 2015; Moeran and Garsten, 2012; Jordan, 2013) throughout the thesis. However, this field does not serve as a main theoretical vantage point, since I am less concerned with consumers, advertising, marketing and finance which are predominant themes within this field, and more interested in organizational dynamics.

Using the idea of the corporation as an entry point for understanding DBI highlights particular features worth keeping in mind as we investigate the interrelations between digitization and organization. Garsten and Nyqvist write that a corporation powerfully shapes the way its employees think and act through production and dissemination of ideologies and normative ideas (Garsten and Nyqvist, 2013a, p. 5). Corporations also shape public discourses and practices through its public relations and marketing efforts, and contributes to the ideological transformation of the individual

from producer to consumer (Garsten and Nyqvist, 2013a, p. 5). This makes corporate organizations a dominant site of cultural production (Garsten and Nyqvist, 2013a, p. 6). Likewise, DBI seeks to shape the way its employees thinks about themselves, the organization and its role in the industry through the production and dissemination of graphs such as the one in figure 4, and through a myriad of in-company booklets, newsletters, and a book on the company's history intended for clients or employees' family members to read. Yet, the history book was not well received by all employees at DBI.

> Axel walked up to my desk with the history book in his hand, asking if I had read it. Axel was a senior FSP and had been at DBI for almost two decades. I quickly replied that I had already read it. One of the junior FSPs had given me a copy of it, because he thought that I as anthropologist *"might find it interesting to learn about our culture"* by reading the book. Axel smiled and commented wryly *"Splendid!"* while returning it to where he had found it: in one of the three cardboard boxes packed with copies the history books, all of them placed in corner of the copy room. He returned to my desk, hovering as if he wanted to say something. I asked him what he found interesting about the book. He said in a sarcastic tone: *"I find it quite interesting that one can write a book about one hundred years of organizational history, and then include more photos than text…"* He shuffled though the book. Many beautiful pictures showed exciting constructions that DBI worked on, colleagues in conversations or standing meetings, portraits of key employees, morning assembly around the piano, and illustrations of the five values of DBI. Axel shrugged his shoulders and closed the book. I asked him if he thought the book was a '*Pixie-version'*, which refers to Danish tiny easy-to-read books for small children. He nodded: *"Yeah, it's an easy-to-read version for our…guests and clients. A sort of sales promotion. Of course I know that there is not room for everything in a book like*

that, but still…" Axel was dissatisfied with the promotional style of the book, because to him it has very little to do with how he experiences DBI and it barely represents the tasks he does.

The morning gatherings depicted in the book by the piano take place in a ritualized format each month, where the CEO and top management brief the employees about the *"state of the union"* as they call it, which primarily focuses on turnovers or new projects in the pipeline. These gatherings do not take place next to a piano, but in the canteen. During each gathering, employees share common breakfast, and the end of each gathering employees can make announcements if they have notified the responsible manager. While the employees eat, the CEO or others from the top management speak; they stand in the middle of the canteen below a hanging microphone and in front of a webcam so that everybody (also those participating remotely) can see them. My colleagues and I would leave our desks together and walk to the canteen, while some would make a comment like: *"Alright, let's go and see what our spiritual leader has to say to us"* or *"Now's the time for us to hear the words of the guru, our Ayatollah"*. Sometimes, these remarks were followed by more sarcastic observations indicating that the gatherings were rather identical: *"The day they're not going to say that everything is great in the business, but that things could be even better, and that everything basically comes down to how much money we make is the end of the world!"* Still, we joined every time each month. The stories with the book and the morning gatherings illustrate organizations' marketing efforts and they are dominant sites of cultural production seeking to shape both employees but also clients and collaborators. The stories also illustrate Urban and Koh's argument that corporations are social groups with their own internal myths, rituals, beliefs, norms and practices oriented to the making of financial profit (Urban and Koh, 2013, p. 141). Such meanings, beliefs and practices are repeatedly contested and changed in corporations. Therefore, negotiations, shaping of discourses, dissemination of ideas and contested processes are the heartbeat of corporate organizations and thus highly interesting for anthropologists.

If we agree that process and power are key features of corporations, it follows that corporate organizations signify continuous, social efforts to impose order and goal-oriented instrumental rationality for strategic ends (Batteau, 2000, pp. 727–728). Organizations are home to negotiations, contested meanings and different powerful relations. Krause-Jensen paraphrases Max Weber for having said that powerful ideas must be carried out by powerful groups with powerful interests to have powerful effects (Krause-Jensen, 2010a, p. 70). This quote aptly captures how power is an inherent aspect of organizational life, where someone always wants to do something to or with somebody else. In short, power is a key ingredient in organizational workings, and the digitization projects at DBI were no exception. Here, the course of a program development could suddenly be changed by senior managers outside the project, other senior colleagues would shelve business plans without consulting the project managers, and project decisions vaporized into indistinct management layers. Halfway into my fieldwork, Sofie – who was a colleague of mine and part of the digitization projects – came to me one day with a paper in his hand. She had made a figure of what she called internal relations and dependencies in the project she was working on. On the paper, all relevant managers were listed and placed in a network-based formation with the project at the center of the network, and the different managers placed around the project. When an important decision was made on this project, the drawing showed that eleven managers could have a say in the matter before the project could move forward. Sofie told me that *"I make these drawings whenever I'm utterly frustrated, and to try and figure out why nothing happens. It can be so tricky to understand who has the final say!"* Thus, despite stated flatness and project-based fluidity in the organization, hierarchical decisions and powerful structures are at play at DBI. As Batteau bluntly puts it, organizational life seldom lives up to the façade of order it projects (Batteau, 2000, p. 728).

I suggest that such power and opaque managerial decision processes became painfully visible during the digitization projects, because the production of these programs demands fundamentally different ways of carrying out projects at DBI and in

the industry, and basically questions how the different departments at DBI make money, collaborate, and relate to one another. For instance, which department earns the money that will eventually be made on the program, who 'owns' the program, who is in charge of the daily operations, and which department bears the risks if things do not go as planned? The department that has brought the fire safety knowledge to the table, or the department who has been doing the programming, or a third one? Is fire safety the only domain knowledge in play, or what about knowledge about programming or about generating insights about users and usability? Digitization's nature of cutting across departments, budgets, alliances and power relations in seam*ful* rather than in seam*less* ways questioned matters of ownership, domain knowledge, decision-making power and client relationships, and disturbed well-established organizational structures, silos and modes of ordering the everyday life in DBI.

Continuing from the Weberian observation on powerful ideas, groups, interests and effects, Krause-Jensen contends that an organization may be understood as an instrumental social unit where a group of people is gathered for specific purposes (Krause-Jensen, 2010a, p. 62). Organizations are thus defined by goal-oriented rationalities, and the achievement of these goals are organizations' basis for existence. Working towards such goals, organizations are defined by continuous and processual attempts to align individual actions with organizational goals (Krause-Jensen, 2011, p. 274). This means that organizations are spaces of negotiation and maneuvering between individual agendas and formalized goals. This alignment is particularly salient in corporate organizations, and it also relates to the challenges of digitizing professional knowledge. In the case of DBI, such alignment translates into how DBI continuously negotiates internal acknowledgements of fire safety as defined by particularities, situated knowledge and subjective risk assessments with external communication of fire safety as defined by generalizability, ordered knowledge and objective risk assessments. Such gap or alignment has so far been more or less successfully bridged in DBI by the FSPs through dialogue with clients and collaborators on a daily basis – I attend to this in depth in article three – and has been one of the keys to DBI's success. I find

that such bridging has gone under the radar at DBI – otherwise digitization would not have caused such a stir. Digitization upsets the alignment between unofficial acknowledgements of fire safety messiness and official portrayal of fire safety order. Digitization displays such gap, and now the FSPs have to explain what it is they actually do. So far, DBI has legitimized the FSPs' expertise, but through digitization the validity of the FSPs' expertise may be scrutinized by clients and collaborators, who must now legitimize it. This shift marked not only changes in who judges and assesses fire safety, but also what constitutes expertise. I attend to that in article four.

Having explicated my anthropological understanding of organizations, I also wish to underscore my eclectic approach. Throughout the thesis, the reader will note that the journals I have published article in are not exclusively anthropological but mostly transdisciplinary, and that I draw inspiration from scholars in organization and management studies beyond anthropology, despite their seeming opposition to anthropological investigations of organizations. Paul Bate has produced a fine and rather humorous review of similarities and differences between anthropology and organizational studies/behaviour, in which he contemplates why the two branches parted since their shared historical beginnings during the Hawthorne Studies in Chicago during 1920s and 1930s (Bate, 1997). In a more recent review, organization scholar and ethnographer Barbara Czarniawska provides an insightful historical account of overlaps between the two disciplines, where ethnography as methodology and studies of cultures, diversity and power step out as common areas of interest (Czarniawska, 2012). Czarniawska refers to studies of organizations from alike disciplines like philosophy, sociology and anthropology, thus underlining the increasingly transdisciplinarity in studies of organizations (Czarniawska, 2012, p. 128). Inspired by such arguments, I aim for a common ground and an eclectic investigation of digitization and organizations – admittedly with a clear preference for anthropological perspectives – because I wish that this thesis will speak to other fields than solely anthropology and resonate with practitioners in the AEC industry. I strive to do two thing on this common ground.

First, I seek to elucidate the entangled practices of digitizing and organizing in a contextually sensitive and explorative way, which underlines everyday particularities and complexities in professional and organizational practices. Second, I employ concepts and draft recommendations intended to help build frameworks and perhaps even methodological tools, which researchers and practitioners may use to think with or reposition their work on digitization in organizational settings.

FIGURE 5. FIRE. PICTURE BY DBI.

CHAPTER THREE.

WHAT IS FIRE SAFETY AND HOW IS IT PRACTICED?

In late 2017 during my fieldwork, change was upon the AEC industry in Denmark as the entire administration of fire safety transferred to a new set of building regulations and the introduction of a certification scheme[8], which would be fully effective from

[8] The certification scheme changes the fire safety landscape in Denmark. I see the scheme as intended to create flexibility, individual-responsible decision-making, and systems transparency (Kapferer and Bertelsen, 2009, p. 15) to ensure a more smooth and problem-free management of the construction process. Previously, the local building authorities administered the building process. Now, they are no longer a part of planning, designing or evaluating the constructions in terms of fire; here, a certified

January 2020. Such administrative and bureaucratic changes affected – and still affects – all FSPs in Denmark and thus also my colleagues. Since my fieldwork ended in December 2018, my ethnography rests primarily upon the administrative, regulative and collaborative circumstances and challenges, which characterized the conditions under the previous, 'old' regulations. In this chapter, I sketch both the new and old regulations, but particularly the 'old system'. I argue that fire safety is a heavily regulated, politicized and contested area in which the FSPs must navigate. Such navigation demands expertise in dialogue, particular assessments and professional intuition in order to foster good collaboration and application of the regulations in the right situations. Understanding this context of organizing fire safety is crucial for understanding digitization of fire safety and the challenges it faces.

3.1. Organizing Fire Safety in Denmark Before 2019

The background for the regulatory and administrative changes in fire safety must be found in how collaboration and decision-making processes used to play out during a construction process and administration of fire safety in Denmark. Previously, fire safety in buildings and constructions were managed with reference to two sets of regulations: The Danish Building Regulation (BR), supplemented by a *"Collection of Examples"* (Danish: *"Eksempelsamlingen"*) providing examples on how to construct buildings in accordance with BR in traditional buildings (Danish Transport Construction and Housing Authority, 2018a, 2019). Since 1925, DBI has been a key player in helping the authorities in drafting the guidelines on fire safety, which accompany the BR (DBI, 2018, p. 10). Interestingly, DBI drafted the rules and regulations, which they themselves provide consultancy and advice on. Additionally, DBI drafted a manual with best practice interpretations of the BR (DBI, 2017). Finally, DBI drafted

FSP will be the only one designing and approving the fire safety plan of a construction. This means that the building owners will get more influence on the construction process, as they will be the ones deciding the specificities in collaboration with the certified FSP.

some 50 instructions, handbooks and manuals in total on specific areas in relation to fire safety (DBI, 2019b). DBI renews these when seen appropriate and beneficial. The handbooks and manuals are still used as guidelines e.g. by insurance companies as we saw in the previous chapter, who assess insurance cases based on these handbooks, and the handbooks also form the basis of the course material for the training and education that DBI undertakes.

Thus until 2019, fire safety was managed with reference to one chapter on fire, along with the "Collection of Examples" and an additional guideline on fire safety engineering covering complex buildings as explained earlier in this chapter. Administration of fire safety was carried out locally in the 98 Danish local authorities with assistance from the local fire-fighting authorities. During the planning of construction processes, the local building service authorities, the local fire-fighting authorities, the building owner, the entrepreneur and a FSP (hired by the entrepreneur or building owner) would negotiate and agree on the building design and building process (see also figure 1 in article three). However, the local authorities might judge and assess fire safety very differently. Hans, whom you will meet later in this chapter, told me that a he had drafted a fire safety strategy for a major supermarket chain planning to build 30 identical shops across the country with the exact same building design and fire safety strategy. They had faced many challenges with getting construction permit and full acceptance in one go, because some local authorities declined the strategies while other accepted the very same strategies. Consequently, a considerable amount of the FSPs' time and collegial chat was spent on exchanging experiences about collaboration with local authorities and sharing insights on which ones were better to work with or easier to convince than others.

The experiences of local differences in granting building permits and sometimes unduly strict interpretations of the BRs frustrated numerous parties across the entire AEC industry including the local authorities themselves. Thus in 2015, the government suggested to remove the administration and decision-making procedures from the local authorities and transfer them to certified fire safety consultants employed in the

private sector (Düwel, 2015). Such initiative was based on the quest for simpler rules, more efficiency and lower costs due to increased competition and privatization of the procedures (Danish Business Authority, 2014; Regeringen, 2015, p. 29). This development mirror a global preoccupation with optimization of work procedures through an increased number of regulations, privatization of state-monitored process, and elaborate documentation requirements that speak of efforts to control seemingly uncontrollable procedures and where individuals are held increasingly responsible for their actions and assessments (Kapferer and Bertelsen, 2009, p. 15; Vike, 2018, p. 108). Such reorganizing illustrate a yearlong tendency to criticize management inefficiency in public institutions and organizations and conversely praise great efficiency in private sector organizations (Vaaben, 2013). As Clarke and Newman describe, public organizations have undergone drastic reorganizations since the 1980s to become *"more businesslike"* by financial and managerial standards, which will yield more dynamic, flexible, innovative organizations resulting in better productivity, efficiency and *"value for money"* (Clarke and Newman, 1997, pp. 58–59). In the same breath, public organizations were also subject to demands for more transparency and accountability (Clarke and Newman, 1997, p. 59), which have been well-described by anthropologists (Shore and Wright, 2015a, 2015b).

3.2. Current Organizing of Fire Safety

Since the roll-out and transition to the new regulations and certification scheme from early 2018, throughout 2019, and until early 2020, fire safety is managed with reference to one primary chapter on fire including eight guidelines, five additional chapters, and thirteen appendices with instructions for prescriptive solutions. The total number of paragraphs in the regulations now accumulates to 565, out of which one fourth focuses solely on fire safety. With the transition, the pages concerning fire in the BRs skyrocketed from 400 to almost 1500 pages. The manuals on best practice interpretations of BR is no longer updated and will be omitted. Curiously, I show in article four

that these interpretations are what DBI's clients and collaborators reach out to DBI for help with. Buildings are now categorized according to daily use, occupancy, risk, complexity and method of documentation. Furthermore, the authorities have introduced fire and risk classes as additional aspects to take into consideration when doing fire safety assessments (CFPA Europe, 2020). If a building is classified as fire class 2, 3 or 4 (the last one representing the most complex buildings), a certified FSP with corresponding adequate education and experience is held responsible for the fire safety design of the building.[9] The fire classes depend on the given risk class and the methods of documentation needed to assess the safety (CFPA Europe, 2020).

The role of the local building authorities is now limited to receiving, filing and storing building designs and construction plans. The contractor now hands in a complete building design to the local authorities, approved and documented by certified statics engineers and certified fire safety engineers (Danish Transport Construction and Housing Authority, 2018b). Subsequently, the local authorities will only assess whether documentation is correct and sufficient, and ultimately grant a building permit. Once the building is ready for commissioning, the certified fire safety engineer must prepare 'as-built documentation' for the fire safety design, including declaration of completion, fire plans, fire strategy reports, check reports and a plan for operation, inspection and maintenance of the building (CFPA Europe, 2020).

Despite great changes in the ways of organizing fire safety, many aspects also remain the same. BR contains the regulations for the construction of both private and public buildings in Denmark. Such regulations cover technical themes such as access, drains, ventilation, lifts, energy, structure, noise, light, and indoor climate – and of

[9] The certification scheme accompany the new building regulations in such a way that as long as the construction is simple and comply with prescriptive rules, not much experience is needed to approve a fire safety plan. As soon as one starts to diverge from the plans with performance-based rules and the building becomes increasingly complex, there is a need for documentation of the fire safety level carried out by a certified FSP.

course, fire (Danish Transport Construction and Housing Authority, 2018a). The regulations are based on functional requirements of fire safety concerning the safety of humans, load-bearing elements, generation and spread of fire and smoke, and safety and operation for fire-fighters (CFPA Europe, 2020). The BRs (or specific parts of it) are renewed, adapted and updated every sixth months, which means that the regulations and guidelines that fire safety builds upon change accordingly. In traditional buildings, so-called prescriptive rules for different building types are applied. In total, these solutions provide the accepted level of safety determined by Danish authorities and society (CFPA Europe, 2020). The prescriptive rules concern simple buildings and constructions, which do not deviate from the regulations. An example of a prescriptive rule could be that the doors leading to escape routes or the outside must have a width equivalent to 10 mm for each person who will use the escape route in buildings intended for many people, e.g. office buildings (BR 18, section 2.3.3.2). But since many buildings deviate from standards, performance-based rules were added to the prescriptive ones (Sørensen, 2004). Performance-based rules and are defined in relation to what function the building is meant to have. An example of a performance-based rule could be that buildings must facilitate safe, easy evacuation via escape routes or directly to the outside, and that evacuation must be to ground level outside or to a safe place inside the building (BR18 §94). Here, the construction type and the use of the building defines what kind of fire safety demands must be met: a storage building with few people inside must meet different fire safety criteria as opposed to a retirement home where people sleep and will need help from others in case of evacuation. With the introduction of performance-based rules, the building owners could now dismiss the prescriptive rules as long as the fire safety level could be appropriately documented. This increased the need for fire safety documentation that led to a boom in the business for DBI, and the revenue for fire safety consultancy has tripled since then (DBI, 2018, p. 49). It is part of this procedure, including the regulations, which DBI is seeking to digitize.

3.3. Interpreting Regulations: Practicing Fire Safety

In this thesis, I focus on employees at DBI who work with fire safety assessments and fire safety engineering, and whose knowledge and expertise is the object of digitization. I call this group of employees 'fire safety professionals' (FSP). I have invented the term on ethical grounds in order to anonymize the job positions and departments, which the employees belong to. The term describe employees in research, development and consultancy and other related departments and positions both within DBI and outside. Thus, when I refer to '*the* FSPs' I mean those working at DBI, and when I refer more generally to 'FSPs' I mean the entire group of FSPs that I got to know during fieldwork. Their professional or educational backgrounds range from engineers and fire safety engineers to architects, building technicians and fire fighters. They all work on tasks related to assessing, interpreting, and applying fire safety regulations and guidelines, and they have professional experience with fire safety. The paramount purpose of the FSPs' job is to provide building occupants with escape routes and safe passage in cases of fire, and with time to reach the outside of a building (Hulin, 2015). Secondly, but also of urgent importance in the FSPs' job is to ensure structural integrity of the building so the firefighting work can take place, i.e. getting people and animals out of the buildings and saving as much material value as possible (Hulin, 2015).

FSPs may execute, assess and interpret the performance-based rules in various ways. The prescriptive rules must be followed, but a minor degree of interpretation is allowed. This means that the FSPs must be able to document a satisfactory level of fire safety in complex buildings to the authorities with reference to performance-based rules, fire tests, comparative analyses or other fire safety engineering methods (CFPA Europe, 2020). Stefan, described the process this way:

> *"The core of my job is basically to help ensure a reasonable fire safety level in Denmark via solutions that are different from the prescriptive and different from the prevalent solutions at hand* […]. *It means that architects and*

> *engineers always come up with something that has not yet been described, and then we'll need to assess how the chosen solutions are comparable with that. And if they are comparable then it is an okay solution, and if they're not, then we need to look at which initiatives are necessary to make in order to reach the same satisfactory safety level."*

With Stefan's description, we see how fire safety practices are about translating regulations and knowledge about the guidelines into fire safety designs via professionally embedded estimates, experience-based assessments, mathematical calculations and engineering knowledge. This means that *experience* and *accumulation of knowledge* is king in fire safety: the more you have seen and tried, the more knowledgeable you are and the more expertise you have. However, the deployment of such expertise and knowledge as part of working as FSP and practicing fire safety do not happen in a vacuum, but unfold through dialogue, negotiation and collaboration with colleagues, clients and authorities. In fire safety, regulations and requirements meet design, practicalities, various risk assessments and different professional and political agendas between FSPs, firefighting authorities, local authorities, building owners and architects. I show this in article three. Contrary to DBI's formal accounts as well as the general discourse on fire safety practices among the FSPs themselves, fire safety is just as much about particularity, context and dialogue as it is about statics, regulations and standards. The following ethnographic snippet from an ad hoc meeting at the office exemplifies such dialogue and negotiation about how to assess a given fire safety regulation.

> I am sitting in front of my computer at my desk, replying emails. We all sit in front of a computer in separated semi-secluded cubicles. Suddenly, two of the FSPs get up from their seats to gather at one of the bigger tables in the middle of the room intended for short meetings and gatherings. I watch

them and listen as one of them – Bjørn, a junior FSP – spreads out a large paper showing a building's floor plan and escape routes marked with green. Bjørn discuss the situation with Astrid, the other FSP standing at the table. She has decades of experience and is always eager to discuss cases and come up with good solutions. After a few minutes of talk between the two of them, a third and semi-senior FSP – Hans – laves his seat and walks towards them. The three of them gather around the printed drawings of the building. Astrid moves her hands on the paper in specific directions, drawing lines with her fingertip, and marking exits and entries with vertical hands on top of the paper. Meanwhile, she speaks and hypothesizes: *"Let's assume that there's a 25 meter escape route here* [She taps the paper*], and there's a door here, an A2-s1, do* [European fire classification code, red.*] here, and an A2-s1, do here, then I guess we have to expect that there will only be a need for it here?"* [She taps on the paper again on a specific place on the drawing] Bjørn tells them that he has discussed the matter with two of their colleagues from one of the other offices. They assess the case differently than Bjørn, and suggest an entirely different solution from Astrid and Hans. Astrid nods: *"Yes, well perhaps they included these perspectives in their assessments. But we don't know that, do we? Maybe they didn't count in these aspects we're talking about now, and that's why they advise the way they do?"* Bjørn nods slowly but also seems to grow a bit impatient with the conversation as he argues: *"But it actually says that it has to be this way."* Hans shakes his head, looks at Bjørn, studies the drawing intensely, and then shakes his head again while replying very slowly as if he himself considers what he argues the moment he speaks: *"Nah…not strictly speaking. It doesn't say 'have to'. I think it says that one ought to do it this way."* Bjørn disagrees and walks swiftly to his desk opposite of mine. He searches determinedly through the bookcase next to his computer. He pulls out a book, and quickly searches through it. It looks worn out, and as he thumbs through the pages, I can see that the

book is filled with notes and post-its. As I watch them from my desk, I get the feeling that Bjørn could easily find what he is looking for with his eyes closed. He stops and brings the open book with him to the table where they are standing. He reads aloud from a guideline in the book. Once he is finished, he comments: *"It doesn't say 'have to', nor does it say 'ought to'... uhm? But I think that it seems closer to 'have to'."* Bjørn and Hans continues to discuss the matter while Astrid looks down at the drawing, then up at her two colleagues, then back at the drawing, scrutinizing the lines, and then back again at Bjørn and Hans. She looks absorbed in thought. Then after a while, she comments: *"The bottom line of this matter... Bjørn... well, it is whether we're going to make up new regulations or whether we'll refer to those already in place? Because if we are, then we may call quite a few things into question."* The discussion ends here. Hans resumes work, and so does Astrid. Bjørn gathers the drawings and slouches back to his desk. I am unsure whether he actually reached any conclusion from this discussion, or if it just made him more confused.

As the above example shows, the three colleagues have different opinions on how to read a piece of regulation and what it instructs in terms of a particular building. It is regulations such as these and the knowledge about how, where and when to apply them are the stuff, that DBI is eager to digitize. But the ethnographic piece shows that a regulation is not just a regulation; it is read, assessed and applied differently among the FSPs, which underlines the multi-vocal understandings and contested meanings that make up the fabric of organizations. The FSPs acknowledge these differences to some extent, which is why the more senior FSPs often draw a line and instruct junior colleagues on what to do. In order to make up for these varying assessments, the FSPs perform rigorous, routinized, peer-to-peer internal quality assurances on fire safety designs, before the design is passed on to external clients/collaborators with less fire

safety expertise. Different interpretations of the regulations and subjective risk assessments are negotiated through collegial dialogue during the drafting of the fire safety design, but ultimately only one solution is communicated externally as the correct one corresponding with DBI's official opinion to preclude any possibility of doubt or misinterpretation among clients and collaborators. This was also the case with Astrid and Hans in their discussion with Bjørn, but even then, many unanswered questions and incomplete solutions remained for Bjørn to attend to, which speaks of the continuous effort that fire safety entails. As noted in the previous chapter, I argue in article three that digitization dislocates these efforts and alignments framed in dialogue by the FSPs, which causes great concern among the FSPs.

In this chapter, I have described how fire safety in Denmark is thoroughly political, heavily regulated and shaped by powerful collaborations. This means that the FSPs' navigate a very changeable and politicized field, which has fostered a need to develop *"gut feelings"*, intuition and dialogue into a professionalized fire safety expertise in order to navigate the area properly. Yet, with digitization (and subsequent digitalization) of such expertise, the FSPs are concerned about the implications for fire safety and how/if their practices translate into digital formats fully accessible and applicable to clients/collaborators. Thus, to understand the challenges and promises of digitizing fire safety, one must also consider the organizing of fire safety. When several professions perform separate tasks during a construction process and have separate, specialized plans dictating how to carry out such tasks, a critical need for shared coordination and collaboration arises; especially when these separate plans must merge into one, coherent plan in order for a building process to gain a permit. Here, *"digitalisering"* is welcomed by practitioners, stakeholders, and authorities alike. In the next chapter, I take a deeper dive into the agendas and ambitions of *"digitalisering"* in the Danish AEC industry and at DBI.

FIGURE 6. FROM DAGENSBYGGERI.DK

CHAPTER FOUR.

REVOLUTION THROUGH DIGITIZATION

The picture above is one among many of similar sorts used as part of invitations to conferences, speeches or in emailed newsletters on the advancement and marvelling potentials of *"digitalisering"* in the AEC industry. The picture shows how a single person in a suit (not typical construction work clothes) may be in charge and control of an entire construction process through the use of digital programs and tools such as iPads. It also shows how mastery, creative forces and decision-making power is manageable and channelled through a single shining tap with an index finger – not on a screen, but on a three-dimensional, virtual drawing of an imagined construction site.

With this picture and all the promises it speaks of in mind, I now zoom in on the intensified and elaborate *"digitalisering"* taking place at DBI and in the Danish and global AEC industry recent years, and link this development with broader societal tendencies outside the sector. In my review of these trends and tendencies, I bring in anthropological approaches to digitalization while asking why anthropology seemingly neglects studies of digitization. I find that there is much to be discovered on organizational workings and professional lives in relation to digital technologies, if we begin to consider not only appropriation and use of technologies (i.e. 'digitalization'), but also equally interesting organizational processes of transforming expertise into information (i.e. 'digitization'). As this thesis shows, the processes in digitization are highly social and cultural, and deserve much more anthropological attention than what has been the case so far.

4.1. "DIGITALISERING" AT DBI

In Denmark, *"digitalisering"* is heavily sponsored and promoted by a close-knit collaboration between state, local authorities, stakeholders, and global tech-companies, in which the Danish state is one of the most eager participants (Bernsen, 2019, pp. 70, 94–98). For the past two decades, the public sector has undergone radical digitization and digitalization in the fields of e-governance (Plesner, Justesen and Glerup, 2018), healthcare (Wadmann and Hoeyer, 2018) and education (Balslev, 2020). The AEC industry has been no exception in that respect. Danish trade and industry associations, leading research institutions and universities (Vestergaard *et al.*, 2012), and other influential stakeholders ranging from the industry-specific knowledge center Molio (Molio, 2020) to the European Commission (EU BIM Task Group, 2018) all partake in advocating intensely for *"digitalisering"*.

At DBI, initiatives on *"digitalisering"* dates back to the early 1980's when the first computer-assisted drawing programs made their way to the architects' offices (Jespersen, 2008, p. 19). In the late 1980s, DBI invested in the first computers to begin

developing smoke-dispersion simulations programs. Additionally, a computerized risk assessment program launched in 1991. The program was used by consultants and clients to assist in the design of fire safety measures in buildings (DBI, 2018, p. 11). Since then, computer simulations or CFD (i.e. Computational Fluid Dynamics) modeling of smoke, spread of fires or evacuation have been carried out as part of performance-based analyses performed by the FSPs (Hulin, 2015, p. 7). The simulations are used to calculate and predict the behavior of smoke, temperature in critical areas, and the time people need to escape. Due to its complexity, a CFD-simulation may take up to three weeks to make. Furthermore, not many FSPs can (or may) do these simulations. Input and location of fires in building models are based on experienced professional intuition, which is oftentimes deemed more reliable by the FSPs than risk analyses. Thus, simulations and the use of other digital programs as part of fire risk assessments must be carried out by experienced FSPs, according to DBI. However, due to the considerable time it takes to do these simulations and since only a small number of FSPs can perform them, DBI has deemed fire safety analyses a potential area for optimization, standardization and improvement through digitization.

Since 2015, DBI has intensified its efforts within *"digitalisering"*, particularly with its performance contract from 2016-18, where *"digitalisering"* was a top priority. The primary aim of *"digitalisering"* at DBI is to work on the problem of integrating fire safety as early as possible in the building process. According to the FSPs, fire safety measures are not integrated early enough in the design process. This may cause serious issues during design and construction, if subsequent analysis and negotiation with local authorities require modifications like the addition of staircases, sprinklers etc. It is argued that *"digitalisering"* may help prevent such situations by disseminating and making fire safety knowledge digitally available as early as possible. Furthermore, DBI believes that the digital tools – including plans on developing a digitized catalogue with experiences and past learnings from cases at DBI – will foster better in-house knowledge exchange among the FSPs. Currently, there is no platform or structured,

searchable space for doing that, and all knowledge sharing unfolds as peer-to-peer training or through daily dialogue among colleagues.

I commenced fieldwork at DBI in spring 2017, when some projects were well underway and others were still in the pipeline. At the end of the performance contract period, the management stated in an internal press release that, *"DBI's simple solutions must be digitized, or our competitors will do it before us. We must be better and smarter than our competitors, and differentiate ourselves by offering other services than they do"*. One of the digitization projects (see figure 7 below) concerns the development of a digital tool intended to support clients, i.e. architects, in their decision-making process. The tool is supposed to know and guide the user on what is risky or not, based on regulations which the FSPs have instructed the software programmers to code into the algorithm. Over time, the tool should entail prescriptive fire safety rules and assist in making fire risk assessments of a given building, even though the user may not have much fire safety expertise. In this way, digitization and subsequent digitalization will help disseminate fire safety knowledge to more people in the AEC industry and enable contractors, architects and other parties to consider fire safety much earlier in the process than what is currently standard.

Another project (see figure 8 below) concerns a digitized version of fire safety guidelines simultaneously facilitating knowledge sharing. The guideline already exists as a handbook, known as *'the Bible'* among the FSPs, which is used extensively to guide their decisions. It was the *'the Bible'* that Bjørn consulted during his discussion with Astrid and Hans in the previous chapter. Like Bjørn's edition of the book, the book covers of *'the Bible'* are often worn-out, and the pages are filled with notes, scribbles, and coloured sticky notes. Experienced FSPs like Astrid know the guidelines and handbooks by heart and therefore rarely consult them. However, their clients often struggle to find their way through these extensive rules, regulations and suggestions, as I show in article four. To DBI, a digitized version of such regulation will ease the navigation through it, improve the general understanding of the regulations and guidelines, and boost knowledge sharing both internally and externally.

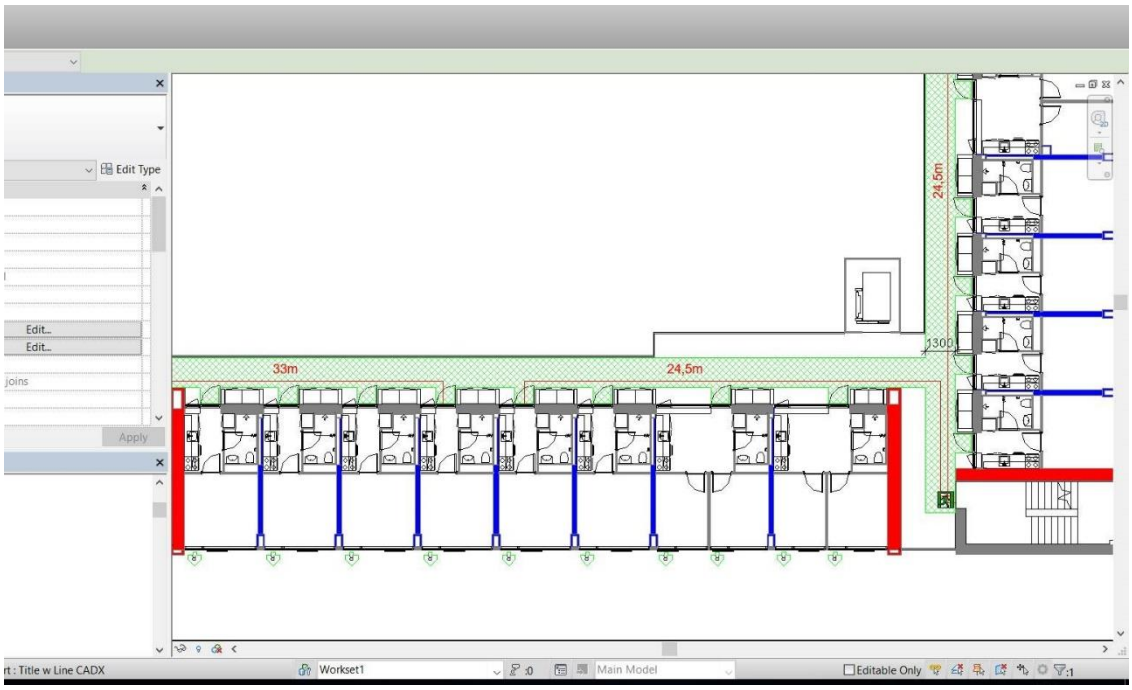


FIGURE 7. SCREENDUMP FROM 'PLUGIN' PROJECT.

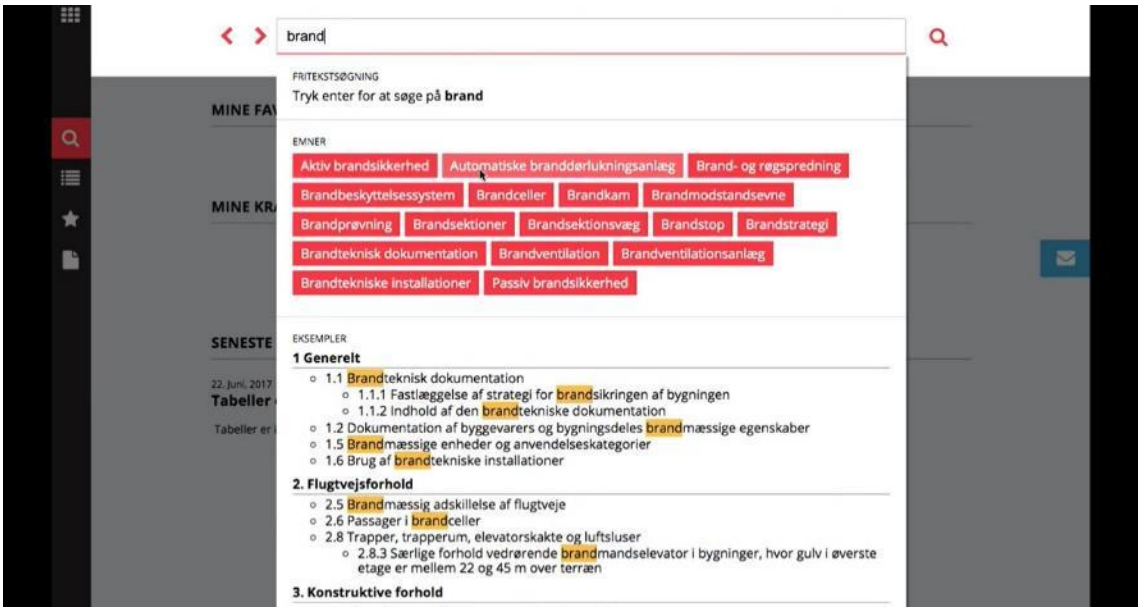


FIGURE 8. SCREENDUMP FROM THE 'LOOKUP' PROJECT.

4.2. Digitizing the Danish AEC Industry

4.2.1. "The Digital Construction" Initiative

Tracing digitization at DBI and in the Danish AEC industry, we must turn back time to the early 2000's when the Danish government at that time commissioned an initiative named *"The Digital Construction"* spanning from 2003-2007 (DTU BIM Lab, 2013). The initiative aimed at: 1) creating shared digital platforms to foster common digital language among all participants in a construction process; 2) setting up demands for building owners in terms of digital tenders, 3D-models, common digital project databases and digital as built documentation; and 3) documenting digital best-practice solutions on optimization as a source of inspiration (Realdania, 2003). A part of the initiative was also to create cross-disciplinary dialogue on digital solutions and how to implement these throughout the entire industry (Realdania, 2003). *"The Digital Construction"* rested upon conclusions from reports drafted by the Ministry of Industry, Business and Financial Affairs and appointed task-force groups and consortia. The reports concluded that the AEC industry was suffering from stagnant productivity, low quality, misunderstandings and mistakes, delays, opacity and overcharging (Jespersen, 2008, p. 19). The discontinuities during the construction process are often ascribed to the high degrees of complexity as so many professions are involved, often resulting in ineffective handling and sharing of information (Mäki and Kerosuo, 2015, p. 163). It was argued that if all parties had access to the right information whenever needed, mistakes, misunderstandings and wasted time could be avoided (Jespersen, 2008, p. 19). With such arguments and initiatives, *"digitalisering"* in the Danish AEC industry soon became a reality.

The *"Digital Construction"* initiative culminated in 2007, when the Danish government launched the Information and Communication Technology (ICT) scheme, which initiated a thorough digitization of the Danish AEC industry (Danish Transport Construction and Housing Authority, 2006, 2010). The ICT regulations entail standardized and mandatory requirements for the use of information and communication

technologies during public and general construction work (Danish Building and Property Agency, 2018). All phases during construction were to be managed digitally, e.g. digital communication and documentation via online portals, use of digital building models during competition, planning and execution, and 'as built' documentation upon delivery of the construction project (Danish Transport Construction and Housing Authority, 2013). With the ICT scheme transformed into regulations, virtually all construction projects accumulating to a certain economic amount must meet these requirements (Danish Transport Construction and Housing Authority, 2013). The regulation was introduced to boost productivity and competitiveness, improve the overall quality, communication and collaboration, and support innovation in all phases of design, planning, construction and communication across the entire industry (Ugens Erhverv, 2013; Schober, Hoff and Nölling, 2016).

From an anthropological perspective, the industry's intensive focus on ordering the messiness during construction is interesting, as it illustrates particular convictions and rationales. Indeed, Thomas Malaby argues that one of the hallmarks of modernity and the Western nation-states and institutions is their pursuit of control through order due to the messy practicalities of the everyday (Malaby, 2012). He writes: *"Nation-states and other large-scale institutions, such as corporations, hopes that efficiency and productivity [can] be found at a final, ordered destination of perfectly organized and controlled people, systems of classifications and technologies"* (Malaby, 2012, p. 291). Digitization in the AEC industry in emblematic of such hopes and efforts to organize through digital means. As Ingold forcefully argues, *"Throughout history, at least in the western world, the project of technology has been to capture the skills of craftsmen or artisans, and to reconfigure their practice as the application of rational principles whose specification has no regard for human experience and sensibility"* (Ingold, 2011, p. 61). Ingold notes that such desire seems to be driven by an ideal of mechanical perfection and algorithm-based practices exemplified in machines and tools made by engineers (Ingold, 2011, p. 61). During industrialization, a shift in attitudes towards the making,

building and creation of things took place. The shift brought about step-by-step sequences, operationalization and determinate tasks built into the design and construction of engineers' and craftsmen's equipment. Practice would now be separated into discrete operational steps guarded by repetition and sameness rather than difference (Ingold, 2011, p. 61). For the FSPs, digitization's potential separation of fire safety expertise into discrete steps and binary values guarded by standardization rather than dialogue and particular assessments caused concern, which I show in article three.

4.2.2. The Promises of Infrastructural Seamlessness

"Digitalisering" in the AEC industry is particularly focused on creating a seamless and smooth delivery from architect to engineer to craftsmen to facility management, because all data and knowledge will be gathered in one digital 3D-model, i.e. the BIM-model. BIM refers to 'building information modelling', and is a model and method to execute computer integrated building designs by applying a common language, platform and method. Here, all involved professional groups can access, use and apply the knowledge needed for their task at hand (Turk, 2016). The idea has been developed both practically and theoretically (however primarily within academia) since the 1970's (Turk, 2016, p. 275). Historically, building designers have always used information models of buildings, so in that respect BIM is no different. With the spread of information technology, these models became digital and increasingly structured. In this regard, Turk notes, one can argue that building information modelling – the process of creating and containing information about a future building – has existed for centuries (Turk, 2016, p. 275).

Ideally, BIM serves as the backbone of digital communication, as a common source of and destination for the information demanded and created by the various individuals and processes in construction (Turk, 2016, p. 276). However, according to stakeholders and my colleagues at DBI, this ideal is not descriptive of the current state of digitization in the Danish AEC industry. What is special about BIM is its parametric

ability. For instance, the model elements changes universally, so if you change something about a door in plan view, such change will persist through all related views such as elevations, sections and 3D. This ability to detect collisions and avoid mismatches immediately in all associated models due to the integration and update of designs from multiple different disciplines – e.g. avoid putting up concrete walls where large pipelines run – saves architects and engineers huge amounts of time and money (Hardin and McCool, 2015, p. 51; Mäki and Kerosuo, 2015, p. 163). In order to support better collaboration, extra dimensions are often added to the BIM cycle, transforming it into a 4D (timeline) or 5D (project costs) model of the construction process[10] (Charef, Alaka and Emmitt, 2018, p. 249,251).

BIM thus implies more centralized and uniform ways of handling, transferring, and presenting information and data in one model accessible for all involved parties during design and construction processes. In this respect, BIM illustrates the building of a digital infrastructure, since *"infrastructures are built networks that facilitate the flow of goods, people or ideas and allow for their exchange over space"* (Larkin, 2013, p. 328). According to sociologist Susan Leigh Star and computer and information scientist Karen Ruhleder, infrastructures are embedded, transparent in use, learned as part of community of practice, linked to conventions of practice, embodied as standards, dependent on an installed base, and reaches beyond single events or sites, and becomes visible when breaking down (Star and Ruhleder, 1996, p. 113). Similarly, BIM is embedded in structures and technologies in the AEC industry and thus depends on a preexisting base of digital communication tools. It is learned and taught peer-to-peer both in site and in offices. It is built to mirror the way in which the AEC industry perceives collaboration and building processes, i.e. it includes important dimensions

[10] Recent developments point towards further expansion of the BIM-model to include a sixth and seventh dimension to add multi-aspects of design information required at every stage of e building's lifecycle (Charef, Alaka and Emmitt, 2018, p. 241). Disagreements on what these dimensions entail still exists. Some argue for safety and quality records, others for a sustainability dimension, while others again argue for as-built information and general facility management information (Charef, Alaka and Emmitt, 2018, pp. 252–253).

such as timeline and budget. The aim is that BIM will reach beyond a single construction process due to its multi-dimensional scope, and thus become transparent and embodied in use over time. Finally, it is still highly visible and intensely debated as it continuously breaks down due to challenges of implementation in the industry. From an anthropological perspective, infrastructures are more than technical arrangements. They are crystallizations of institutional relations (Dourish and Bell, 2011, p. 96) and shape social lives (Anand, Gupta and Appel, 2018, p. 6). Infrastructures drive and maintain standardization, reflect and embody power and control, and are instruments through which access is managed (Dourish and Bell, 2011, p. 96).

Despite the discourse on BIM and ICTs, which highlight interoperability, better access to information for all, transparency and collaborations, there are potential drawbacks. In practice, such networked information systems are political, multivalent, unequally distributed and may just as well reinforce as they may destabilize existing institutional arrangements (Anand, Gupta and Appel, 2018, pp. 6-7,10,14). Thus, digitization may support and even foster fragmentation in the AEC industry rather than contain or eliminate it (Hepsø, Monteiro and Rolland, 2009; Turk, 2016; Morgan, 2017), because different professions, expertise, knowledge forms and practices clash in such infrastructure-building. Indeed, pre-existing challenges with cross-organizational collaboration and interoperability in the AEC industry may very well inhibit the success of digitization and implementation of digital technologies. Based on her studies of implementation of digital technologies in American business organization, anthropologist Marietta Baba argues that while the success of ICTs does not rest solely on trust in relationships, their failure is often the result of distrust[11] in relations (Baba, 1999, p. 332). Negative expectations or preexisting distrust oftentimes inhibits collab-

[11] Baba defines 'trust' as *"the subjective expression of one actor's expectations regarding the behavior of another actor (or actors)"* (Baba, 1999, p. 333, emphasis in original). Baba considers 'distrust' as a feeling that rests upon expectations of harm based on previous negative experiences with certain groups (Baba, 1999, p. 332). Distrust helps people identify situations where they must protect themselves by reducing uncertainty through self-protective practices and avoidance of risk (Baba, 1999, p. 334).

oration and can increase the risk of implementation failure, since it hampers the sharing of information and knowledge across group boundaries – a sharing, which is otherwise crucial for the design, building, and use of ICTs (Baba, 1999, pp. 332, 336). Thus, digitization cannot build or bring about trustful and well-functioning collaboration and interoperability, if the existing relations and collaborations are defined by distrust (see article three for descriptions of such relations). In other words, contrary to predominant discourses, digitization will not necessarily improve or fix collaboration.

In many ways, digitization in the AEC industry seems unfulfilled yet always in the process of maturing. Things are not yet working, collaborating is not frictionless, and exchange of data and knowledge is not seamless. Indeed, as Anand and colleagues argue, infrastructures are often incomplete in that things are not moving as they should to deliver their potential, which makes infrastructures appear as *"ruins of a promise"* (Anand, Gupta and Appel, 2018, p. 27). And yet, despite such ruined promises, there is a persistent conviction in the industry and among my colleagues at DBI that if only people stopped being conservative and reluctant and started believe and engage more wholeheartedly in the process, digitization would succeed in the AEC industry. And then we arrive at core features of digitization: it seems that promises, good intentions and unfulfilled potentials are forever a part of the mythology or imaginaries of digitization (Dourish and Bell, 2011, pp. 22–25; Sims, 2017, pp. 165–166). In the next pages, I investigate such promises and potentials further.

4.3. The Fourth Revolution

"Digitalisering" at DBI or in the AEC industry is not only about simulations or algorithmic risk assessments. It is much more than that. It is said, that a fourth industrial revolution is dawning upon our societies. It will *"fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has ever experienced before,"* according to World

Economic Forum (Schwab, 2016). What such revolution entails more specifically remains undescribed. The earlier revolutions marked the introduction of the steam engine to mechanize production; then came the transition to electric power and enabling of mass production; and thirdly the use of electronics and IT to automate production (Schwab, 2016). The fourth, coming revolution builds on the third which we are in now, but differs in that it evolves with exponential speed, disrupts every industry in every country and has thorough systems impact (Schwab, 2016). Indeed, digitization is predicted by leading economists to radically change the way organizations work, how managers and leaders think, and to revolutionize economic and professional practices through incremental transformations and dismantling of traditional professions (Susskind and Susskind, 2015, p. 2). In Denmark, a partnership consisting of promoters of digitization and innovation networks in the AEC industry (not including DBI) has re-named the fourth industrial revolution *"Build 4.0"* (InnoBYG, 2017). According to proponents, the revolutionizing transformations will initiate great economic earnings, process optimisation, better communication and transparency, better productivity, and increased interconnectedness in an industry marked by fragmentation, flaws, low productivity and lacking innovation (Buehler, Buffet and Castagnino, 2018; Revealing Reality, 2018; Seismonaut, 2018).

When reading internal newsletters and booklets disseminated by the management at DBI, a distinct discourse appears which resembles the above quote from World Economic Forum. It also speaks of rapid and radical changes, unforeseen and unknown demands, complexities and possibilities, and unprecedented speed and adaption. One booklet states: *"New technologies and digitization upheaval and challenge us all. More complexity make new demands on fire safety* [...] *Digitization and technological developments generate new and exciting possibilities, but they also change and challenge companies' business practices. In line with an accelerated technology development, companies' needs to launch products faster will rise accordingly. When these companies simultaneously meet fire safety standards and regulations fitted to outdated technologies, a dilemma emerges of being able to develop products fast and efficiently while*

adhering to legislative demands." In statements like this one, I read an explicit strategic focus from the top management on engaging with *"digitalisering"* and seeing it as an exciting and promising new tool. Yet, I also find that the enthusiasm and digitization-imperative is accompanied by a discomforting realization that there are not clear directions or path to follow and no one knows exactly how to go about *"digitalisering"*.

Along with these predictions, DBI have produced the following graph (see figure 9 below). According to DBI, the graph shows that technological development moves at a rapid pace compared to surrounding community, and that this distance has increased significantly because the development accelerates. There is no mentioning of what knowledge or data this graph is based on, neither any indicated units of measurement in relation to it. The graph indicates that technology, people, organizations and regulations are detached unities acting, developing and working independently. This thesis argues the complete opposite: I show that technology, people, organizations and regulations are deeply interweaved, particularly during digitization, and therefore cannot be understood independently of one another. The development depicted in the graph is termed exponential growth, and it is a cornerstone in numerous descriptions of how digitization behave and alters societies (Plesner and Husted, 2020, p. 10). In exponential growth, development doubles constantly and this is particularly salient within technology development. Such tendency is often referred to as *'Moore's Law'*, which dictates the amount of integrated circuit computing power one could purchase for one dollar doubles each year (Brynjolfsson and McAfee, 2016, pp. 40–44).

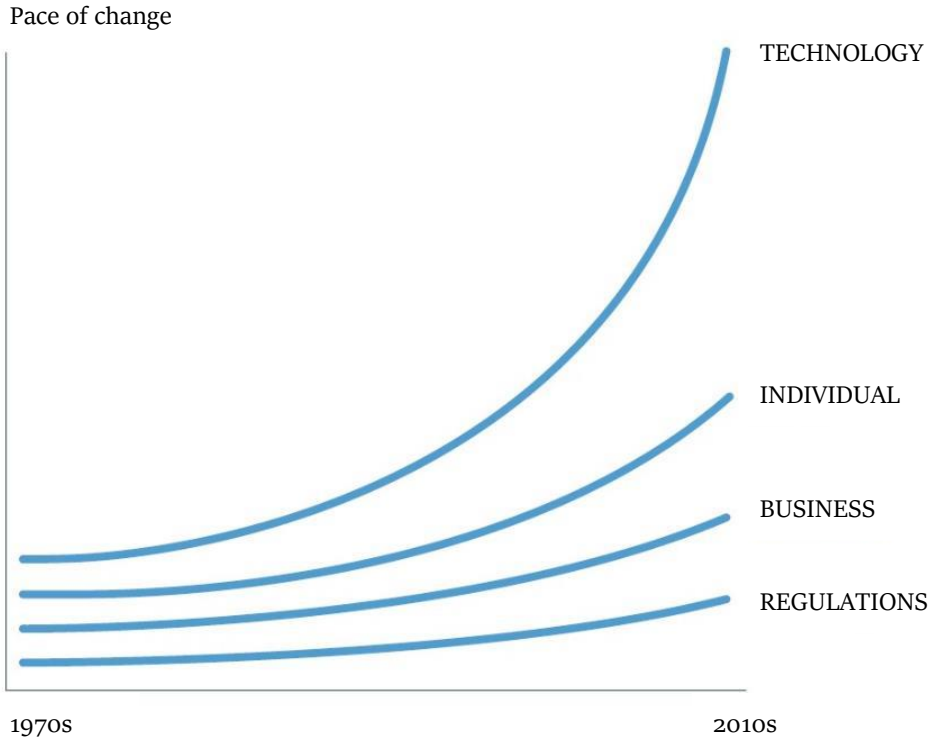


FIGURE 9. TECHNOLOGY DEVELOPMENT. MADE BY DBI IN 2019.

DBI started to focus more intensely on *"digitalisering"* around the same time as the Danes heard more in the media about 'disruption'[12] and various technological achievements such as 'Big Data'[13], 'Internet of Things'[14] (IoT), and AI, as well as robots, drones

[12] The term was developed by economist Clayton Christensen to describe technological disturbances in markets, where disruptive products induce new markets or technology use after initial resistance among mainstream customers and mainstream companies (Bower and Christensen, 1995, p. 45,47) (45,47). It has since then taken on several different meanings far from its original definition (Christensen, Raynor and McDonald, 2015, p. 46). Danish journalist Marcus Bernsen notes that 'disruption' have also taken on several different meanings in Denmark from the late 1990's and onwards (Bernsen, 2019, p. 39). In the beginning, 'disruption' referred to questioning of conventional truths and thereby creating new visions. A decade later, 'disrupton' referred to rapid changes imposed from outside, causing destruction on its way and making things spin out of control (Bernsen, 2019, p. 39).

[13] Albeit continuous discussions on 'big data' in anthropologically (Boellstorff and Maurer, 2015; Hjort *et al.*, 2017; Kinder-Kurlanda, 2017; Knox and Nafus, 2018), I shall limit myself to considering 'big data' as an accumulation of data that is too large or too complex for traditional data management tools – including human minds – to process or grasp.

[14] 'Internet of Things' speaks of the exchange and transferal of information and data from objects to various devices using the Internet. The emergence of Internet of Things have contributed significantly

and autonomous vehicles based on ubiquitous and almost incomprehensible computing power (Bernsen, 2019, p. 40). Disruption was described in the media as a *"revolution"* or *"force of nature"*, which consumes everything around us unless we fight back, digitize more, and become a part of the development rather than falling behind. The key message articulated by private tech-companies, business organizations, unions and politicians was that disruption is not a threat, but a means to growth and profit (Bernsen, 2019, pp. 40–47). As noted, this is the same year DBI initiate its work on *"digitalisering"* by *"rising to the challenge and creating a basis for increased production in the AEC industry through digital processes"* (DBI, 2016, my translation). Around the same time, the Danish government launched its Digital Strategy 2016-2020. In that, it says: *"The rate and evolutionary power of technological developments will accelerate in the years to come. Digital development will be so fast, profound and unpredictable that it will challenge and change society in ways we cannot even begin to imagine. What the future will bring is now more uncertain than ever"* (Regeringen, 2016). Such digital prophecy is compelling and awe-inspiring with its features of speed, unpredictability and upheavals combined with compelling imaginaries of future possibilities and a genuinely better world awaiting with the help of advanced technologies.

My colleagues at DBI adduced similar reasoning and narratives. Ideas about disruption, exponential growth and rapid change, and images of upheavals and promising digital transformation had reached the halls of DBI, too. One afternoon as I tried out an AR-tool with Sofie, she eagerly told me that, *"This is not 'The Future' - it's now! This is where we must be in and be a part of it - and not the ones standing last in line, outside, looking stupid and not smart enough to jump on the bandwagon."* Sofie is part of professional networks on technology advancement in the AEC industry, she attends

to the development and emergence of significantly smaller and more powerful sensors, devices and other hardware. Common examples are GPS-technologies, wearables, and other devices that generally link bodies to digital systems through various trackers and sensors.

conferences on the topic regularly, and she is a strong advocate of more *"digitalisering"* in the industry, including DBI. However, she does not herself have any experience with any of the digital programs that she thinks the industry should use more. Both of us participated in a meeting around halfway into fieldwork on how to advance digital agendas at DBI and in the industry. At this meeting, she and colleagues in similar positions voiced their frustrations with the challenges of accelerating *"digitalisering"* at DBI. Helena, a senior colleague in the research and development department, impatiently argued that, *"We can't let ourselves be controlled by the fact that 'digitalisering' is difficult for us. We need to work on what's difficult for our clients. It might be tough sometimes, but we cannot deter from doing it just because it's difficult. Ideally, our colleagues would agree with us. But great things in the world history didn't happen because the majority wanted it, but because a few wanted it. Right? And it didn't happen without people dying. Like the French Revolution. 'Digitalisering' is in many ways at the centre of a revolution here at DBI. The way we have been doing it until now, the evolutionary one where we wait for people to accept and adapt…that's good because everyone is involved. But it takes an incredibly long time, and the question is whether we have the time to wait?"* Note the language on revolution versus evolution, the constant battle between minority ideas and majority opinion, the worry of bringing about change (way) too slowly compared to an indiscernible external competitor, which you do not know the speed of but assume to be catapulting into the future rush in rocket speed.

FIGURE 10. RELATIONS AND DEPENDENCIES DURING DIGITIZATION. EACH BUBBLE SIGNALS A MANAGER/DEPARTMENT THAT HAS A SAY IN DECIDING THE COURSE OF DIGITIZATION. PHOTO BY AUTHOR IS INTENTIONALLY BLURRED.

CHAPTER FIVE.

THEORIZING DIGITIZATION AND ORGANIZATION

5.1. ANTHROPOLOGICAL INTERESTS IN DIGITALIZATION – AND DIGITIZATION?

In this chapter, I consider the theoretical backdrop for my investigation of how digitization organizes and how organizations digitize. My argument on the interweave-

ments between organizations and digitization is much indebted to decades of anthropological studies arguing that digital technologies shape social relationships and lives, and vice versa (Horst and Miller, 2012a; Pink, 2016). In a Danish welfare context, Pors shows how citizen service changes into citizen support among social workers due to e-governance (Pors, 2015), and how tasks and relations between patient and healthcare professional are displaced with the introduction of electronic patient records (Pors, 2018). Vikkelsø has shown how the introduction of electronic patient records redistributes work practices and risks in Danish hospitals (Vikkelsø, 2005). Vikkelsø shows how easier access to patient's progress reports resulted in a multiplying of readers of these notes (and thus informed participants in medical activities) and in changed, more distributed ways of writing and authoring these notes among the doctors (Vikkelsø, 2005, pp. 10–12). In studies of digital technologies implemented in or by (corporate) organizations, anthropologists hired by these corporations (e.g. Intel, Xerox PARC and IBM) have helped advance our understanding of technology's entanglement with mundane as well as professional practices (Suchman, 1995; Orr, 1996; Suchman *et al.*, 1999; Cefkin, Thomas and Blomberg, 2007). In recent years, anthropological studies on technology in organizations and among professionals have expanded to also include studies of robots and the implementation of them (Leeson, 2017b, 2017a; Sorensen *et al.*, 2019). Based on studies of robots and their implementation among professionals in rehabilitation centers, Hasse argues that society, institutions and persons are not merely (inter)connected through materials and technologies, but that these also conversely transform persons, institutional practices and societies (Hasse, 2020, p. 2). Tim Ingold raises a similar point by arguing that technologies are open rather than closed systems, where people are *"working with machines that work with him"* (Ingold, 2011, p. 62). Ingold contends that skills will continue to develop just as machines are continually developed, because people have improvisational abilities to disassemble technologies and creatively reincorporate it into their own way of life (Ingold, 2011, p. 62). To Ingold then, the economic or managerial discussions on when and how the increased digitalization and use of AI will lead to a deskilling or dismantling of professionals (Susskind and Susskind, 2015; Brynjolfsson

and McAfee, 2016) seems misplaced. For Ingold, the need for human skills and expertise will persist as long as people seek to make the best of a given situation (Ingold, 2011, p. 62). Despite these important contributions and crucial arguments, my agenda in this thesis and the contribution I seek to make is targeted elsewhere, as I have already pointed out. I thus let digitalization recede into the background, and focus on digitization.

Yet as we begin to seek out anthropological work on digitization, ethnographic studies are few and far between. In social science studies, there seems to be no consensus on how to go about the study of digitization and what it actually entails (Koch, 2017a, p. 1). Oftentimes, it is seen as just another insignificant step in the advancement of digital technologies (Koch, 2017a, p. 1). In the few excellent studies of digitization that do exist, the professionals who develop and design such coding of culture are oftentimes at the center of the analyses (e.g. Akrich, 1992; Koch, 2017a, p. 4), rather than the organizations in which such digitization takes place (see Kinder-Kurlanda and Boos, 2017 for a rare example). Most studies of digitization are found in the neighbouring science and technology studies, particularly within actor network theory (ANT). In ANT, researchers take interest in materiality and the actions of objects, they are concerned with tracing people, things and ideas across multiple locations, and they suspect settled explanatory frameworks and standard dichotomies such as science versus politics or nature versus culture (Candea, 2018, p. 209). Important and impactful ethnographic research exists in this field, where the authors show how practices of scripting technologies (Akrich, 1992), designing gambling machines (Schüll, 2012), or adjusting relations between humans and equipment (Winance, 2006) are inherent in making digital technologies fit with or substitute work-related and everyday practices. Here, scholars argue for a socio-material understanding, not least in our understandings of how organizations work (Orlikowski, 2007). Such ANT-inspired studies are admirably committed to an agenda of up-close descriptions of materials, artefacts, hu-

mans, bit, pieces and numerous other distributed relations constituting and constructing a specific work practice, tool or 'fact' in human-technology relations (Candea, 2018, p. 209,220).

However, I find that studies in ANT lack a foregrounding of the organizational settings, workings and challenges, which are inherent to understanding digitization. Whittle and Spicer write that organizations according to ANT are understood as networks of heterogeneous actors, be they persons, machines, germs, technologies etc., who are in radical symmetry with each other and therefore equally uncertain, ambiguous and disputable (Whittle and Spicer, 2008, p. 612). But as they note, the actor network *"is only stable as long as all human and non-human actors remain faithful to the network"* (Whittle and Spicer, 2008, p. 613). ANT-inspired organizational analyses tend to focus on how robust networks are constituted and maintained, which means they miss the opportunity to uncover limits, breakdowns, failing operations, powerful relations, and things which are not easily translated across contexts (Whittle and Spicer, 2008, p. 616). These issues are exactly what this thesis focuses on. The digitization I traced is profoundly tangled up with the organization that did this digitization. To understand how digitization unfolds and works in organizational contexts, it is not sufficient to investigate particular professionals' scripting of technologies (cf. Akrich, 1992) or to argue that humans develop their skills creatively alongside machines' development (cf. Ingold, 2011). This does not tell us why digitization is difficult, why professionals are concerned, why things do not work out as expected, or why *"digitalisering"* is a process both dreaded and welcomed among the FSPs and in DBI. Think for instance at figure 10 in the beginning of this chapter, which depicts an illustration made by a FSP which shows the numerous organizational relations and dependencies unfolding during digitization. Thus, I put the ANT approaches aside and investigate digitization through the lens of organizational anthropology. However, the ANT framework did prove very useful in other instances during transdisciplinary collaboration. I return to these two aspects in chapter five and six.

The seeming omission of digitization (in organizational contexts) from anthropological scrutiny is unfortunate, because we miss important insights into how organizations 'do' digitization and how digitization shapes and structures organizational workings, professional knowledge and industrial collaborations. At its most general level, digitization provides us with possibilities to change, manipulate, move, replace and reconstitute expertise, knowledge and information with ease, swiftness and across distances – not just geographically speaking, but also socially, professionally or organizationally speaking – by means of transformations from analogue to discrete data (Koch, 2017a, p. 1). If digitalization's challenge is implementation, use or even misuse of digital technologies – then digitization's challenge is conversion, construction of contexts and partiality in terms of what to include and exclude in the tools. The two photos below in figures 11 and 12 illustrate this challenge of inclusion and exclusion, and the tricky questions of what would travel across contexts. The illustrations show how the FSPs tried to list, order, rank and prioritize practices.

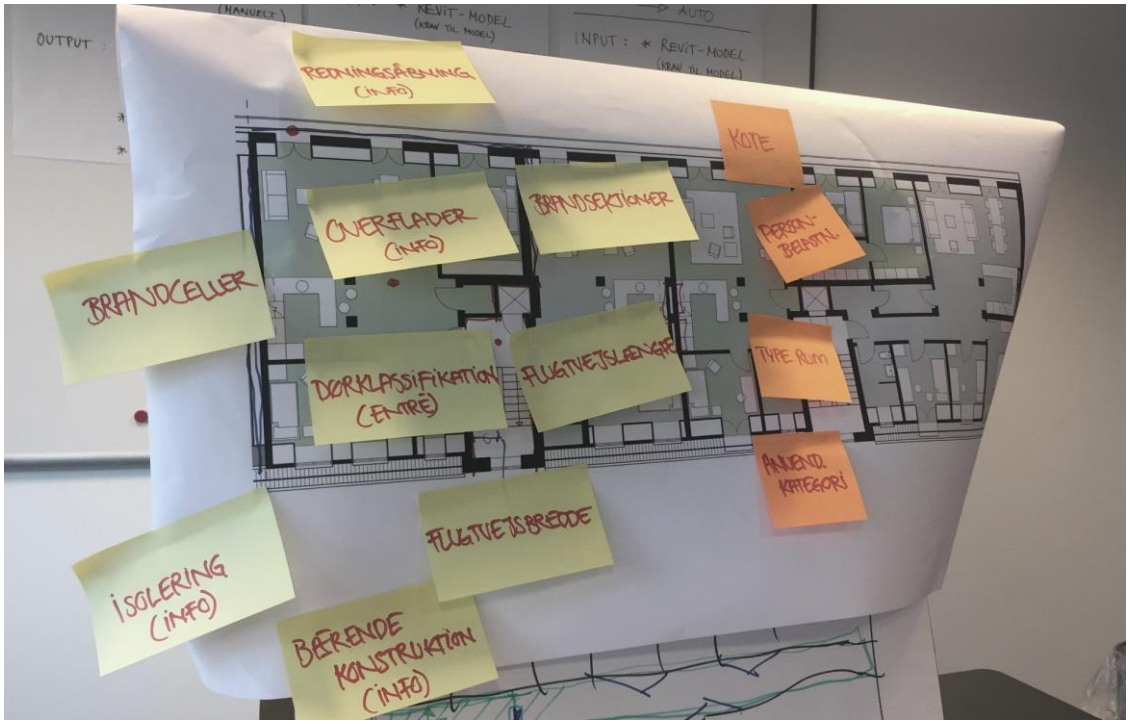
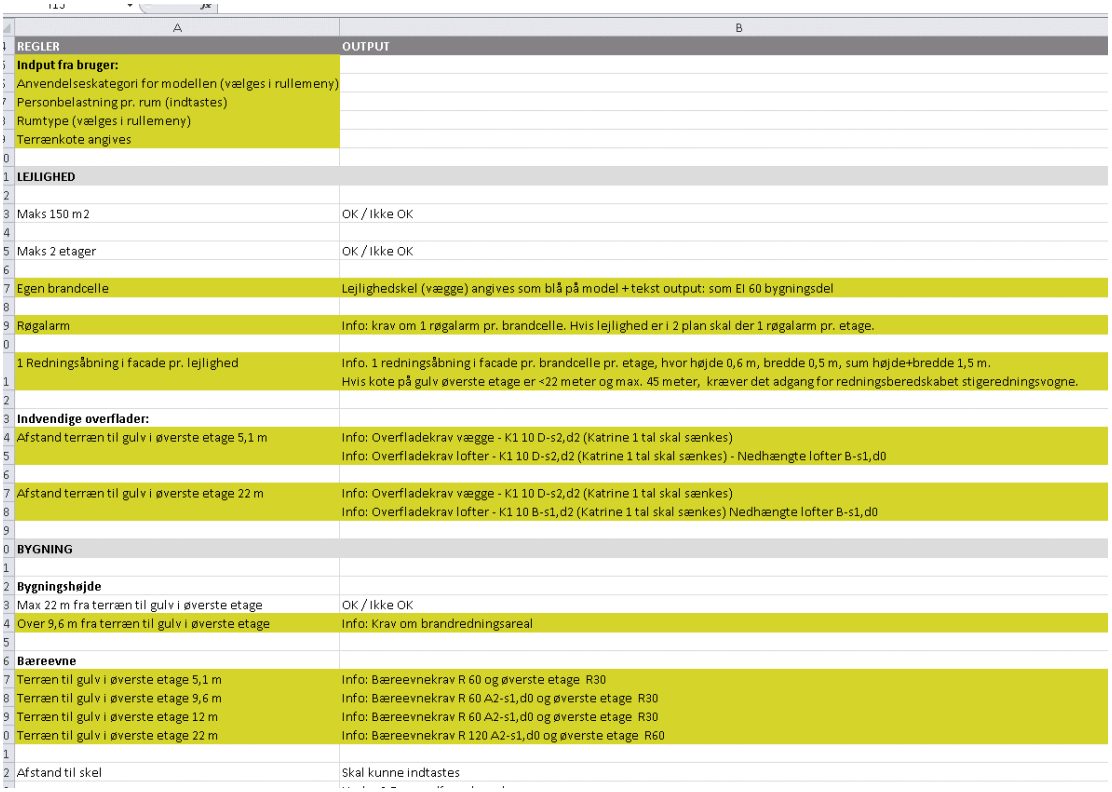


FIGURE 11. ORDERING OF RULES AND REGULATIONS IN 'PLUGIN' TOOL. THE DIFFERENT COLOURS ON THE POST-IT'S SIGNAL A RANKING IN IMPORTANCE. THE TEAM HAVE NOTED THAT SOME FEATUES ARE ONLY INTENDED AS HELPFUL INFORMATION AND NOT RULES. PHOTO BY AUTHOR



	A	B
1	REGLER	OUTPUT
5	**Indput fra bruger:**	
6	Anvendelseskategori for modellen (vælges i rullemeny)	
7	Personbelastning pr. rum (indtastes)	
8	Rumtype (vælges i rullemeny)	
9	Terrænkote angives	
10		
11	**LEJLIGHED**	
12		
13	Maks 150 m2	OK / Ikke OK
14		
15	Maks 2 etager	OK / Ikke OK
16		
17	Egen brandcelle	Lejlighedskel (vægge) angives som blå på model + tekst output: som EI 60 bygningsdel
18		
19	Røgalarm	Info: krav om 1 røgalarm pr. brandcelle. Hvis lejlighed er i 2 plan skal der 1 røgalarm pr. etage.
20		
21	1 Redningsåbning i facade pr. lejlighed	Info. 1 redningsåbning i facade pr. brandcelle pr. etage, hvor højde 0,6 m, bredde 0,5 m, sum højde+bredde 1,5 m. Hvis kote på gulv øverste etage er <22 meter og max. 45 meter, kræver det adgang for redningsberedskabet stigeredningsvogne.
22		
23	**Indvendige overflader:**	
24	Afstand terræn til gulv i øverste etage 5,1 m	Info: Overfladekrav vægge - K1 10 D-s2,d2 (Katrine 1 tal skal sænkes) Info: Overfladekrav lofter - K1 10 D-s2,d2 (Katrine 1 tal skal sænkes) - Nedhængte lofter B-s1,d0
26		
27	Afstand terræn til gulv i øverste etage 22 m	Info: Overfladekrav vægge - K1 10 D-s2,d2 (Katrine 1 tal skal sænkes) Info: Overfladekrav lofter - K1 10 B-s1,d2 (Katrine 1 tal skal sænkes) Nedhængte lofter B-s1,d0
29		
30	**BYGNING**	
31		
32	**Bygningshøjde**	
33	Max 22 m fra terræn til gulv i øverste etage	OK / Ikke OK
34	Over 9,6 m fra terræn til gulv i øverste etage	Info: Krav om brandredningsareal
35		
36	**Bæreevne**	
37	Terræn til gulv i øverste etage 5,1 m	Info: Bæreevnekrav R 60 og øverste etage R30
38	Terræn til gulv i øverste etage 9,6 m	Info: Bæreevnekrav R 60 A2-s1,d0 og øverste etage R30
39	Terræn til gulv i øverste etage 12 m	Info: Bæreevnekrav R 60 A2-s1,d0 og øverste etage R30
40	Terræn til gulv i øverste etage 22 m	Info: Bæreevnekrav R 120 A2-s1,d0 og øverste etage R60
41		
42	Afstand til skel	Skal kunne indtastes

FIGURE 12. AN EXCEL SHEET WITH ORDERING AND RANKING OF RULES, WHICH THE 'PLUGIN' TOOL SHOULD INCLUDE. THE LIST CONTAINED HUNDREDS OF RULES, AND THE TEAM FOUND IT DIFFICULT TO LIMIT THEMSELVES. SCREENDUMP BY AUTHOR.

5.2. Transformation and Travels Across Contexts

To understand such transformative processes inherent to digitization, I turn to anthropologist Hannah Knox and her colleagues, who carried out studies on how the performance of expertise is increasingly tied up with the development and implementation of digital enterprise resource planning (ERP) systems in corporations (Knox *et al.*, 2007). In their work, Knox and her colleagues use the notion of 'transformation' to conceptualize the reasoning that given 'real world' phenomena can be abstracted into data, which subsequently gets turned into information, which is then mobilized as 'knowledge' that may transform the 'real world' and create a kind of value, e.g. profit (Knox *et al.*, 2007, p. 27). The transformation of 'real world' knowledge by means of digitization knowledge is based on the assumption that organizational pro-

cesses and activities can be captured as information, which can subsequently be systematized and reorganized digitally to create controllable 'knowledge', which can be used to perform tasks and make decision about organizational paths and change (Knox *et al.*, 2007, p. 22).

The notion about 'transformation' is a very simple yet apt way to begin theorizing digitization. While it underscores the generative promises and challenge of digitization, it also attunes us to the changes and conversions it entails – not least for those professionals and organizations involved in the development. Specifically, Knox and colleagues argue that what constitutes 'expertise' changes (Knox *et al.*, 2007, p. 27). As part of that argument, they provide an apt description of expertise: *"Expertise is played out through the negotiation of a tension between the expert subject's ability to control the generation of 'knowledge' through classification, enumeration and informationalisation (which is ultimately hoped to generate 'value'), together with a simultaneous acknowledgement of the indirectness, contingency – or even impossibility – of this aim"* (Knox *et al.*, 2007, p. 25). Knox and her colleagues believe that the tension between the control of knowledge and acknowledgement of the impossibility to control such knowledge emerges most clearly during moments of transformations where things are converted (Knox *et al.*, 2007, p. 25). To them, the more classic understanding of expertise as *"knowledge gained by trial and experimentation"* changes with digitization to an understanding of expertise which denotes mastery and ability to manipulate objectified abstractions (Knox *et al.*, 2007, p. 36). In the wake of digitization, expertise is not only about how to create and apply knowledge in the classic sense – it is also about how experts gain the skills and authority to carry out contested and contingent transformations (Knox *et al.*, 2007, p. 37). In sum, Knox and her colleagues observe different kinds of expertise in digital transformations: the expertise built into the system (i.e. best practice guidelines and the knowledge of e.g. software programmers), the experience of the person interpreting the information in the system, and the expertise needed in using the output for their intended purposes (Knox *et al.*, 2007, p. 35).

The idea that digitization enables transformations of professional fire safety practices into knowledge assets and accessible information bits used among clients and collaborators that ultimately generates value presumes a great deal of travel across contexts. Anthropologist Petter Almklov studied such processes in his fieldwork among geologists, engineers and physicists searching for oil in the North Sea (Almklov, 2008). Almklov shows how knowledge and data is given meaning in new contexts during processes of decontextualization and subsequent recontextualization (Almklov, 2008, p. 873). During decontextualization, the information is made mobile via abstractions, i.e. the geologists transform their understanding of an area into objects with standardized lists of properties (Almklov, 2008, p. 876). For instance, well logs and standard gas volumes are decontextualized by the geologists and turned into standardized abstractions, which may mobilize knowledge (Almklov, 2008, p. 890). Almklov writes that, *"Given that any 'text' must be understood in the light of some context, decontextualization cannot mean 'without context' – rather it is a process in which meaningful signs are created to compose a 'text' about the world in such a way that the 'readers' need no other information about the original context in order to understand them"* (Almklov, 2008, p. 876). An example of such decontextualization at DBI is project *"Lookup"*, which aims to digitize guidelines and turn these into searchable units with linked experiences, notes and explanations. Another project, *"Plugin"*, aimed at building a digital program compatible with BIM, where users would not need to *"think for themselves"*, because all possible fire safety outcomes would be taken care of by the algorithms, which would be dense with information and knowledge delivered by the FSPs. The two kinds of decontextualization have turned out to be much trickier than anticipated, because there was no agreement on which signs were most important or correct in the composition of the digital programs. In short, the recontextualizations varied. Almklov describes recontextualization of information as *"the creative activities that combine all kinds of information at hand in each context into local singular meanings. This process occurs whenever decontextualized data are supplanted in new contextual environments"* (Almklov, 2008, p. 876). In Almklov's case, the recontextualization and use of log information in particular assessments often resulted

in new, highly simplified and standardized data (Almklov, 2008, p. 876). However, such data were often not taken at face value, but underwent meticulous scrutiny and further recontextualization through discussions and interpretations among colleagues based on experience, professional background and informal knowledge (Almklov, 2008, p. 886,891). Similarly, Knox and her colleagues observed how the abstractions, which emerged out of the calculations in the digital systems they studied, were often at risk of destabilization as they were subject to repeated interrogations in practice (Knox *et al.*, 2007, p. 29). Such recontextualization is what the FSPs do on a daily basis – it is what DBI does at its best, and illustrates why DBI holds such a prominent position in an industry where so much decontextualization happens. Such recontextualization is also what is at stake in digitization: it can be improved or dislocated, thus making fire safety either improved or hampered.

Almklov's consideration of decontextualization and recontextualization in combination with Knox and her colleagues' notion about transformation helps me bring out important dimensions of the ethnography. First, their concepts enable me to highlight that the promise *and* challenge of digitization at DBI and in the AEC industry is its transformative qualities and consequences. Second, they illustrate that such transformations of 'real world' phenomena into value hinges on the mastery of decontextualization and recontextualization, both prior to digitization and during digitization. Thus, the notions of 'transformation' and 'de-/recontextualization' provides as a shared comprehensive, sound basis for conceptualizing digitization. Meanwhile, I find that these concepts are mostly interested in describing the particular workings of digitization or standardization processes. Almklov and Knox with her colleagues focus on immensely crucial dimensions of digitization– which is why I include them here – but they seems less concerned with the organizational contexts of such digitizing, albeit they study it from the perspective of professionals or experts. As concepts, 'transformation' and 'de-/recontextualization' take an interest in how digital technologies and standardizations work as objectifying abstractions, processes, and practices, which eventually take shape as objects that cross boundaries. In other words, they suggest

close links with 'infrastructures', which can embody, convert and move institutional and organizational relations, power and standardizations (Dourish and Bell, 2011, p. 96), thereby shaping social lives (Anand, Gupta and Appel, 2018, p. 6) across sites. Thus, infrastructures are defined by how technologies, organizational agendas, business models, collegial relations, and professional practices *interact* to make it function (Koch, 2017b, p. 85, my emphasis). ICTs are often prima facie cases of infrastructures through their capacity to link various and disperse contexts and communities of practices by means of 'boundary objects' (Bowker and Star, 1999, pp. 290–300). Indeed, infrastructures comes in vastly different sizes and shapes, but they share the purpose and ability to make goods, people and ideas flow and exchange across space (Larkin, 2013, p. 328).

However, I do not conceptualize digitization at DBI as expressions of 'boundary objects' or 'infrastructure', because they are not yet such objects or structures – despite the fact that BIM approximates to being one, as noted in the previous chapter. The programs developed at DBI are not yet working as classification systems, they are not yet ubiquitous, they are not yet integrated with several other systems or lodged into different communities of practice, which are features of 'infrastructures' (Bowker and Star, 1999, p. 33,38). Digitization at DBI is still marked by processes of maturing, which makes it a contested practice infused with continuous organizational negotiations and concerns about validity, knowledge, expertise, authority and value. Thus, despite their apt usefulness in describing core features of digitization, the concepts of 'transformation' and 'de-/recontextualization' do not suffice in capturing the profound role that DBI as organization and ways of organizing play during digitization. I turn to consider such aspects in the following section. For a more comprehensive review of my understanding of organizations and organizational workings, please revisit the second half of chapter two.

5.3. Organizing and Digitizing Knowledge and Expertise

We have established that digitization *does* something. Its generative capacity means that it changes things, it reconfigures practices, and it potentially does so regardless of embodied experiences and previous knowledge. This is where I believe that thinking about digitization in an organizational context brings something new to the table. Typical management studies of digitalization in organizations focus on end-states and seek to provide managers with a toolbox for understanding how to adapt to certain changes (Plesner and Husted, 2020, p. 43). Backed up by rich ethnographic description and studies, researchers across the social sciences have criticized organization studies in general for not acknowledging the significant impact and entwinement that technologies and materiality have on and with social lives in organizations (Bijker and Law, 1992; Orlikowski, 2007; Horst and Miller, 2012b; Hasse, 2020). If we accept this premise, I will add that digitization is also integral to organizing and vice versa, and that digitizing and organizing are integral to each other. An anthropological focus on the nexus between organization and digitization provides mirrored images where we can understand both better, because the two phenomena share key features that expose the counterpart's workings. In digitization, a primary concern is how knowledge is structured and inscribed in the digital systems, and how we may organize the information it produces in an orderly, honest and pedagogical way. In short, it must be determined what is input and output. Such conversion and organizing of contexts is a process of negotiating agendas and power, which places digitization at the heart of the workings of organizations. One might say that digitization and organization amplify the counterpart's ability to (re)distribute and transform knowledge, practices, relations and powerful ideas and ideals across contexts. As Garsten and Nyqvist argue, corporate organizations are *"circuits of power"*, where normative frameworks are produced and diffused, knowledge is wielded, and ideas distributed (Garsten and Nyqvist, 2013a, p. 4). Thus, power is intimately related to knowledge in organizations, and an organization's claim to knowledge rests on whatever knowledge and expertise it can muster. Organizations are therefore highly skilled in developing tools and technologies

that assist them in the creation, administering, analysis, representation and dissemination of knowledge (Garsten and Nyqvist, 2013a, p. 9). The digitization orchestrated by DBI are examples of such processes, where fire safety expertise is created, managed, and distributed – most recently by means of digital programs.

To understand DBI's preoccupation with digitized knowledge dissemination, we must take a few moments to better understand the backdrop of such orientation. In the early 1990s, researchers in management studies argued that knowledge was a critical part of a company's competitive advantage, international strategy, and demarcation of boundaries and organizational culture (Starbuck, 1992; Foss, 2007). Knowledge was seen as something which could be developed, produced, nurtured and managed as a response to corporate problems and possibilities (Alvesson, 2011, pp. 1643–44). Such assumptions are emblematic of the widespread hegemonic discourse on 'knowledge-based economies' expanding from the early 1990s and onwards, where knowledge transfer through digitization and knowledge work are seen as key components of economic growth (Schou and Hjelholt, 2018, pp. 47–48). I expand a bit further on this in article four. Today, the idea of knowledge work and knowledge management continues to play a crucial role in corporations (Adelstein, 2007), but in slightly new ways. Across organizations and corporations, entrepreneurialism, experimentation, collaboration, and innovation are seen as key to harness, optimize and exploit the competitive potentials of knowledge, knowledge workers and expertise (Jiménez, 2014; Adler, 2015; Lex, 2016; Schou and Hjelholt, 2018, p. 50). In contemporary capitalist societies, innovation is seen as the key to growth, prosperity, differentiation, competitiveness and well-being; and in innovation, knowledge is a resource not passively stored in models, but made ready and active by means of digital technologies and transformations (Malefyt and Morais, 2017, p. 7). Eventually, as Schou and Hjelholt note in their analysis of digitalization in the Danish welfare state, competitiveness, innovation and entrepreneurialism become increasingly premised on digital competencies and skills in a manner that makes digitization unquestionable, desirable and necessary for citizens

(Schou and Hjelholt, 2018, pp. 112–113). A key motivation for digitization among my colleagues was to transform so-called *"dead knowledge"*, which referred to inaccessible or static knowledge that was difficult to interact or engage with, into *"living knowledge"* facilitated by digitization (see article four). Digitization thus appears as a tool that may serve to make knowledge active and convert it into assets consisting of manuals, stored information, best practice knowledge, and specialist knowledge that anyone can understand (Plesner and Husted, 2020, pp. 159–160) and which can thus generate value for clients and customers.

Organizational scholar Mats Alvesson notes that despite extensive research and discussions for decades, it remains difficult to pin down exactly what 'knowledge' entails (Alvesson, 2011). He argues for an understanding that highlights ambiguity, because he finds that organizations that work extensively with producing and selling knowledge seldom have clear-cut ideas or agreements on how to assess the knowledge which they wield (Alvesson, 2011, p. 1645). This ambiguity is inherent in the claimed core product (i.e. knowledge), professional practice, and the impact and meaning of the work these organizations carry out (Alvesson, 2011, p. 1646). The knowledge ambiguity means that it is crucial that the employees in these 'knowledge intensive firms' succeed in providing convincing accounts, regulate impressions and control the images circulating and exiting the organization. Since the knowledge they manage and sell do not speak for itself, someone else must and thus organizational discourse and vocabulary take center stage not only to address the external world, but also to constitute the employees as confident and credible knowledge workers (Alvesson, 2011, p. 1649). The high-risk knowledge DBI produces, distributes and sells is informally acknowledged among the FSPs as arbitrary and ambiguous, yet it is verbalized and communicated both externally and internally as rightful, objective and singular as a means to claim its mandate, standpoint and professional validity. For instance, the FSPs' colleagues with backgrounds e.g. in programming, IT and marketing have less knowledge of fire safety and its workings, and are most often only told about the 'rightful' solutions adhering to standards and regulations. This means that while employees at DBI are all

concerned about digitization, they are for very different reasons, depending on which kind of knowledge they have access to. Those who are not FSPs are generally championing increased digitization to maintain industrial influence, market share and societal impact, while the FSPs themselves often argue to maintain some kind of status quo to safeguard fire safety and human lives. Consequently, the FSPs eventually find themselves caught in their own representation and account of fire safety as objective and rational, which makes it hard for them to justify their concern about digitization, since they do not communicate or express fire safety's ambiguity or particularity.

With Boholm, we remember that risk assessments are highly observer-dependent, relational and shaped by particular circumstances (Boholm, 2015, p. 10,12). Boholm also notes the importance and impact of power asymmetries on how risks are defined in a given context (Boholm, 2015, pp. 161–164). In other words, risk assessments link closely with organizational power, and how an organization situates itself in a field. The risk assessments that DBI wield are highly ambiguous and explosive (pun intended), because they deal exclusively with assessing when something is safe enough or too risky. A wrong judgement or calculation may have fatal outcomes. Such *potentially* hazardous outcomes underlines the power inherent in the expertise that DBI wields on a daily basis, and explains the continuous negotiations and contestations among colleagues about what is deemed risky and what safety means. With digitization, an extra layer of risk and need for recontextualization is added, as the FSPs and software programmers discuss how intangible risk assessments and *"gut feelings"* may be fitted into a digital format. Thus, digitizing knowledge in fire safety equals to some extent the digitization of risk assessments. I argue in this thesis that this is where the trouble begins, because those assessments are expressions of expertise, and not of knowledge as such.

5.4. Conceptualizing Expertise through Mētis and Techne

In the past sections, I have discussed the assumptions about digitization's ability to transform the real world into value. This thesis nuances such linear assumptions by showing that knowledge conversion during digitization at DBI is a contested process marked by disagreements on input, output and value. This is because I argue that it is mistaken to focus on knowledge; we should instead focus on expertise to better understand what happens in the nexus between digitization and organizations and understand why digitization is such a challenge (see article four). Fire safety expertise is not constituted by finite practices or discernible entities, but outcomes of contested assessments of risk and safety in a given situation (Kaprow, 1991; Boholm, 2010; Almklov *et al.*, 2018; Karsten, 2020a). How may we understand such professional expertise in the context of digitization?

Odd as it may sound, I suggest that we look to political scientist James Scott and his book *Seeing Like A State*, where he considers the failures of large-scale plans across various contexts such as urban planning in Brazil and The Great Leap Forward in China (Scott, 1998). I find Scott relevant because of his reflections about knowledge and skills. As part of his quest for understanding why authoritarian, high-modernist schemes often fail, Scott focuses his attention on two knowledge forms that according to him underwrite any complex activity; '*mētis*' as a form of common-sense, practical knowledge based on experience,e and '*techne*' as a form of more formalised, "scientific" knowledge completely unaffected by context (Scott, 1998, p. 311,320). According to Scott, *mētis* originates from Greek and represent a broad spectrum of practical skills and acquired intelligence in responding to ever-changing natural or human surroundings and environment (Scott, 1998, p. 313). *Mētis* is difficult to teach, and can only be learnt through engaging in the activity itself (Scott, 1998, p. 313). For Scott then, it makes perfect sense that most crafts requires a subtle feel for materials and contexts, and that they have traditionally been taught in long apprenticeships by master craftsmen (Scott, 1998, p. 314). Thus, *mētis* is learned through practice. Other examples of professions who learn through practice and must adapt to many different situations

are specialists dealing with emergencies and disasters, such as firefighters, rescue squads, paramedics, doctors, technical crews repairing broken installations and farmers (Scott, 1998, p. 314). On a bigger scale in more political arenas, Scott also finds that politics and war diplomacy are *mētis*-laden skills. He argues that adapting swiftly and well to unpredictable situations and trajectories – both natural and human – and making the best of these situations demands skills which are hard to teach (Scott, 1998, p. 315). In all these instances, Scott notes that rule of thumbs are taught, but each situation is unique, and *"half the battle is knowing which rule of thumb to apply in which order and when to throw the book away and improvise"* (Scott, 1998, p. 314). *Mētis* thus concerns the application of knowledge in concrete situations, which makes it a form of knowledge marked by particularity and localness (Scott, 1998, p. 316). Summing up, we could use Scott's own concluding remark: "*Mētis resists simplification into deductive principles which can successfully be transmitted through book learnings, because the environments in which it is exercised are so complex and non-repeatable that formal procedures of rational decision making are impossible to apply"* (Scott, 1998, p. 316).

After drawing the contours of *mētis*, Scott moves on to describe *techne*, which he understands as something radically different. To Scott, *techne* denotes technical knowledge, and it can be expressed precisely and comprehensively in hard-and-fast rules (as opposed to rules of thumb), principles and standards (Scott, 1998, p. 319). In its core then, *techne* is logical deduction based on self-evident principles; it is a self-contained system of reasoning where findings may be logically derived from initial assumptions (Scott, 1998, pp. 319–320). *Techne* describes universal, settled knowledge. Here, knowledge can be taught more or less as a formal discipline, and the theoretical knowledge in this realm may or may not have practical applications. *Techne* is therefore also impersonal, often quantitative and concerned with explanations and verifications through measurements, calculations and rigorous logic (Scott, 1998, p. 320). Described as an ideal system of knowledge, *techne* resemble the idea of modern science where the rules of *techne* specify how knowledge must be codified, expressed,

and verified after it has been discovered (Scott, 1998, p. 320). However, the actual *practice* of science may very well require *mētis* (Scott, 1998, p. 320, emphasis in original).

With *mētis* and *techne* we can underscore the inherent balances between embodied knowledge and general rules in fire safety expertise. What is communicated internally and externally at DBI about fire safety is mostly *techne*-inspired, rendering fire safety practices immediately ready and perfect for digitization. Yet, the daily acknowledgement of *mētis*-like knowledge and skills among the FSPs challenges this. In article three, I show that this duality of *mētis* and *techne* makes fire safety an ambiguous knowledge form, which DBI deals with and wields. The core of the FSPs' expertise is thus constructing, negotiating and framing the relationship between *mētis* and *techne*. Such omnipresent negotiation defines the very nature of fire safety expertise. This ambiguity is crucial to bring into our understanding of digitization in an organization such as DBI. As Scott notes, every instance of the application of a piece of knowledge will require adjustments to local conditions, and every general knowledge requires imaginative translation (Scott, 1998, p. 317). The FSPs do this on a daily basis – adjust, translate, imagine – but how does digitization adhere to such need? For Scott, the holder of *mētis*-knowledge typically has a passionate interest in a particular outcome, and *mētis* describes the ability and experience necessary to influence an outcome to improve the odds in a given situation (Scott, 1998, p. 318). In article three, I describe how such interest and quest for influence is framed through dialogue. In Scott's terms, the FSPs are concerned about the dark implications of digitization, because it reduces and shifts their ability to influence the application of *techne* through *mētis*. Not only is their expertise dislocated; their power over such knowledge is also redistributed and removed. Interestingly, there is a peculiar irony to *mētis*. According to Scott, *mētis* is not democratically distributed, but depends upon access to the experience-based knowledge that may not be common (Scott, 1998, p. 334). Such knowledge may be treated as a monopoly one is unwilling to share, and the availability of this knowledge

depends on the advantages which such a monopoly brings (Scott, 1998, p. 334). I already touched upon some of the issues of knowledge monopoly at DBI in the beginning of chapter 2. In article four, I elaborate a bit further the question of access, distribution and organizational decisions about who knows what, as I show how the FSPs' influence over contexts is transformed and fundamentally challenged by digitization.

I am aware that my use of *mētis* and *techne* evokes a rich and century-long anthropological and philosophical discussion about what constitutes (scientific) knowledge and (practical) skills. It is worth briefly mentioning how Scott's *mētis* and *techne* relates to Aristotele's descriptions of *'episteme'*, *'techne'* and *'phronesis'*. I do so inspired by Bent Flyvbjerg's reading of Aristotle (Flyvbjerg, 2001). According to Flyvbjerg, *"phronesis goes beyond both analytical, scientific knowledge (episteme) and technical knowledge or know-how (techne) and involves judgements and decisions made in the manner of a virtuoso social and political actor"* (Flyvbjerg, 2001, p. 2, emphasis in original). Aristotle never included considerations of power in his conception of phronesis, but Flyvbjerg intends to do so, because he finds that conflict, power, and value-based questions about what constitutes 'good' and 'bad' are immanent in social and political inquiry in modern society (Flyvbjerg, 2001, p. 3). As Aristotle's *'techne'* and *'episteme'* both stem from logical deduction and aim for universal principles (Kumar, 2019, p. 6), I think of these as comparable with Scott's *techne*. Furthermore, Scott's *mētis* seems similar to Aristotle's *phronesis*, but they differ in some critical ways. *Mētis* is characterised by improvising, tricks and cunning – whereas *phronesis* concerns analysis of values and ethical judgements, which are contextually subjective (Kumar, 2019, p. 6). In short, *mētis* is particularly about practice and action, whereas *phronesis* is primarily about ethics and judgements of good and bad (Kumar, 2019, p. 6). Despite the fact that fire safety expertise is indeed founded upon judgements of contexts, and these judgements rest on the FSP's individual assessments, such assessments are not solely marked by ethical or value-based questions of good or bad. I do *not* mean to say that FSPs are indifferent about their ethical responsibilities or moral obligations towards society; they are acutely aware of this! The FSPs' work

is permeated by questions of safe or unsafe, which admittedly do relate to questions of ethics. But in my endeavor to conceptualize the expertise that the FSPs wield, ethical dimensions are not at the forefront. What absorbs their attention is questions about how to solve a problem, how to be creative within the framework given, how to incorporate various dimensions of technical knowledge, how to balance past experience from a particular case with a case at hand, and how to make designs work in the midst of different opinions, standards, understandings and assessments. For this reason, I have chosen Scott's framework to highlight this practical dimension. However, I have also chosen his framework to elucidate the interactions between digitization and expertise where some parts, i.e. *techne*, are easily digitized and other practical dimensions, i.e. *mētis*, are not so easily digitized.

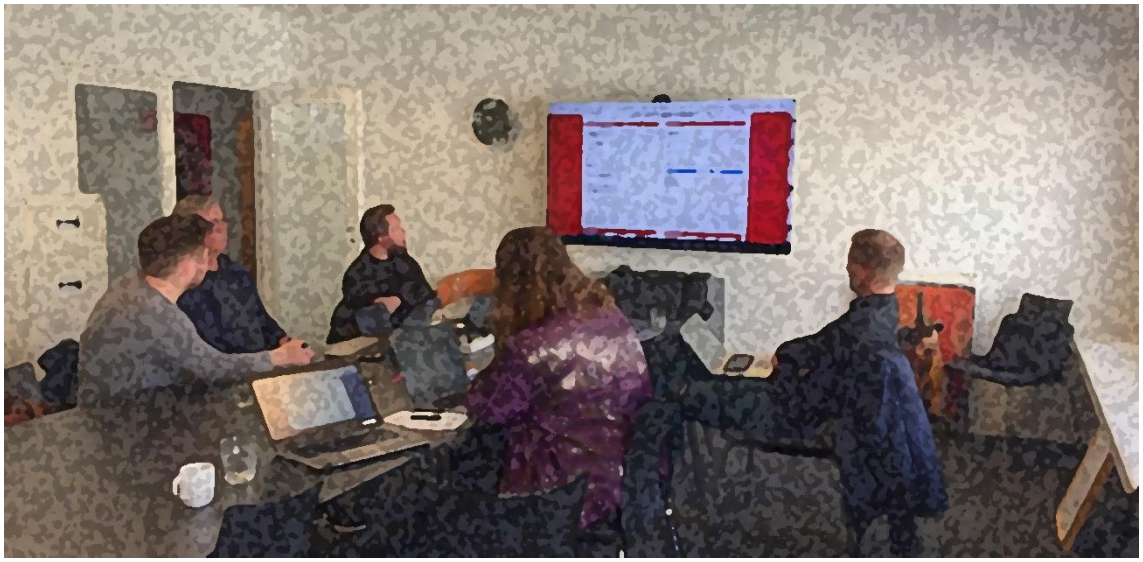


FIGURE 13. COLLABORATION ON A DIGITAL PROJECT. ILLUSTRATION BY AUTHOR

CHAPTER SIX.

METHODOLOGY AND ETHICS

This chapter precedes two articles and an appendix article on methodological and ethical considerations about doing fieldwork in, for and with an organization. Article one and the appendix article illustrate early versions of my steadily maturing argument over the past years on anthropological collaboration. Thus, some of the reflections in the articles may appear as premature or even contradictory compared to the adduced arguments in the present chapter. Yet in this way, the articles provide a tangible testimony to the transformative process that junior scholars undergo in the formative

years of their PhD-studies, and testify to the inherent learning process not only during fieldwork, but *also* during analysis and writing up.

In the present chapter, I consider how my colleagues were always also my informants, and how my fieldwork and research took shape as a collaborative, complicit endeavor in an organization such as DBI. My position as both researcher and employee/colleague in the digitization I traced provided rare insight into concerns, negotiations and challenges of *"digitalisering"* at DBI. Thus, this chapter discusses how anthropologists can practice and re-conceptualize collaboration to fit with current employments, research setups and engagements beyond co-production of ethnographic texts. During such discussions, the reader will notice that I am particularly inspired by works of George E. Marcus.

6.1. Entries

6.1.1. Drafting a Proposal and Engaging in Strategic Research

In the fall of 2016, a former colleague of mine at the University of Copenhagen put me in contact with DBI to write a research proposal for an industrial PhD project on *"digitalisering"* in the AEC industry. An industrial PhD is a research format based on a trilateral relation between state, university/Ph.D.-student and corporation. I consider such constellation a triple helix, and have done so in article one and two. In such a research project, the state partly funds the Ph.D.-student's work in the corporation under the condition that (s)he is affiliated with a university and will carry out independent research for the benefit of both industry and university and to boost societal innovation in general (Innovationsfonden, 2019). DBI had a somewhat clear vision of what they believed to be an issue in the industry, and they suggested that the problem might be best exposed through anthropological research and suggestions for solutions. Thus, we co-authored a proposal with an anthropological take on the empirical problem: how might increased *"digitalisering"* affect the relationships between a

knowledge intensive organization such as DBI and its clients, and how could DBI maintain a trust-based relationship during *"digitalisering"*. The collaboration had started, and the applied, collaborative aspect of anthropology was manifest in the project's intention to come up with ideas on how to engage with the issues of digitization in fire safety.

As noted, such relation is nothing new in anthropology, neither in ethnographic practices. Years back, anthropologist James Spradley noted the following in his canonical book *'The Ethnographic Interview'* (Spradley, 1979): *"Instead of beginning with theoretical problems, the ethnographer can begin with informant-expressed needs, then develop a research agenda to relate these topics to the enduring concerns within social science. Surely the needs of informants should have equal weight with "scientific interest" in setting ethnographic priorities."* (Spradley, 1979, p. 14). Spradley's call extends to my own situation. Collaboration was well underway before fieldwork had begun. Anthropological goals were synchronized with DBI's needs, which lay the foundation for the anthropological research interests. I speak more of this alignment of interest in article one via the notion of *"passing tests"* in organizational fieldwork. Spradley suggest that the ethnographer may engage in *"strategic research"*, which targets human problems that suggest needed changes and information needed to make such change (Spradley, 1979, p. 15). The questions that DBI posed at that time was how *"digitalisering"* of expert-knowledge on risk and safety could be done successfully, what the drivers and barriers of such *"digitalisering"* might be, and why current examples on *"digitalisering"* in the AEC industry seemed to be filled with pitfalls and problems. One of Spradley's suggested areas of interest for strategic research was *"socially responsible corporations that operate in the public interest as well as for the private interest"* (Spradley, 1979, p. 15). As fire safety is a topic of broad social and societal relevance, DBI may be one such corporation operating to serve both public and private interests, as I noted in chapter two. Other listed areas are health care for all, elimination of poverty, equal rights, securing multiculturalism in public institutions, responsible use of natural resources, and education for all (Spradley, 1979, p. 15).

Spradley's listing illustrates how collaborative ethnography and applied anthropology ought to focus on keeping stakeholders, governments, institutions and corporations in check. Such assumptions rest on disciplinary ethical standards of doing no harm but rather doing good as a consequence of anthropology's concern over colonial roots and possible continuation of neo-colonial approaches (Sedgwick, 2017, pp. 67–68). Such perspectives on how anthropology may (or may not!) engage or advocate (e.g. Hastrup *et al.*, 1990; Rylko-Bauer, Singer and Willigen, 2006) has created a thin line for anthropologists to walk on in terms of practicing anthropology, which has casted shadows over any anthropological engagement with corporations, businesses or other private stakeholders (Stewart and Aldrich, 2015, p. 10). Hammershøy and Madsen note that in the discussions of how to practice anthropology in businesses in an ethical manner, there is a tendency to demand academic/scientific rigor and responsibilities to protect human subjects, which is seen as being in seeming opposition to corporate barbarism and careless utilization (Hammershøy and Madsen, 2012, p. 68). Timothy de Waal Malefyt and Robert Morais argue that practicing anthropology in and for corporations or organizations involves complex ethical issues, which differ fundamentally from academic and other practicing non-business anthropologists (Malefyt and Morais, 2017, p. 1). Examples of ethical concerns particular to business-contexts is the aspect of intellectual property and ownership over fieldnotes and fieldwork data (Batteau and Trainor, 2017, p. 57). This was also an issue for me to attend to early on, because as an industrial PhD-student I would be employed by DBI, where it is stated as default in the contracts that the organization owns the intellectual property. We drafted and signed an addition to the contract to ensure my rights as researcher and explicate both DBI's and my own rights and ownerships in this project.

6.1.2. Harm Versus Help in Anthropological Practice

Based on their experiences as practicing anthropologists, Elizabeth Briody and Tracy Pester argue the ethical principles of AAA (American Anthropological Association,

2012) need revision to capture current ways of engagement among practicing anthropologists, who work to identify and solve problems in organizations or corporations (Briody and Pester, 2017, p. 23). For instance, they note an overwhelming emphasis on harm without a corresponding emphasis on help in the principles, which then does little to reflect current practices among anthropologists (Briody and Pester, 2017, p. 39). As Hammershøy and Madsen forcefully argues in their critique of the AAA code of ethics: *"With this emphasis on protection of universally identifiable and stable categories, instead of constant critical self-reflexion and affirmation of contingency, responsibility is removed from the singular concrete situations in which the social scientist is inscribed"* (Hammershøy and Madsen, 2012, p. 68). Thus, ethical considerations in anthropology oftentimes circle around protection rather than responsibilities, leaving a major gap to be filled out and interpreted by practicing anthropologists, myself included. Using my research as a way to help push commercial and industrial interests has faced critique among colleagues in academia, who had a hard time understanding what I was doing and how it could be an ethically responsible endeavor to help DBI understand internal processes and clients which ultimately may benefit the organization's turnover. Therefore, I was very pleased when I came across Briody and Pester's argument that: *"Anthropology's new ethical horizon should move beyond the Do No Harm principle to Do Some Good"* (Briody and Pester, 2017, p. 39). They find that much of anthropology's inspiration springs from desires to make a difference and trying to make cultural systems better in any way they can (Briody and Pester, 2017, p. 39). Yet, the principle of doing no harm does not immediately encourage anthropologists to imagine ways in which their work might make positive contribution to organizations or society (Briody and Pester, 2017, p. 40). Consequently, Briody and Pester argue that working in an ethical way as an applied anthropologist should not be defined by the negative, but by the requirement to actively position one's insights instead of passively protecting and representing subjects (Briody and Pester, 2017, p. 39).

Despite Spradley's slightly outdated arguments, the core of it – engaging with one's informants to do strategic research on topics which they find pressing – has no

sell-by date. Combined with the more updated calls on allowing anthropology to 'do good', it is still highly relevant. Marietta Baba hits the nail on the head when she argues: *"Advances in disciplinary learning may follow from inquiry situated in a problem-oriented surrounding where researchers pursue questions of interest to both their discipline and their society"* (Baba, 2009, p. 383). This thesis illustrates engagement and springs from the desire to try and make a difference, to help resolve questions and to imagine ways in which digitization may work better in society. Therefore, I wholeheartedly agree with Luke Lassiter when he argues that collaborative ethnography *"foregrounds the possibility that ethnography can matter for those beyond the academy*" (Lassiter, 2005, p. 151). Indeed, it is my hope that the research carried out at DBI and the present thesis matter beyond academia, including DBI and the AEC industry.

6.1.3. Creating Para-Sites

The act of drafting a research proposal with DBI or writing an article with colleagues (see article two) not only signals strategic research or collaborative ethnographic work. I argue that it also illustrates how I operated in a *'para-site'* (Marcus, 2000). According to anthropologist George Marcus, anthropology has for decades been preoccupied with exploring positions of opposition and resistance against dominant structures; the marginalized and the abused were favoured subjects of much anthropological work (Marcus, 2000, p. 1). Marcus is one of the prominent figures in of a yearlong heated debate on anthropological representation, which unfolded particularly in the 1980s as harsh self-reflexive critique of anthropological writing, practice and ways of portraying "the Other" (e.g. Said, 1979; Marcus and Fischer, 1986). According to Marcus, the established and widespread focus on 'the oppressed' was in line with anthropology's preference for leftist social and cultural criticism, yet it had resulted in a very limiting focus on resistance or opposition among *"the Other"* (Marcus, 2000, p. 2). Such focus is what we may observe in Spradley's attention to where anthropologist might do good: in areas where 'oppressed' people need help to gain access to health

care, income, or education. The leftist political preferences might also explain the critique of anthropologist doing fieldwork or working in corporate environment, as this was seen as a yield for capitalism and its power over the oppressed and not in line with anthropology's ethical responsibilities (Baba, 2009, p. 380).

To break away from such focus and shift the anthropological analyses, Marcus employs the notion of 'para' based on his observation that current anthropological work takes shape through relationships with 'counterparts' rather than oppressed, who often provide intellectual input in defining the fieldwork. Such relationships define a mutual appropriation happening when the anthropological project undergoes turnings of its course, which is so commonly expected of fieldwork (Marcus, 2009, p. 30). To Marcus, counterparts are co-producers of the interpretations, which they and anthropologist make collaboratively through negotiations of how insights, critiques, and perceptions will be formulated (Marcus, 2000, p. 2). Thus, anthropologists may expose collaborative views through dialogue, instead of authoritative concepts and narratives about "Others" (Marcus, 2000, p. 3). For Marcus, working alliances with counterparts from other disciplines or experts with shared, discovered or negotiated critical standpoints offer a way out of the limiting frames of ethnographic research (Marcus, 2000, p. 3). This collaborative space, intended to create alternative thinking by counterparts, who are deeply complicit with and implicated in powerful institutional processes during times of great social transformation, is what Marcus goes on to call a *'para-site'* (Marcus, 2000, pp. 5–6).

'Para-sites' are thus spaces marked by ambivalence, alternative thinking, and complicit, conflicting interpretations forged through dialogue (Marcus, 2000, p. 5). Importantly, para-sites involve a material dimension, a piece of work or project that must be carried out, or a thing which must be built or made through such dialogue (Marcus, 2000, pp. 7–8). Marcus' close linking between the word 'parasite' and his notion of 'para-site' is intentional. 'Parasites' live at an other's expense and repay with flattery, as parasites live in or upon other organisms; 'para' refers to various formulations of being by the side of someone else or being abnormal to name a few (Marcus,

2000, p. 6). With the notion of 'para-site', Marcus wants to stress how these spaces are wily transgressive as parasites, thus allowing for flexibility, resistance, subversion and creativity in a marginal position (Marcus, 2000, pp. 6–7). In other words, fieldwork in para-sites unfold as working alliances with intellectual counterparts, where the collaboration may transgress established conventions, and thus challenge and criticize through flexible, resistant, subversive and creative work among the involved. All parties live at others' expense and benefit from this parasitism. This makes fieldwork with intellectual counterparts persistently ambiguous, conflicted and unpredictable (Marcus, 2000, pp. 7–8).

Inspired by Marcus' conceptualizations, I consider my colleagues and informants as intellectual counterparts, and the work we engaged collaboratively in as expressions of para-sites. My colleagues provided input to my analyses, and I discussed not only my research with them but also gave input on their projects. Such dialogue across disciplines oftentimes spurred discussions, negotiations and carving out of new opinions or alternative ways of going about fire safety knowledge and risk assessments. A senior manager dropped books and articles off at my desk that he thought I should read. My manager challenged my hypotheses while he also implemented concepts I had told him about into the department's strategy. I taught software programmers about ethnographic fieldwork, and upon fieldwork we shared fieldnotes for the UX-designers to transform into digital designs and wireframes. All of these counterparts held master's degrees in computer science, social science, or adjacent disciplines such as management, economy, or digital design, and they were employed in key positions.

I also co-authored article two with two colleagues (see article two). Our article focuses on how to bridge anthropology and fire safety engineering, and it rests on projects where my anthropology-colleague and myself had carried out rapid ethnographic fieldwork (similar to the fieldwork described in the appendix article), and the engineer was eager to engage in anthropological reflections and contemplations, but did not carry out fieldwork. In the article, we argue for a socio-technical transdiscipli-

nary approach to risk assessments in fire safety. Such approach draws on ANT, although I have pointed out that I do not consider it as part of my theoretical framework for understanding digitization. Yet in this case, we experienced, like others before us (Baba and Falkenburg, 1994, p. 22), that the taxonomies, phrasing and focus on systems, networks etc. in ANT resonated well with engineering concepts and vantage points, although these held very different meanings. In retrospect and drawing on Marcus' work, I believe that such transdisciplinary collaboration enabled us to create a para-site that facilitated dialogue across disciplines. Discussions of how anthropologists understand concepts such as networks and systems compared to how engineers understand them, fueled lengthy and curious discussions where we tried to understand each other's epistemological perspectives and reach common ground. The establishment of a para-site emerged on the condition that we ventured into scrutiny of our own epistemological vantage points and kept an open mind in order to collaborate transdisciplinarily. In such para-sited endeavor, a kind of synchronization between different disciplines must take place (Askland, 2013, p. 251), which was also the case for our small team. In such epistemological synchronization, we strived (and still strive) to build transcending frameworks through an overarching synthesis of our different disciplines and available knowledge (Askland, 2013, p. 252). We found that this synthesis challenged, expanded, and enriched the usual disciplinary scope for understanding fire safety in a new perspective, which subsequently fostered a holistic approach that is now being implemented in more projects at DBI. The article thus shows how anthropology may find its contemporary relevance in facilitating new and altered perspectives on fire safety or digitization based on continuous dialogue and mutual, collaborative engagement across disciplines (cf. McCabe, 2016).

6.2. Relations: Schizophrenic Collaborations

There is something schizophrenic about practicing anthropology, I dare say. Being at once an insider and outsider – an observer and participant – is both tremendously hard

and yet truly rewarding work. These mixed, ambiguous emotions have spurred numerous tales and harsh critiques about anthropological hardship and manoeuvers during fieldwork, where the researcher does all (s)he can to immerse him/her-self in the field (i.e. participate) while staying analytically aloof and considering the situation from an analytical distance (i.e. observe) (Crick, 1985; McLean and Leibing, 2007; Fabian, 2014). Recent years, several organizational anthropologists and ethnographers have reversed the notion of 'participant observation' to 'observant participation' to highlight how anthropologist/ethnographer helps out on projects, intervenes or otherwise engages as a means to get "back stage" in organizations (Lassiter, 2005, p. 62; Moeran, 2007, p. 14; Gatt and Ingold, 2013, p. 154). Yet, despite good intentions and strong arguments, a distinction between observation and participation remains. Anthropologist and ethnographers must seemingly continue to endure the schizophrenia, not least in organizational or corporate fieldwork. Here, we remember how small-talk at the coffee machine may suddenly turn into a moment of deep analysis (Tietze, 2012; Hepsø, 2013), or we reflect upon the fact that we are doing fieldwork "at home" where one's field in professional regard is also one's home in private regards (Lex, 2013; Vangkilde and Sausdal, 2016).

The insidious schizophrenia becomes even more conspicuous, when the anthropologist is employed by the organization, which she is hired to study. This has been the case for me in this project – but also for others before me (Czarniawska, 2012, p. 132; Lex, 2016, p. 231). Such format presents anthropologists with particular advantages as well as challenges. Anthropologists have long chronicled the trials and tribulations of getting 'inside' and getting access to the fields they wish to engage with or study. So have organizational anthropologists, where closed doors, limited access and secrecy have posed challenges in terms of accessibility and 'getting behind' the front lines (Moeran, 2007; Lindberg and Eule, 2020). Yet, in my case, the trouble of getting access was of a different kind. As employed, I had full access to all that my colleagues had access to – but I was also denied access on the same terms as them. When colleagues shared frustrated or angry reaction to organizational reorganizations

or dysfunctional processes, I could relate to their frustration – not only because I had spent so much time studying these processes, but also because I was an employee myself. But like my colleagues and despite continuous efforts, I was never let into management meetings – not due to lacking trust in me as researcher, but because I was an employee on equal terms with my colleagues, and no regular staff member was allowed to enter these meetings, as they were intended as a "safe space" for the managers.

Beyond access, the consequence of being researcher-as-employee was that any moment might be a potential 'fieldwork moment', so to speak, and that my colleagues were always also my informants. I reflect more on that in article one. Meeting notes were also fieldnotes, and fieldnotes were at times transformed into minutes of a meeting on the request from my colleagues. Rapid ethnographic studies and telephone interviews carried out for paying clients in seeming non-Ph.D.-related projects suddenly proved worthy of later academic reflections and were included in the analyses. For instance, a project on the use of batteries as part of the propulsion system on passenger vessels in the maritime sector produced valuable insights into how DBI's clients consider digitalization. Insights from this project later formed the basis of article two about merging anthropology and fire safety engineering. The lines between academic and corporate agendas blurred and mixed repeatedly. Eventually it seemed feigned and pointless to me to try and maintain a distinction between when I was at work and fieldwork respectively, and when I was in a colleague-to-colleague relation or an anthropologist-to-informant relation. Oftentimes, I found myself caught in-between domains of academia and business, where neither of the fields seemed to fully comprehend or credit the work carried out.

I am not the first to experience such friction and blur during fieldwork. For example, organization scholar Rita Järventie-Thesleff and colleagues write about carrying out "at-home" ethnography and shifting professional identities among corporate executives, who conduct research in their own organization and eventually leave to

work in academia (Järventie-Thesleff *et al.*, 2016). Järventie-Thesleff carried out ethnographic research as part of her PhD studies on organizational change processes in the organization she was employed by and in which she held a key position as business executive (Järventie-Thesleff *et al.*, 2016, p. 236). She experienced how, *"academia did not offer suitable tools or frameworks, let alone to quickly fix the slackening corporate branding project [that she was working on, red.]. Instead, it provided a wealth of approaches and understandings to question the foundation of the entire corporate branding project. […] At the same time, the first version of Rita's doctoral thesis was grounded in a positivist world view, characterized by a strong tendency toward finding neat cause-and-effect relationships, which was not aligned with the conventions of critical management studies "* (Järventie-Thesleff *et al.*, 2016, pp. 248–249). I shared Rita's experiences. When presenting my research to academic colleagues, I was criticized of not being critical enough, of buying in to the life in the organization, and of not acknowledging how the sometimes messy and flawed digitization process illustrated how my colleagues were an incompetent *"bunch of retards"*, as one associate professor put it. I defended my colleagues and rephrased my explanations to make my arguments more clear. Conversely, I also experienced how colleagues at DBI grew impatient with my questions and efforts to analyze a given situation rather than answering their questions and coming up with suggestions for solutions. In response, I defended my profession, and rephrased my analyses to try to make them more applicable to the situation.

The schizophrenia became a constant companion throughout fieldwork (and during the writing-up of the thesis). I had the feeling that I had nowhere to turn to, neither in the organization nor in academia, apart from my supervisors and a few mentors who cheered and supported my seemingly untrodden path. Indeed, Marcus and Holmes argue that the long-established anthropological tradition does little to help enter and collaborate in knowledge-intensive, epistemic communities inhabited by experts like ourselves (Holmes and Marcus, 2008, p. 82). Eventually, my way out of the

schizophrenia was to consider the entire project and endeavor through the lens of collaboration (Lassiter, 2005) (see also article one). I started to consider my informants as always also my colleagues and vice versa, as we collaborated on my research project as well as client-paid projects or state-funded development projects. I decided for myself that in each case – whether it was during interviews as a researcher or during product development as a colleague – ethnographic moments arose, all worthy of anthropological contemplation. It had to be so. At the time of writing these lines, I am convinced that it is undoubtedly so.

Settling on such an approach and believing in it was a learning process. Indeed, anthropological fieldworks are entire processes of learning (Hasse, 2015). We may enter the field as cultural newborns or well-acquainted insiders. Irrespective of our previous knowledge and experiences, it is through participation and immersion with people that anthropologists slowly but steadily learn about beliefs, practices, networks, emotions and customs through joined awareness, experiences and correspondence with those we seek to understand (Gatt and Ingold, 2013, p. 147). Simultaneously (at least as junior researchers), we also learn about the craft of anthropology – doing fieldwork, doing analysis, writing up, and disseminating. We learn what works and what does not. Slowly, we start to build up our own experiences and professional opinions on what anthropology is, what we would like it to be, and where we fit into the field. We become full-grown anthropologist.

However, I was not the only one learning about anthropology, DBI and digitization – so were my colleagues/informants. Such two-way learning process and questioning of ideas and notions coupled with the creation of anthropological insights based on these learnings and explorations was a prerequisite for my access and the entire research project (see also Vangkilde and Sausdal, 2016). DBI wanted to learn, they wanted impact from my research, they wanted me to function as a 'change agent', and they wanted to use my analyses as a lever for boosting digitization, creating an enhanced focus on usability and initiating organizational changes. Dourish and Bell observe that such demands for devising implications for technologies or designs, based

on ethnographic fieldwork, is common both in industry and academic contexts (Dourish and Bell, 2011, p. 65). DBI expected insights, implications for design, and *"something different"* as one of my colleagues put it from day one. This seemed reasonable, given the popular business literature that argues the benefits of incorporating ethnographic studies and anthropological approaches into businesses and product development (Madsbjerg and Rasmussen, 2014; Braun and Kramer, 2019). Others were less expectant, almost dismissive, of anthropology's ability to contribute to areas of business, profit, or engineering. And others again expressed modest enthusiasm; anthropology might bring *"something different"* to the table by asking *"uncomfortable questions"* in an organization permeated by technicians, engineers and people, who had been in this industry for a lifetime. How could I respond to these expectations and presumptions, gain acceptance, and prove myself and anthropology's worth, both as researcher and as an equal colleague? Some six months into fieldwork, I realized that I had to *'pass tests'*. In article one I reflect upon this: I argue for a collaborative engagement inspired by Lassiter's work, and describe how I went about it during fieldwork. However, having learned (and read!) more now than I had at the time of writing that article, I would like to expand a bit on that argument. I will do so in the following sections.

6.3. Positions

6.3.1. Collaboration

Anthropological participant observation is fundamentally entangled in and dependent on our commitment to and engagement with others (Gatt and Ingold, 2013, p. 153), and thus fundamentally mutual (Vangkilde and Sausdal, 2016). One way of considering such engagement has been as a form of collaboration, which is described as something that goes without saying. As Steffen Jöhncke puts it, *"fieldwork is collaboration. Collaboration is not an option, which you can opt in or out from – but you can consider what kind of collaboration you aim for, and to the best of your abilities try to establish*

that" (Jöhncke, 2018b, p. 125, my translation). The take has been that comprehension, understanding and immersion presuppose participation, thus anthropologists always collaborate in some sense with informants (Lassiter, 2005, p. x). Yet, such collaboration has not always been clearly expressed, primarily due to the heavy individualistic focus in fieldwork practices (Rabinow, 2011, p. 115).

What I find striking about anthropological considerations of collaboration in ethnographic endeavors is that they tend to focus exclusively on co-producing written texts or analyses with informants (Lassiter, 2005), neighboring disciplines or intellectual counterparts (Marcus, 2000; Holmes and Marcus, 2008). Only rarely do anthropologists consider ethnographic collaboration unfolding during concrete work practices or corporate projects intended to create specific solutions, where anthropological analyses derive from transdisciplinary co-production of other artifacts than texts. In design anthropology and other applied branches of the discipline, scholars do reflect on how anthropologists collaborate with stakeholders and co-creators on creating, devising and designing desirable futures (e.g. Gorup and Podjed, 2016; Smith *et al.*, 2016). Within business anthropology, Askland has provided a fine yet rare record of interdisciplinary collaboration between anthropologists and engineers (Askland, 2013) along with Hanson's description of her collaboration with software programmers (Hanson, 2018). Yet, when we know that knowledge and insights emerge productively from the cooperation and coexistence of different disciplines in projects (Askland, 2013, p. 261), I cannot help but find it peculiar that anthropological concerns with collaboration often hinge on the co-creation of ethnographic texts. Co-creation of corporate value, Power Point Presentations or products targeting end-user needs are strikingly missing in descriptions of collaborative ethnographic engagements. Since Lassiter's notion of collaborative ethnography primarily concerns the production of written texts (Lassiter, 2005), we must look elsewhere.

6.3.2. Correpondence and Design

In my endeavor to conceptualize collaboration beyond creative writing or para-ethnographic fieldwork (Holmes and Marcus, 2008), I am inspired by anthropologists Tim Ingold's and Caroline Gatt's notion of *'correpondence'* (Gatt and Ingold, 2013). In their work, they provide examples from Gatt's doctoral fieldwork among activists from Friends of the Earth International in Brazil. Gatt realized that she and the activists shared the same intellectual questions and interests. She studied relationships within the organization, and was also asked by the activists to make organizational diagrams of such relationships and to compose regulations which incorporated the activists' aspirations for how the organization should develop (Gatt and Ingold, 2013, pp. 150–151). Ingold and Gatt suggest that Gatt was not only learning how to practice anthropology and do fieldwork, but she was also contributing with her own experiences and skills to the ongoing, unfolding trajectories of the activists she worked with (Gatt and Ingold, 2013, p. 154). Gatt's engagement with the activists in Brazil resemble much of my engagement during fieldwork: not only did I have to learn how to practice anthropology myself, but I also contributed with skills and questions to the digitization processes I studied.

This brings us to the ever-returning discussion of anthropology carried out 'of', 'for' or 'with' the field in question, particularly within business and organizational anthropology (Baba, 2009; Fisher, 2017; Peluso, 2017; Ilkjær and Madsen, 2020). For Ingold and Gatt, the trouble with the 'anthropology of' conceptualization is that it turns practices into static objects of analysis (Gatt and Ingold, 2013, p. 140). Therefore, Ingold and Gatt propose an anthropology 'by means of' to highlight inherent experimentation and improvisation during fieldwork employed to enrich the lives it seeks to understand (Gatt and Ingold, 2013, p. 141). For them, the notion of 'by means of' is aptly expressed in design processes, which describes how people respond in innovative and creative ways to the ever-changing circumstances of our lives (Gatt and Ingold, 2013, pp. 144–145). In my case, digitization characterizes one such design process in which the employees at DBI envision future needs and build digital solutions in response to

changing circumstances of the AEC industry. But such design process reaches beyond the artifacts made, and may – as I argue with Marcus (Marcus and Okely, 2007) in the appendix article – also include anthropological practice itself, where the individual and collective are constantly interacting with each other, whereby continuous form-giving (i.e. design) of the fieldwork and collaboration takes place (Karsten, 2019, p. 122). Ultimately, anthropology-by-means-of-design is inherently transdisciplinary, because it challenges project members to think beyond disciplinary boundaries and focus on the big picture and on how other disciplinary perspectives can contribute and add value (Miller, 2017, p. 108). With Marcus, we might say that such transdisciplinary anthropology-by-means-of-design unfolds in para-sites, as argued previously.

In their argument for an anthropology-by-means-of-design, Ingold and Gatt employ the concept of *'correspondence'*. Correspondence refers to exchanges between people, but in a particular way of joining along in a companionship with people rather than more exclusive and de-temporalizing interactions, which may cut across the paths and movements one actually seeks to understand (Gatt and Ingold, 2013, p. 143). Classic anthropology carried out by means of ethnography denotes retrospective description, whereas anthropology-by-means-of-design is prospective and transformational (Gatt and Ingold, 2013, pp. 144, 147–148). Thus, by means of correspondence fieldwork becomes a deliberate and experimental learning process where the researcher learns to see, hear and feel things the way that her counterparts do (Gatt and Ingold, 2013, pp. 147–148). Finally, Ingold and Gatt argues that, *"what is produced during fieldwork, in the anthropological task of correspondence by means of design, is of a value equal to, if not greater than, what is produced after fieldwork in the documentary form of written ethnography"* (Gatt and Ingold, 2013, p. 148 emphasis in original). In short, correspondence leaves room for deliberate design of things, ideas and processes and experimental engagements with counterparts in the anthropological fieldwork. The article I wrote with colleagues, the seminars and events which I helped execute, the lessons I gave on ethnography to programmers, the dialogues I had with colleagues, and the advice I gave (based on my fieldwork insights) on how to

go about digitization are all ethnographic moments of anthropological importance on a par with written texts. In this respect, my endeavors to *'pass the tests'* in organizational fieldwork (article one), my fieldwork among plumbers targeting Helo's service designs (appendix article), and the collaborative work of carving holistic fire safety assessments (article two) all speak of correspondence with my colleagues and the designing of possible futures.

6.3.3. Reconsidering Rapport

Collaboration and correspondence necessarily speak of something different than *'rapport'*, which is the more classical way of describing anthropologists' relations with informants (Marcus, 2012, p. 435). Indeed, Marcus is not a big fan of how rapport has been used and continues to be used in (particularly American) anthropology as a shorthand for all the messy dimensions of ethnographic fieldwork (Marcus, 2001, p. 520). Particularly, he is bothered by how the notion – with its distanced, positivist focus and underscoring of formality in procedures – falls short of explaining and accommodating current research projects in anthropology, and he intends to leave the notion behind (Marcus, 2001, pp. 519–520). He argues: *"the emphasis on "being accepted," being liked in the pursuit of one's own purposes, is also culturally a very American way of thinking about attaining a steady state of friendship in instrumentally driven relationships (such as fieldwork) through the attainment of "trust" in the most superficial, one-sided sense"* (Marcus, 2001, p. 520). Upon his unravelling of 'rapport', Marcus turns to 'collaboration' and observes that despite powerful provocations in the anthropological community, 'collaboration' failed to fully replace rapport (Marcus, 2001, p. 521). He argues that the changing circumstances of research projects, fieldwork and collaborations demand an updated conceptualization of anthropological engagements in settings, where anthropologists and counterparts share similar lives, worlds and educational background etc. (Marcus, 2001, pp. 521–523).

I find much comfort in Marcus' critique of the notion of 'rapport' and his call for reconsideration of method and fieldwork ideals. Before I started writing up and was busy with fieldwork, I did not know about 'correspondence', but only about 'rapport' and 'collaboration'. The appendix article bears witness to that, as I use the concept of 'rapport' in it. The article reports from a study I did immediately before this doctoral fieldwork, and I wrote it during the first months of my PhD research. In retrospect, my use of 'rapport' (including my frustration with the notion!) seems fair, since 'rapport' continues to be used to describe how to engage with and relate to informants during ethnographic fieldwork (see e.g. McCabe, 2016; Hjorth *et al.*, 2017). In the early stages of the PhD, much of what I was doing or the way I engaged in fieldwork seemed to be wrong in many respects. I now know, that 'rapport' is not what I achieved during fieldwork at DBI or with Helo – rather, it was collaboration by means of correspondence.

'Collaboration' implies joint engagement and production entangled in shared and negotiated purposes and outcomes, whereas 'rapport' signals an instrumental one-way engagement with a pre-designed purpose for the sole benefit of the anthropologist's inquiry (Lassiter, 2005, p. 71). In the Helo case (appendix article) and in the maritime case (article two), I entered fields where there was a pre-defined purpose and an instrumental engagement on the agenda: an anthropologist visits 'the real life out there', asks questions, and brings back information that a corporation may use for the benefit of advancing their business. In these ways, these projects spoke of classic rapport relationship. But something else *also* happened during those fieldworks. In both cases, fieldwork was short and condensed to single days or even hours. There was no time for building (allegedly) trustful rapport over the course of lengthy fieldwork. Both anthropologist and informant wanted value for money and time spent in each other's company. As I write, there was *"no time for beating around the bush"* (Karsten, 2019, p. 112). Consequently, we engaged in a shared dialogic production of stories, details and information about what we deemed most important to "bring back" to tell Helo or DBI about. As the plumbers were fixing sinks and toilets and telling me

about their working lives, they often ended their stories with stressing that I must tell this or that to Helo. We did not co-produce written ethnographic text, but co-produced 'reality-checks' of the plumbers' working lives, which I described and visualized in a Power Point presentation that I presented to Helo. Such ethnographic 'reality checks' expressed a kind of correspondence that I could facilitate across sites and organizations. These 'reality checks' where co-produced between me and the plumbers, but were also shaped by colleagues at my workplace as well as managers as Helo, who challenged my analyses and added their own interpretations to the 'reality checks'. Thus, I also think of them as kinds of para-sites because they enable a demonstration of how things are 'out there' beyond the organization, and transgress boundaries between corporation and client/user which helps challenge established conventions and ideas at DBI or Helo.

6.3.4. Beyond Rapport and Correpondence: Complicit Positions

In relation to my fieldwork, Ingold and Gatt's concept of 'correspondence' defends the production of products as equally valid ethnographic testimonies of anthropological engagement during fieldwork (Gatt and Ingold, 2013, p. 148). Indeed, 'correspondence' offers a possibility for me to consider my collaboration on products, procedures and services designed for the benefit of DBI or Helo and its clients as equally valid parts of my research and anthropological practice to the post-fieldwork written ethnographic texts. That said, something is amiss and missing. Ingold and Gatt's notion of 'correspondence' leaves one with the impression that fieldwork by-means-of-design is a relatively neat process marked by creativity, and where the mutual engagements are based on respectful dialogue, companionship, and equity. Notions of power, confusions, challenges, politics, or personal agendas are seemingly absent from Ingold and Gatt's work. Thus, their conceptualization does not reflect the kind of organizational fieldwork I did (see article one), let alone much of the transdisciplinary collaborations and engagements that I partook in with intellectual peers and counterparts (see article

two). As Ilkjær and Madsen argue as they reflect upon collaboration in a Danish technology start-up company, transdisciplinary collaboration and teamwork is not a neat process, but characterized by recurrent confusions and clashes between different disciplinary notions, practices and ways of doing things (Ilkjær and Madsen, 2020, p. 178). They suggest that while clashes and confusion are curiously unexpected during such collaboration, these clashes can lead to changed perspectives and co-produced moments which may enter the company as productive insights (Ilkjær and Madsen, 2020, p. 178). Indeed, the premise for collaboration and fieldwork at DBI are *'quid pro quo'* for all involved – it was both parasitic *and* functioning at times as a para-site, as Marcus would have it (Marcus, 2000). This brings me back to Marcus once again.

In his effort to device a more adequate conceptualization of fieldwork methods and ideals that fits current fieldwork projects and research setup, Marcus employs the concept of 'complicity' (Marcus, 1997, pp. 96–97). He does so to account for an existential 'doubleness' for both anthropologist and counterpart, which stems from a shared sense of being in a place where big transformations are unfolding. These transformations are tied to events happening simultaneously elsewhere. Yet neither anthropologist nor her counterpart are sure about or have a grand overview of how these transformations are connected. One explanation does not have more authority than the other, and each individual must account for the changes and their connections in relation to her/his own narrative, circumstances and everyday life. Both the anthropologist and her counterparts are confronted with the same challenge of understanding these changes and seeking explanations (Marcus, 1997, pp. 96–97). In this regard, recurrent discussions about being either 'inside' or 'outside' – which I have myself engaged in previously in this chapter, and in article one particularly – appear as irrelevant, since anthropologists in Marcus' opinion always are marginal and *"ever-present markers of 'outsideness'"* among their counterparts (Marcus, 1997, p. 97). Indeed, despite the fact that I believe I succeeded in 'passing the tests' during fieldwork (see

article one), I was repeatedly reminded of the 'outsideness' I evoked through my colleagues' references to my position as researcher, as an anthropologist, and as someone hired specifically to study a phenomenon which was itself strangely 'elsewhere' yet always very present. Carrying out multi-sited fieldwork and tracing digitization across sites, I was always a marker of 'outsideness' (Marcus, 1997, p. 97). Yet at the same time, I am trained in a particular way of conducting and describing fieldwork, which ushered me to get 'inside' and establish trust, be accepted, and perhaps even build friendships (Marcus, 2001, p. 520). Indeed, article one discuss the trial and tribulations of getting access and acceptance in organizational fieldwork. But perhaps these efforts and my feelings of schizophrenia, which I described earlier, were not so much questions of access as they were matters of complicity during fieldwork.

Given that 'rapport' – and I would add 'correspondence' to some extent – is incapable of accounting for the challenges and predicaments in contemporary fieldwork, anthropologists should also move beyond investigations of 'local knowledge' (whatever that may be in a globalized, interconnected, networked world?) (Marcus, 1997, p. 97). Instead, 'complicity' begs the following. In changed, new fieldwork setups such as the one I describe in this thesis, anthropologists should attend to: *"the forms of anxiety that are generated by the awareness of being affected by what is elsewhere without knowing what the particular connections to that elsewhere might be"* (Marcus, 1997, p. 97). Marcus contends that only when outsiders (such as anthropologists) begin to relate to and engage with counterparts, who are also concerned with 'outsideness', can issues of change, anxiety, and concern come to the fore and be given full attention during fieldwork. As a result, fieldwork is pushed into the challenges and promises of multi-sited spaces, where the anthropologist as a marker of 'outsideness' moves across different sites that are powerfully embedded in field (Marcus, 1997, p. 98).

As I write these lines, I realize that it is not surprisingly then, that I have found the notion of 'concern' so productive for investigating different ways to relate to and engage with digitization (see article three). I suggest that the anxiety which Marcus

describes translates to the pressing concern at DBI about how to engage with digitization as 'outsideness', what impact it will have on their profession, fire safety and the business. Here, I see digitization as the 'elsewhere' that connects in ways that neither DBI nor myself were/are sure of or certain about. Digitization is emblematic of big transformations unfolding both in the immediate vicinity of the FSPs, at DBI, in the AEC industry, in Denmark and globally. What happens 'elsewhere' was always related to what happened in our daily interactions. Yet, none of us had the broad overview, and my analyses and explanations might be just as valid as those of my counterparts. Thus, we shared an interest in understanding and grappling with digitization. Indeed, as Marcus notes, 'complicity' signals an affinity between fieldworker and counterpart, which rests on: *"their mutual curiosity and anxiety about their relationship to a 'third' […] elsewhere that affect their interactions and make them complicit (in relation to the influence of that "third") in creating the bond that makes their fieldwork relationship effective."* (Marcus, 1997, p. 100). Thus, complicity denotes a sense of shared fascination and complex partnership or involvement through the relationships to a 'third' elsewhere, which the anthropologist evokes through her multisited research (Marcus, 1997, p. 100). It seems to me that digitization represents that third 'elsewhere', which my colleagues and I investigated, queried, discussed and produced. It was, and is, a contested and complex 'elsewhere', which continuously engages us in complicit relationships.

With complicity as a guiding methodological framework for practicing anthropology in contemporary organizational settings such as DBI, I find it possible to wrestle with the deep-seated notions of involved yet distanced participant observations as the hallmark of anthropological studies (Luthans *et al.*, 2013). I suggest that conceptualizing organizational anthropology as a kind of engaged, complicit collaboration sets fieldwork free from compulsory distinctions between 'insider' and 'outsider', which seems fundamentally irrelevant in settings where the anthropologist is also employed by the organization she studies. Curiously, notions about complicity are strangely absent from discussions about positionality and fieldwork relations in organizational and

business anthropology; only now are such discussions starting to emerge (Sedgwick, 2017). This thesis represents an effort to engage with such discussions and consider how we do anthropology in, with and among organizations, where research interests coincide with corporate interests, and where anthropologists as well as counterparts learn from each other along the way in correspondence through collaborative engagements.

FIGURE 14. DIGITAL TOOL. PHOTO BY DBI

CHAPTER SEVEN.

THE (NOT SO) STRAIGHTFORWARD DIGITIZATION

This chapter address the challenges of digitization at DBI, and precedes articles three and four. Together, the chapter and two articles investigate how digitization organizes fire safety knowledge and expertise, and how the organizing of fire safety expertise at DBI impacts digitization, and consider which challenges these dynamics bring about. In article three, I argue that digitization intervenes with the FSPs' professional practice and dislocates their dialogue with clients and thus their ability to construct and carry out contextual risk assessments. Such dislocation causes great concern among the FSPs. In article four, I show that DBI's way of organizing expertise and constructing

contexts profoundly shape digitization's impact in the organization. Thus, organizational workings and ideals entwine with digitization's capacity to reshuffle and question DBI's expertise. The articles suggest that the challenges of digitization are not *just* a matter of dislocation, transformation and concern, but *also* about how expertise is organized and restricted, and how this affects the impact of digitization. In effect, organizational digitization results in an externalizing of fire safety assessments and expertise that have previously been kept within DBI. Such transformation adds yet another layer of challenges to the already existing hurdles of digitization, while it also sets up demands for new kinds of expertise that follow as part of such effort.

To be clear, DBI clearly stated in original, early project descriptions that the intention was *not* to digitize decisions requiring communication, dialogue and negotiation between the different actors during a construction process. Rather, *"digitalisering"* should target decisions and knowledge relying solely on the FSPs knowledge. However, I show in article three that such seemingly agreed-upon knowledge and logical decision processes do not unfold in a vacuum, but are deeply entwined in social, professional, and collegial relations. Fire safety is a matter of balancing *mētis* and *techne* in dialogue. Such balancing and practice is expressed through professional expertise, and not just knowledge. Thus, DBI may not seek to digitize decisions requiring communication, negotiation or dialogue – i.e. expertise – between different actors, but I argue in article four that they try to do exactly that and are challenged by it.

7.1. Concern As Analytical Entry Point

Understanding why digitization is tricky starts by considering how digitization organizes fire safety expertise, and the FSPs' concern about such transformation. The concepts of 'concern' and 'dialogue' guide my focus in article three, where I investigate the darker envisioning of digitization among FSPs. Because the article features in a special issue on the darker implications of digitalization in organizations, it may be less clear to the reader that concern was expressed in a multitude of ways at DBI. I

find that such differences speak of professionals trying to decipher how to best engage with digitization due to the ambiguities and uncertainties that digitization presents them with. To illustrate some (!) of these differences, I want to take the reader to a communal breakfast a Friday morning in September 2018.

> Allan passed the basket with homemade buns around the table. Helena sat opposite me and smiled wryly while asking me eagerly how yesterday's technology promotion went, whether it was good, and if I got to try it out. She referred to an afternoon session yesterday, which she had helped organize together few people from the research and development department. They had invited anyone interested at DBI for a try-out session of VR-headsets. The setup focused on emergencies, where fires had to be put out. Some ten colleagues (all engaged in digitization projects) and I took turns using a dummy fire extinguisher to put out fires in virtual worlds of shipwrecks, storage buildings, and skyscraper hotels. Loudspeakers accompanied the virtual worlds with crackling fire sounds, footsteps, heavy breathing, splintering glass and real time noises from the fire extinguisher. I smiled and told Helena that it was nice, and added that I had never tried to put out a fire until yesterday. We laugh. One of the FSPs sitting next to me had joined the session shortly, but only as a spectator. He had declined to try the VR-headset. He now commented proudly that not everybody tried it out, because they had already done the real thing. Another of the FSPs quietly and with a slight disappointment in her voice asked me how it had been. She had also watched the promotion, but like the other FSPs she had refused the offer to try the virtual fire extinguishing. Allan works with digital programs and products, and he had also joined the session yesterday. He joined the discussion, arguing that it was a fine experience, which could easily be integrated into training sessions on how to put out fires, for in-

stance in maritime settings or as part of DBI's own training. While buttering the piece of bread on his plate, he claimed: *"This is the future. In ten years from now, that will be the standard. Perhaps even before?"* Helena nodded and agreed: *"It will be upon us much sooner. The development is so rapid! Imagine the possibilities! New ways of collaborating, right? If we can suddenly be virtually in the same building despite distances, and discuss the cladding or equipment right in front of us…perhaps even touch it, discuss it and even correct it, right there? So many mistakes could be avoided!"* Other nod while they chew their bread and pour orange juice. The talk continues to circle around how VR-technology has improved significantly over the past years. Helena turns towards Erik, another senior FSP a few seats from her, who have been quiet in the discussion until now. She smiles at him and predicts that these technologies will enter the fire safety industry any time. Erik shrugs his shoulders, puts a piece of cheese on his bread while exhaling *"Well, now I'll be the grumpy old man again"*. He acknowledges that he does see the point of VR in niches like offshore or in other industrial environments, but he maintains that from a fire safety perspective it does not make sense yet. He believes that only niches will benefit from VR, and that it is very likely to be very expensive. Helena is silent, and seems to observe her colleagues' reactions to these arguments, as if to decipher how we react to them. She puts thin slices of chocolate [a Danish spread, red.] on her breads while arguing back that, *"the gaming industry is pushing on, and this will make things go fast – really fast!"* Erik seems unconvinced: *"Well, what about professionalism and the professional assessment? The professional assessment has to be integrated! It isn't of any good with first person shooter settings in the style of Counter Strike with tip-top graphics if there is not integration of lifelike, well-documented and well-simulated fire safety knowledge. Fire safety knowledge is the essence, and it's going to take several years before you can integrate that successfully and reasonably cheap into a game"*.

In the excerpt, Allan, Helena and Erik are all concerned about digitization and its impact on DBI and fire safety, but in markedly different ways. Allan is concerned with how DBI can best engage with the promising possibilities that VR can offer in terms of emergency training. Helena is concerned with how DBI can keep up with the development and how her colleagues can be persuaded to see the genius of digitization. And Erik is deeply concerned about what will happen with fire safety assessments, professional knowledge, and validity once it is digitized. You will get to know him a bit more in article four.

As I argue in article three, an analytical focus on 'concern' highlights how the FSPs genuinely think differently about digitization, and it helps us explore the perceived pros and cons of digitizing fire safety at DBI. For a growing number of employees like Allan and Helena, the beneficial and profitable dimensions of digitization – i.e. the *value* that it potentially generates – take center stage. When asking Helena and Allan who they think demands such increased digitization, they replied without much hesitation that it is *"the clients"*, *"society",* or *"the future"*. The internal communication at DBI supports this idea in newsletters and emails, and gives notice that DBI must be ready, adaptable and responsive to such external, outspoken demands. Ideas and acronyms such as 'IoT', 'AI, 'Big Data', 'BIM', 'VR', and 'AR' are disseminated vastly and reappear in emails, booklets, newsletters or on internal communication platforms, and through seminars and events across the industry. For instance, newsletter emails would advertise webinars or after-work meetings where researchers, consultants and CEOs from organizations undergoing digitization and digital transformations would share stories, experiences and provide advice for the audience on how to go about digitization. One email declared: *"At our event*, you will learn about *the new demands for successful digital engagement, how automation is a new frontier for digital operations, how organizations are struggling to become digital businesses, the competencies and training required to succeed, and how to build a bright future in a world of constant disruptions."* A price for such events was stated at the end of the email, along with a

kind reminder: *"Remember that you can always reach out to us for help and guidance on concrete actions to take to kick-start digitization at your company and release its potentials."* In the midst of these promises, hopes and aspirations of digitization were also the more worried and bleak concerns about digitization and its implications. That is what article three focuses on.

7.2. Digitization Both Decreases and Increases Risks of Fire

To the FSPs at DBI, digitization appears both as a viable solution and an immediate threat to fire safety. On the one hand, the FSPs believe that digitization can mitigate risks by imposing standards, systematism and regulation behavior, thus disciplining and educating humans who know very little about fire safety and therefore pose a danger or are at risk. These abilities of digitization may help them advance fire safety markedly. Since fire safety knowledge and expertise is regulated by the building regulations, national as well as international standards, it makes good sense for my colleagues to try to digitize such 'objective' information for the benefit of clients and collaborators, who struggle with navigating through the heavily regulated landscape (see figure 2 in article three). As Boholm argues, based on her studies of railway planning in Sweden, communication errors between experts and non-experts are assumed to be remedied by effective risk communication through skillfully designed pedagogical presentation of facts (Boholm, 2015, pp. 156–157). It is such skillfully designed presentation of fire safety facts and risks that digitization is hoped to help facilitate. This is based on the assumption that risks may be defined by quantifiable measures, scientific standards, and statistical calculations (Boholm, 2015, pp. 91–92). Indeed, among Swedish government officials working with risk communication, it is believed that top down knowledge dissemination of scientific knowledge and expert knowledge to the non-expert public is key in mitigating risk (Boholm, 2019).

Boholm's points are interesting because they help to elucidate that because of digitization's capacity to standardize and move knowledge across contexts from experts to non-experts, the FSPs are also simultaneously deeply concerned that digitization may eliminate crucial assessments and professional dialogue from fire safety practices. While the FSPs do talk of objectivity and rightful solutions in fire safety, they *also* speak of subjective risk assessment, negotiable rules, ambiguity and use of professional dialogue with clients to draft a good fire safety plan. The trouble is that all of these qualities are not easily digitized, which makes many of the FSPs – including Erik – concerned about the implications of such digitization. For the FSPs, we may say that the trouble is not the issue of discrepancies between stated objectivity and practiced particularly in fire safety. Following Suchman (Suchman, 1995, p. 61), the trouble is when fire safety procedures are drafted as a distance from where they are carried out, or when they are decontextualized from one place and subsequently recontextualized into another to use Almklov's phrasing (Almklov, 2008).

Think back to Scott's distinction between *mētis* and *techne* for a moment. According to Scott, *techne* was originally designed to master chance (Scott, 1998, p. 321). However, chance was: *"eventually, thanks to statistics and probability theory, transformed into a singular fact that might enter the formulas of techne. Risk, providing that it could be assigned a known probability, became a fact like any other, whereas uncertainty (where the underlying probabilities are not known) still lay outside techne's reach"* (Scott, 1998, p. 321). Similarly, Boholm has shown in her studies that despite prevalent notions on standardization, regulations and objectivity, risk assessments among professionals in the construction industry rest primarily on informal, pragmatic and intuitive use of experience and inference of subjective probabilities (Boholm, 2015, p. 92). She has also shown that dialogue is used as a tool to implement policy goals on risks among peers, elite stakeholders and collaborators, but not the general public (Boholm, 2019). The same tendency seems to be the case with risk assessments and fire safety among the FSPs at DBI. As noted, DBI engages actively in both cross-

industrial relations and governmental where they seek to influence the use of guidelines and draft regulations on safety in close dialogue with their collaborators. Similarly, their professional dialogue extends to collaborators in construction processes. But at some unidentifiable point, the dialogue on risk parameters changes into one-way communication to ensure better understanding of the risks and adherence to guidelines. Risk turns into facts for the sake of safety. This change rests upon particular impression of the other person's expertise and experience, and communication is adjusted accordingly.

An example of these subtle changes and risk communication among the FSPs is the computational simulations of smoke development in fires (explained in chapter 4 and article three), which are referred to as 'CFD models', i.e. Computational Fluid Dynamics. In daily talk among the FSPs, the abbreviation *also* referred to *"Colours for Dummies"*, which are visually simplified, neat and pedagogical presentations of highly complex calculations and data, that are presented to clients with no expertise in fire safety. While showing me some CFD-models on his computer screen that he was working with, Hans commented that the term CFD also refers to *"Colours for Directors"* because, *"it all comes down to who pays for the colours, and whether the clients wishes to have only graphs or colours and shapes"*. He smiled vaguely. Judging from his expression, he looked like one who had found himself in situations with directors asking for these models quite a few times. Hans showed me another CDF-model and explained that most of the time, the clients ask specifically for presentation of fire scenarios via the colours and shapes, even though the CFD-models in his opinion did not depict fires any better or different than the graphs or calculations do. In Hans' opinion, the clients do not understand these graphs and calculations, and the visual colours do not represent the truth because they are manipulable. That is why the FSPs refer to them as *"colours for dummies"*. This subtle yet distinct adjustment in risk communication - based on the FSPs' impressions of the client and dialogue with them – and switch in persuasion style aided by tools such as the CFD models may not be possible the same way if digitized.

Thus, when it comes to digitization, it seems to the FSP that it may both mitigate existing risks but also introduce new or increase existing risks. These risks – of misinterpretation of digital outputs, of misunderstanding numbers, or of lacking competencies in constructing contexts digitally – did not replace existing risks of fire hazards, but were added on top of them, making the total impression of digitization potentially much riskier than current non-digitized cases.

7.3. The Field of Tension between Expertise and Imaginaries

I find that the FSPs' concern about dislocated dialogue and concern about risks or implications of digitization point to the need for further exploration of the organizational backdrop for such digitizing. In other words, it is interesting to consider how digitization seems to work as a magnifying glass for ways of organizing in organizations. In many ways, digitization is deeply dependent on ways of organizing. By learning more about digitization, we thus also learn more about organizing – and in that process, we realize that doing digitization in an organization concerns so much more than how software programmers go about the task. Indeed, digitization is shaped by processes of scripting (Akrich, 1992) and choices in design (Schüll, 2012) among software programmers or designers. And we remember Bijker and Law's quote in chapter one, in which they state that technologies *"embody social, political, psychological, economic, and professional commitments, skills, prejudices, possibilities, and constraints"* (Bijker and Law, 1992, p. 7).

But as we investigate digitization from an organizational perspective, all these aspects come together in organizational workings and are expressed in ways of organizing at DBI. Therefore, if we wish to learn more about digitization, we should start by acknowledging that development of digital tools and the digitization of professional expertise in an organization hinges closely on *what* kind of expertise an organization wields, and importantly *how* it organizes such expertise. As I argue in article four, DBI

may be considered as part of a 'knowledge-based economy'. In such settings, it is believed that knowledge work and professionals' knowledge can be captured and owned in organizations as assets by means of digital technologies, thus making knowledge movable, marketable and a key component in economic, social and political capital (see also Adelstein, 2007; Schou and Hjelholt, 2018, p. 47). Contrary to such notions, I show in article four that it may be mistaken to focus on professionals' *knowledge* and more representative to speak of *expertise*, which denotes a close-knit interweavement of *mētis* and *techne* in the FSPs' professional practices. I argue that expertise is in fact what DBI tries to digitize, and that this is part of the reason why digitization is a challenge.

Upon such arguments and investigations, I arrive at the question of whether digitizing fire safety is, after all, an endeavor that is bound to fail? In many Danish industries beyond the AEC industry, we can observe an intensified interest in digitization and widespread use of ICTs, despite repeated experiences of failure (Bernsen, 2019). In his research on the Danish educational system's use of ICTs, social scientist Jesper Balslev describes how the promised positive yet almost incomprehensible impact of digital technologies and digitization on Danish society, welfare and quality of life is compared to the revolutionary impacts of the printing press, steam power and electricity (Balslev, 2020, p. 10). He argues that in the midst of this, there is a remaining, fundamental problem: the effect of ICTs on students' learning attainment is questionable (Balslev, 2020, p. 11). And yet, political institutions – not just in Denmark, but globally – remain convinced that education can be reformed and optimized for the better through the use and central placement of digital technologies in an increasing number of activities (Balslev, 2020, p. 1). Based on his fieldwork at schools in New York, anthropologist Christo Sims also focuses on the educational system's intense interest in ICTs and particularly 'disruptive technologies' (Sims, 2017). He aptly asks: *"How is it that this [technological] idealism, while temporarily tarnished by recurring shortcomings and failures, does not take long to renew? Why does techno-philanthropism seem immune to the lessons of history? How, in other words, do we reconcile*

recurring "failure" with persistence?" (Sims, 2017, p. 4). In his analyses, Sims shows how frustrations among his interlocutors with the status quo at a school and their yearnings for change are repeatedly transformed into seemingly cutting-edge technological and commonsensical interventions, which regrettably often fall short of the initial plans and aspirations, but often also help sustain and extend the status quo and its problems (Sims, 2017, p. 4).

Likewise, I was also struck by the persistent enthusiastic engagement with *"digitalisering"* and digitization at DBI and in the AEC industry paired with recurrent set-backs and challenges in succeeding. As we have learned in the previous chapters and will understand even more in the following two articles, *"digitalisering"* is no joke; it brings out heartfelt desires, powerful imaginaries and intense convictions. The various imaginaries and promises of *"digitalisering"* are remarkably powerful and durable *despite* repeated experiences of failure and set-backs. This form the basis for a profoundly contested field of tension between organizations like DBI trying to digitize professional knowledge (read: expertise) within an imaginary, where the destination or purpose of such digitization is always beyond reach in a seemingly phantasmal way. Here, digitizing expertise appears as an endeavour somehow bound to fail – or, at least bound to face several challenges.

I consider the discourses and ideas described in chapter four on digitization, as well as those aspirations sketched in articles three and four, as examples of 'imaginaries' of *"digitalisering"*. Ethnologist and artist Robert Willim works with how imaginaries and practices unfold in digital cultures, emerging technologies and different ways of organizing. Willim writes that imaginaries are used to make sense for people by situating their projects and lives in certain environments and by instilling a moral order, which guides practices and ways of organizing. Imaginaries are not about escapism or beliefs, but rather coupled with intentions, actions, expressions and events in the world (Willim, 2017, pp. 54–55). Imaginaries are open-ended, indeterminate and impossible to complete – they mediate between an ungraspable future and everyday life, and create unity, congruity and homogeneity (Willim, 2017, pp. 55–57). In his

work on imaginaries, Willim draws on anthropologist Vincent Crapanzano, who argues that imaginaries can be seen as frontiers (unlike borders), which may never be transgressed or reached (Crapanzano, 2004, p. 14). Crapanzano contends that what lies beyond the horizons or frontiers are *"the possibilities it offers us, the licit and illicit desires it triggers, the plays of power it suggests, the dread in can cause – the uncertainty, the sense of contingency, of chance – the exaltation, the thrill of the unknown it can provoke"* (Crapanzano, 2004, p. 14). In this way, imaginaries are also part of infrastructures or infrastructure building, since both are concerned with building and reaching future promises and potentials (Harvey and Knox 2012; Reeves, 2017, p. 717). Following Crapanzano, the question that remains is whether imaginaries will be reached or redeemed. According to him, this is not a possibility, because imaginaries work as frontiers and not borders (Crapanzano, 2004, p. 14). I find this line of thought very intriguing given that digitization indeed seems to be forever out of reach, always telling of unfulfilled potentials, chance and possibilities. In passing, I want to briefly note that Crapanzano's emphasis on feelings of dread, uncertainty and contingency combined with exaltation, thrill and desire as part of how people relate to 'imaginaries' relates to a methodological point I made in chapter six (see section 6.3.4.) on Marcus' concept of 'complicity' (Marcus, 1997). With Crapanzano, *"digitalisering"* and digitization appears as imaginaries that both create fascination and cause anxiety. With Marcus, we learned that 'complicity' describes relationships between anthropologists and counterparts, in which both seek to understand a 'third elsewhere' that both fascinates and concerns them (Marcus, 1997, pp. 97–100). Combining Crapanzano and Marcus, we may begin to think of digitization and the imaginaries it speaks of as that third space or 'third elsewhere', which my colleagues and I investigated, discussed and co-produced.

Returning to the current discussion, we may also consider imaginaries as particularly socio-technical, which linguist Sheila Jasanoff has famously done (Jasanoff, 2015). She considers sociotechnical imaginaries as: *"collectively held, institutionally stabilized, and publicly performed visions of social life and social order attainable*

through, and supportive of, advances in science and technology" (Jasanoff, 2015, p. 4). Willim also draws on Jasanoff in his work. For Willim, the normative and aspirational qualities of sociotechnical imaginaries makes them comparable with strategies or visions stated by organizations and corporations in that they concern aspirations, normativity, collective sharedness, and some kind of organizational stability (Willim, 2017, p. 55). I find Willim and Jasanoff's observations intriguing and very fitting in describing the AEC industry's preoccupation with *"digitialisering"* which I have traced particularly in chapter four. Indeed, I agree with Willim that imaginaries denote intentions, actions and moral imperatives about how organizations and professionals perceive *"digitalisering"*. But I also disagree and conclude otherwise in this thesis, as articles three and four illustrate. Societal imaginaries or organizational strategies on *"digitalisering"* based on socio-technical imaginaries are far from collectively held among the FSPs or stable in the everyday practicing and organizing of digitization at DBI. Rather, they are contested, negotiated and a source of concern at DBI. In effect, I suggest that the challenge of digitization for DBI as an organization lies in how to negotiate and navigate the field of tension or juxtaposition between existing ways of organizing fire safety expertise *and* how digitization organizes and promises desirable futures of better, digitized fire safety. Thus, the challenges lies in balancing ways of digitizing with ways of organizing.

ARTICLE ONE.

TESTING RELEVANCE AND APPLICABILITY:

REFLECTIONS ON ORGANIZATIONAL ANTHROPOLOGY [1]

ABSTRACT

Starting from the challenges and implications of doing organizational ethnography within the organization which the researcher is also employed by, this article reflects upon the idea of 'passing the test' in relation to such ethnographic endeavor. The article discusses how 'collaboration' on projects and in product development processes with colleagues/informants is a precondition for passing 'tests', which unfolded as subtle, verbalized demands made by colleagues/informants during fieldwork.

Longitudinal anthropological fieldwork was carried out as part of an industrial PhD project, which investigates digitization as organizational, professional and social practices in the Danish construction industry. The fieldwork lasted on/off from April

[1] Karsten, M. M. V. (2020) 'Testing Relevance and Applicability: Reflections on Organizational Anthropology', *Journal of Organizational Ethnography*, 9(2), pp. 159–172. doi: 10.1108/JOE-01-2019-0005.

2017 to December 2018. Various forms of participant observation and collaborative ethnographic methods were used during fieldwork.

The article investigates how these 'tests' focused on two key aspects: (1) the relevance of anthropology in a profit-oriented, technical corporate organization, and (2) the application of anthropological theories and ethnographic methodologies for the benefit of product development, usability studies and organizational change. It is argued that the tests were passed through collaborative engagements, where the author oscillated between positions as collegial insider and outside researcher for the dual benefit of both commercial interests and research interests.

The article suggest that daring to collaborate and co-create products (as something different than texts) during organizational fieldwork for the benefit of both corporate and ethnographic interests offers strong possibilities for keeping ethnography relevant and applicable, passing tests in organizational settings, and advancing ethnography's impact in the world.

1. INTRODUCTION

This article is about doing ethnography in, for and particularly *with* organizations for the dual benefit of generating both corporate, profit-oriented value and anthropological, research-oriented value. The collaborative *with*-aspect is a leitmotif in this article's argument on how to move beyond initial, formalized access during organizational fieldwork in order to gain trust, acceptance and credibility. I suggest that *'collaboration'* as a form of engagement offers a different and exciting - yet challenging – way to conduct organizational ethnography. Daring to co-create products in addition to knowledge during fieldwork for the benefit of *both* corporate and ethnographic interests – that is, working both as *"ethnographic researchers from deep within and as active participants in the engines of corporate and organizational life"* (Cefkin, 2010, p. 9, emphasis in original) – holds strong possibilities for keeping ethnographic disciplines relevant and applicable and advancing ethnography's impact in the world.

This article's argument and reflections have taken shape as part of my industrial PhD study in a *'knowledge intensive firm'* (Alvesson, 2011) in the Danish construction industry where I investigate organizational, social and professional aspects of digitization[2]. I have traced digitization ethnographically at the Danish Institute of Fire and Security Technology (known as DBI) and among its clients and collaborators in the industry on/off from April 2017 until December 2018. An industrial PhD in Denmark is a research format where a PhD student, a university and a private or public organization or corporation collaborate on specific research activities to develop innovative solutions (Innovationsfonden, 2019). In this manner, the research format is emblematic of a Triple Helix-constellation (Etzkowitz and Leydesdorff, 2000). Here, the trilateral alliance between state, university and industry collaborate to develop and test different (technological) possibilities, which holds promises of profitable innovations and futures (Etzkowitz and Leydesdorff, 2000, pp. 111–118). Initially, the industrial

[2] I use the term 'digitization' to highlight aspects of daily practice, i.e. "*the action of digitizing; the conversion of analogue data into digital form"* (Oxford English Dictionary, 2010b). In comparison, 'digitalization' refers to a more general, societal *"adoption or increase in use of digital or computer technology by an organization, industry, country, etc."* (Oxford English Dictionary, 2010a).

research format targeted engineering or medical companies seeking to develop a specific product that could benefit from research input from university graduates in related fields. Furthermore, it was a good way for graduates to try to convert academic knowledge into applicable tools or products with commercial benefits in the industries. Over the years, other academic fields within the social sciences and humanities started to engage with this format, adding other perspectives to the industrial research carried out. For example, when anthropologists engage in industrial PhD research (e.g. Lex, 2013), the objective of the research is often not a specific service or scientific issue, but rather the cultures and socialites of the organization or corporation engaged in such research. Thus, the task of the industrial, ethnographic researcher is not cracking the code of a medical condition or an algorithm, but assisting the organization in exploring and understanding it along with its practices, employees and beliefs as a whole. With this purpose, the industrial PhD resemble a kind of *'contract ethnography'*. As explained by Fayard, Van Maanen and Weeks, contract ethnography *"is sponsored by the organization being studied for the purpose – explicit or implicit – of helping the sponsoring managers make more informed decisions"* (Fayard and Van Maanen, 2015, pp. 46–47). Under such circumstances, the ethnographer is inevitably drawn into and becomes a part of the culture and organization which he/she is employed by to try and understand and depict (Fayard and Van Maanen, 2015). This balance or merge between being both an *'insider'* and *'outsider'* (Hepsø, 2013; Järventie-Thesleff *et al.*, 2016; Gosovic, 2018) has framed my entire research, fieldwork and employment.

In many organizational or corporate settings, ethnographers are expected to contribute actively and sprinkle *"ethnographic pixie dust"* over flawed products, processes or organizational practices (Anderson *et al.*, 2015). My fieldwork was no exception. Here, anthropological *"pixie dust"* was in several ways expected to make an impact during the daily (field)work at DBI and spur organizational changes through my dual function as employee and ethnographer. I this article, I argue that such expectations and demands may be considered as 'tests' to be passed and worked through during fieldwork (see also Lindberg and Eule, 2020). I follow Crapanzano who notes that *"a*

test is a way one's informant learns something about you [...] sometimes one is immediately aware of the test and at others only later, upon reflection" (Crapanzano, 2010, p. 65). In my case, it was only upon completion of fieldwork that I realized how my colleagues/informants'[3] demands and expectations of me could be thought of as tests.

The article's focus on *'collaboration'* as a way to respond to such tests during organizational fieldwork aligns with a broader anthropological debate and disciplinary development, which I find relevant to position this research within. I shall briefly turn to that discussion in the following.

1.1. DISCUSSING AND DOING RESEARCH 'WITH' ORGANIZATIONS

Anthropology is not only part of businesses nowadays to help decode and decipher organizational culture (Fayard, van Maanen and Weeks, 2016); it is increasingly becoming a business of its own (Madsbjerg and Rasmussen, 2014; Pedersen, 2018). Since the 1990s, anthropology has found its way into the field of design and user studies, e.g. at Xerox where ethnographic approaches were adopted, and in-house anthropologists and PhDs were hired by corporations working with product design such as Kodak, Motorola, and Hewlett Packard (Jordan 2013, 18–19). Parallel to this tendency, ethnographic records of organizations and businesses have significantly increased since the 1980s[4] (Kunda, 2006; Krause-Jensen, 2010a; Røyrvik, 2011; Vangkilde, 2012), perhaps not least due to the popularity of *'culture'* as a tool to use in the management of organizations and corporations (Wright, 1998; Garsten and Nyqvist, 2013a).

[3] I use the slash to indicate the close relation and recurring indistinguishability between my colleagues and informants, as they were often (if not always) both. For more perspectives on this matter in organizational anthropology, see Jordan (2013, pp. 69–70) and Garsten and Nyqvist (2013, pp. 15–17).

[4] The ethnographic interest in organizational studies arguably began with the Hawthorne Studies carried out by Elton Mayo and Lloyd Warner in the 1920's and 1930's in Chicago. These studies were the first of their kind to show informal social organization in a work setting and initiated the focus on human relations as a key component to understanding organizations (Jordan 2013, 10–11).

Parallel to these tendencies, anthropologist have continuously been referring to ethnography as either 'academic' or 'applied' when discussing the discipline's relationship with business (Fisher, 2017). Urban and Koh distinguish between research *in* organizations done by academic anthropologists and research *for* corporations done by practicing anthropologists (Urban and Koh, 2013, p. 140). Ilkjær and Madsen (2020) convincingly reflect upon this matter by arguing that doing industrial research as an anthropologist involves continuously switching between *in* and *of* in relation to the organization or corporation one is involved with. According to Moeran and Garsten, the discussions on fieldwork in anthropology[5] continues to circulate around this awkward relation between 'pure' (academic, red.) versus 'applied' anthropology and seemingly remains hesitant to go beyond such distinctions and investigate what productive insights might lie there (Moeran and Garsten, 2012). Moeran and Garsten point out that anthropologists who work *in* or *with* business organizations are often believed to be tainted by commercialism, because they are either paid by these organizations or because their research will be used to boost the organization's profits (Moeran and Garsten, 2012, pp. 8–9). In continuation of such discussions, I argue that doing ethnography *in/of* or *in/for* an organization seemingly amalgamate into a particular kind of collaborative '*with'*, when you are employed by the organization which you also study. The ambiguity in my position (both an ethnographer *and* employee) fostered particular circumstances for the *with*-relation unfolding during fieldwork. Therefore, I discus how *'collaboration'* may be pushed a bit further than Lassiter's classic explanation of *'collaborative ethnography*' (Lassiter, 2005b). In this article, I suggest that *'collaboration'* may work as a response to my colleagues/informants' demands, i.e. the tests, and as a way to prove the relevance and applicability of anthropology in corporate organizations for the dual benefit of both research *and* business.

[5] Other discussions on fieldwork in anthropology revolve around how long (or short) a fieldwork must be (e.g. Marcus and Okely 2007), and whether it should be done in one singular stretch or it can be done in a yo-yo-format where the ethnographer switches between being on and off fieldwork (e.g. Wulff 2002).

Since the early days of anthropology, understanding the context of the ethnographic setting has been a fundamental prerequisite for grasping the arguments, discussions and considerations following fieldwork (Malinowski, 1922). Indeed, the ways DBI perceive itself had essential impact on how I was able to do ethnography and pass the tests in the organization. Therefore, I shall now draw the contours of the ethnographic field.

2. ENCOUNTERING THE FIELD AND INTRODUCING THE ORGANIZATION

2.1. THE ETHNOGRAPHIC FIELD

On the outskirts of Copenhagen in one of the largest industrial zones in the Danish capital, grey skies melt with the large concrete masses of grey, industrial buildings. Here, heavy trucks, cargo vans and yellow busses race along the roads at the feet of the hallmark of the area: a combined heat and power station with tall, white chimneys rising majestically towards the skies. In this neighborhood, you will find DBI. The organization specializes in product testing, training and consultancy on fire safety in buildings and in security technologies. The headquarters of DBI is a white and grey square-like building with glass-façades covering staircases, which connect the upper and lower sections of the buildings. The DBI logo with the red cock and its weird-looking eye hangs above the entrance, strangely watching you and the other comers and goers as you enter the building. The red cock is a fire cock, and its symbolic meaning dates back to the Middle Ages where it would crow in case of fires. The eye refers to the all-seeing eye of the giant Argus in Greek mythology, who is said to have had one hundred eyes. Argus got the byname Panoptes, which translates roughly to 'all-seeing' in the meaning of being followed or watched by. The logo underscores the long history and self-image at DBI; indeed, on the front cover of a book about the organization published by DBI, it says that the organization has been *"protecting lives and assets"* for 100 years.

Next to the main entrance, four black flags with the logo sway in the wind next to an additional flagpole reserved for hoisting up the Danish flag on days of celebration, anniversaries or national flag-days. Behind the flags, a tall, dark fence encircles the ground. The fence only opens when you swipe a magnet across safety locks and press your personalized code. Without these magnets, you will not be able to move around inside the building either. Behind the fence, the main building is accompanied by two white chimneys and a handful of large, storage-like buildings. In these buildings, DBI hosts training sessions and tests how building materials, combustibles and other products catch fire and burn. From time to time during the day, you and your colleagues may look up from your computer screens in the offices nearby the testing facilities, sniff a few times, and share a comment with your neighbor about a fire somewhere while a strange, subtle smell of burned plastic or other indefinable materials spreads throughout the office halls. Apart from the headquarters, four other DBI-locations are spread out across the rest of Denmark and in Norway.

DBI's stated *raison d'être* is developing knowledge and offering consultancy, training and technologies to private and public companies, contractors, authorities and stakeholders – while also investing in activities which profit the competitiveness of small and medium-sized companies primarily in the construction industry. DBI is an independent, private, non-profit corporation approved by the Danish Ministry of Higher Education & Science as one of seven Research and Technology Organizations (RTO) in Denmark. The Danish RTOs are state-funded and engaged in promoting innovation in industries and society in general (GTS, 2019a). The RTOs see it as their core task to help shape the technological infrastructure in Denmark and Europe through consultancy, training and participating in research and development activities (ERATO, 2019). DBI tries to solve this task by seeking to transform in-house fire safety and security expertise into relevant products and applicable knowledge.

Since 2015, DBI has expanded its portfolio of digital services and products which are provided to clients to assist with management of safety procedures, alarm systems,

fire safety etc. One of the efforts to push new digital solutions for fire safety matters in the construction industry is the DIGI-project intended to make fire safety designs more accessible earlier in the design and construction process for fire safety non-experts, such as architects and building technicians. The project aims to digitize the Danish Building Regulations by transforming guidelines into digital handbooks, and by developing a plugin for a computer-based 3D-drawing program assisting in decision-making processes. The engagement with digitization in DBI is emblematic for a more general tendency across the entire construction industry both in Denmark and across Europe to strive for increasingly digitized, automated and artificial solutions and tools to optimize, improve and streamline the construction industry (e.g. Smith and Tardif, 2009; Roland Berger, 2016; Turk, 2016).

DBI believes that it has an important role to play in pushing *"new technological agendas"* such as digitization to society. Furthermore, the organization argues that it produces applicable knowledge as opposed to universities, whose work is regarded as purely academic, and often *"detached from reality"*. DBI's function as neither fully private nor entirely public has fostered a delicate balance where the corporation must do well, but must not accumulate an annual turnover above 3-5%. Any turnover exceeding these percentages must be reinvested in ever-new research and development activities, which today amounts to 20% of the total turnover. Thus, research and development activities constitute one fifth of DBI's activities, while the majority still focus on consultancy, training and other client-paid tasks. In subsection 4.1, I provide some examples on how my colleagues/informants practiced organizational balance between client-paid tasks and development. This aspect turned out to play a decisive factor for how I negotiated access and built relationships, and eventually for how I was able to respond to my colleagues/informants' tests of the relevance and applicability of anthropology at DBI.

2.2. CONCEPTUALIZING 'ORGANIZATION' AND 'CORPORATION'

As the reader may have noticed by now, I use the terms *'organization'* and *'corporation'* interchangeably. I do so to draw attention to both organizational *and* business-related aspects which influenced the fieldwork. When referring to *'organization'*, I follow Krause-Jensen, who did fieldwork in the Danish design corporation Bang & Olufsen. According to him, *'organizations'* are social formations which are defined by a goal-oriented, instrumental rationality, and whose purpose is to perform particular tasks and reach specific results. When viewed as a process, an *'organization'* describes a continuous process of trying to create order guided by strategic targets (Krause-Jensen, 2010b, p. 127). With this, I understand DBI as a social formation guided by goal-oriented rationalities. Very often (if not always), such rationalities are accompanied by focuses on turnovers, revenues, sales numbers, and invoices - all speaking to the idea of DBI as not only an organization, but also a corporation. *'Corporations'* are guarded by production goals, ownership structures, audit practices, reward systems, wage relations, and juridical obligations (Røyrvik, 2013, p. 73). As stated by Urban and Koh, *'corporations'* can be perceived as a kind of social entity constituted around the dominating goal of pursuing profit (Urban and Koh, 2013, p. 140). Furthermore, *'corporations'* are social groups which operate *"with their own myths, rituals, beliefs, norms, and practices"* (Urban and Koh, 2013, p. 141). Urban and Koh argue that *'corporations'* are very similar to many other small-scale or large-scale societies which anthropology has typically studied. What is particular about modern business-corporations (such as DBI) is their orientation to and overarching goal of making (financial) profit and value-creation (Urban and Koh, 2013, p. 141). I shall return to this aspect in section 4 and illustrate how such a focus on profit significantly framed the tests I had to respond to. However, before I turn to this, I shall elaborate a bit more on the methodology and data gathered during the fieldwork.

3. RESEARCH DESIGN AND FIELDWORK ENTRIES

3.1. METHODOLOGY AND DATA OVERVIEW

I engaged with my research topic (i.e. digitization) by tracing the linkages among colleagues, office and conference sites, ideas, money and managerial decisions by following the concept and practices (Marcus, 1995). Specifically, I did so by participating in and collaborating on four digitization projects at DBI including a few adjacent projects. The ethnographic data from the fieldwork includes fieldnotes made during participant observation (Spradley, 1980) during meetings and activities related to the projects I traced. However, participation and collaboration also took place during activities such as team building outings, department seminars, social activities, attending industrial conferences with colleagues or simply spending days at the office. Participant observation and collaboration on projects also extended to email correspondences on daily basis about projects, planning, small-talk, and access to intra-organizational, digital communication platforms such as Yammer and Slack. Moreover, the ethnographic data consists of 250 pages of written material produced by DBI, i.e. press releases, newsletters, articles, and a book about the company's history. Thus, I conducted fieldwork through *'polymorphous engagements'* (Gusterson, 1997), where I observed, talked, interacted and collaborated with informants across a number of dispersed contexts, not just within DBI but also in the industry while following digitization as a practice and industrial discourse. In total, 45 interviews (Spradley, 1979) have been conducted during fieldwork. Interviews lasted 1-3 hours and have all been transcribed verbatim. After completion of fieldwork, fieldnotes and transcriptions have been coded and analyzed using NVivo. Recurring themes across the ethnographic material were condensed and elaborated further into different analytical and thematic directions (Glaser and Strauss, 1967).

My access in the organization was negotiated continuously through the fieldwork and gained step-wise over time (Gellner and Hirsch, 2001, pp. 5–6) through different kinds of collaborative engagements with colleagues/informants. I zoom in on these

activities in the following section 4. There, I consider how *'collaboration'* became a way to respond to the tests of the relevance and applicability of research and anthropology for the benefit of DBI's core philosophy: merging research with business for the benefit of society and industry.

4. Testing relevance and applicability – and responding through 'collaboration'

4.1. Early signs of 'tests': Questions of (economic) contribution and initial positioning

I got a desk in the fire safety consultants' department, because they carried out the digitization projects (referred to as the DIGI projects) I would be tracing. However, I had to be pushy about participation in the beginning of the fieldwork. At times, the project manager of the DIGI projects would not invite me to project meetings. When asking him whether I could join these meetings, I discovered that I was more than welcome. He admitted that he had forgotten to invite me; and his two most mentioned reasons for that was that I was new in DBI and worked from another office at that time, or that he had believed the meetings were not interesting or relevant for me. Particularly, meetings with economy, project planning or fire safety technicalities on the agenda were not deemed interesting for me, because my colleagues believed my profession had to do with *"culture"*, *"users"*, or *"human factors"* [6]. Most often, however, it seemed he had simply forgotten about me rather than deemed the meeting irrelevant for me. One-third into my fieldwork I transferred from a minor office location to the headquarters where the DIGI projects were carried out. I now got a desk

[6] *'Human factors'* refer to a great risk factor in fire safety engineering. Theories on *'human factors'* are widely accepted and used in the aviation, maritime, gas & petroleum, and construction industries. Overall, theories on *'human factors'* argue that accidents are direct or indirect results of human actions and errors (Shappell and Wiegmann, 2000; Chen *et al.*, 2013; Kongsvik, Gjøsund and Vikland, 2016).

opposite of the project manager's and my manager/company supervisor[7] advised me to regularly scrutinize the project manager's Outlook calendar and check when he might have meetings of relevance to me. This meant that I occasionally popped up from my chair and asked him across our desks whether I could participate in this or that meeting – including all the seemingly irrelevant meetings about economy, planning and technicalities. Through this rather pushy approach, things slowly changed and I was increasingly involved in project meetings of all sorts. Once the digital tools in the DIGI projects had matured to involve user feedback, I was consistently invited to all project meetings – again because of my colleagues' understanding of my profession as having to do with *"culture"*, *"users"* and *"human factors"*.

After swapping office locations to the headquarters, I had to get to know new colleagues yet again, who did not always seem to understand the meaning of my project, even though they understood that I was following the DIGI projects. Here, some would comment on my position and profession by referring to me as *"the academic on social benefits"*, *"the note-taker",* or suggest that I was an academic spending time at DBI as part of receiving a kind of therapy for not having a regular job. These comments were often linked to questions about how my project and employment was funded, and what (if any) kind of value or economic profit I could provide to DBI compared to their client-paid tasks (remember the delicate balance between development/research activities and client-paid income). In their opinion and experience, as a PhD student I would be working three years without producing a single invoice or product for the benefit of DBI, while they had to work hard to provide a surplus for DBI and indirectly pay for my academic research project.

These opinions about who generates the profit and value relate to DBI as organization. A considerable number of the employees are non-academic with backgrounds such as craftsmen, firefighters or salespersons, who may have completed other, addi-

[7] I use the slash to indicate that my manager also function as my company supervisor. In an Industrial PhD, the candidate has an academic supervisor and a company supervisor.

tional educations such as building technicians. Since the middle of the 2000's, academics with degrees within fire safety engineering, social science, management or commerce entered DBI. For the past 4-6 years, PhD students and Postdocs in fire safety engineering have entered DBI to boost the scientific, research-based anchorage of the organization. The research and development department is home to most of these academics and researchers (including me). Despite these recent changes in the composition of employees and the increased focus in the business strategy on research and development activities, colleagues in the other departments commonly refer to the research and development department as *"the department of jiggery-pokery"*. I consider my colleagues/informants' questioning of my contribution to the overall turnover as expression of an ongoing debate at DBI on how to balance client-paid tasks with research and development activities. But I also see these questions as subtle demands of me to make myself and my profession relevant in and useful to the organization as an employee – to be more than (merely) a researcher, to contribute to the daily tasks, and to actively impact the organization I had come to study. I shall turn to these demands and expectations in the following.

4.2. The 'tests': Demands for "something different" and "stupid questions"

Six months after transferring to the headquarters, I was allocated to a department dedicated to support and develop digital tools and services for DBI's clients and collaborators. This change of department meant that my manager would now be the same person as the supervisor for my PhD project, and that I would be in a department charged with tasks of both developing and maintaining digital tools. To many of my colleagues/informants, this change seemed meaningful because the focus of my research saw most relevance and application in this department. With this structural change, I started to gain better access to more meetings and was involved in managerial, strategic discussions concerning digitization in DBI. This meant that I also started to find myself in conversations where attitudes towards in-house projects, the industry, external partners, the management, and personal agendas were expressed more

freely and openly. During fieldwork, I saw these changes as signs that I was gaining trust and credibility among my colleagues/informants. In retrospective, I find that this gradual change indicates the passing of some of the initial, subtle tests of the relevance and applicability of anthropology in the organization.

With the redeployment to the digital department, new tests occurred. My colleagues/informants started involving me as project member or as *"the UX [user experience, red.] expert"* in other digitization projects outside the initial research scope where they wanted help concerning *"usability"*. Furthermore, they increasingly started to ask about my opinion on matters of *"users"*, ethics, project management, and asked about *"whether there was something particular I had noticed"* during meetings. Now, fieldwork observation made during a meeting might suddenly turn into a moment of requested impact or action where colleagues/informants inquired into what I was thinking and whether I had *"any thoughts on the matter"*.

My manager/supervisor made it clear to me that to him and DBI, the most valuable contribution of my PhD would not be the final dissertation, but rather my continuous presence in the organization where I would be able to challenge and explore DBI's practices, beliefs and assumptions. He specifically urged me to ask critical and *"stupid questions"* to help them *"see things"*, which would make him and others capable of pausing and reflecting upon their practices and strategies in DBI. The project manager of the DIGI projects would invite me to meetings or ask me to read through meeting agendas before emailing them out to meeting participants, *"just to get your input on the stuff and see if anything is missing or could be done in another way"*. One of such meetings was on a grey September morning in 2018. Here, I participated in a status meeting in the DIGI projects, and it was the kind of status meeting that I by now had participated in at least a few dozen times. During this meeting, we discussed (yet again) how to convert the upcoming new rules and guidelines in the building regulations into intuitive, digital tools that might help clients to manoeuver, understand and best apply these regulations. Many of the technicalities in the regulations were (and still are) strange and unfamiliar to me, and therefore I asked my colleagues quite a few

questions about the impact of the regulations, who might be using such digital tools, and what the tool would be intended to do for the users. My colleagues focused intensely on how to make the regulations understandable and intuitive through digitization, because they thought the clients (i.e. the users) found the regulations difficult to understand. *"Here we need someone who knows about this,"* one colleague said suggestively and looked at me with a smile, hinting that I was their usability-expert who would know how to go about this. I sat thinking that I had no clue how to respond to such a demand. Another added, *"One who'll ask a lot of questions."* I was unsure what my colleague meant; which *"questions"* did he refer to? While wrapping up the meeting, the project manager looked at me and said, *"The value you bring to the table is very concrete; you ask questions and make us think about what it is we're doing, and why we're doing it. Today, we thought about many things that we often take for granted. There's a lot of ping-pong going on all the time with you."* After the meeting, one of my colleagues who had also been present at the DIGI projects meeting enthusiastically told me that, *"it's great to have someone different like you bring something different to the table here in DBI."*

I never got to ask my colleague what she meant by this *"something different"*. And at the time of writing, it is still somewhat unclear to me what kinds of *"questions"* and *"input"* my colleagues/informants were pursuing. However, I find that such expectations to my deliveries resemble those described by other organizational or business anthropologists, where anthropology seems to symbolize a quite other-worldly and exotic discipline compared to the other professions hired in the organization or corporation. Reflecting upon his fieldwork at Bang & Olufsen, Krause-Jensen notes that anthropologists had quite a reputation in the corporation due to the methods of participant observation, and because their experiences with exotic fieldwork presumably *"gave them an ability to see things from odd, unexpected angles"* (Krause-Jensen, 2013, p. 46). Indeed, my manager/supervisor and colleagues/informants at DBI expressed similar expectations for my work and impact. During fieldwork, I learned that I was part of a strategic business agenda focusing on bringing about change and an increased

focus on usability and digitization in the organization and in specific departments. One way for the managers interested in consolidating these strategic focus areas was to employ a PhD student studying exactly this and place her in the targeted departments, thereby aiming for impact through ethnography (Fayard, van Maanen and Weeks, 2016). Thus, I was there because these managers hoped I could help facilitate increased attention on digitization, usability and spur change in the organization among colleagues judged by these managers to be hesitant or resistant towards digitization and organizational changes.

Summing up, I suggest that the tests I had to pass were subtle and vague, yet ambitious and challenging demands about inspiring change and initiating new ways of thinking about DBI and its clients. The passing of the tests were measured by if, how and in what way I managed to be an anthropologist *researching* digitization in the organization while also being an employee *contributing* to digitization projects and product development carried out at DBI. My response to the tests was to engage in a collaborative approach, which I will describe in the following.

4.3. Collaboration as response to the 'tests'

Throughout fieldwork, I was repeatedly reminded of my colleagues/informants' requests for *"stupid questions"* and *"input"*, and the desired impact through ethnography to spur organizational change. I tried to fulfil these demands, despite feeling constantly unsure about how to do it and what it meant specifically. What were these *"stupid questions"*, those *"inputs"* or that *"something different"* which they were looking for and asking me to deliver? As a chary response to these demands, I stated to state my opinion on usability, research design, methodology and approaches to clients, and 'wondered aloud' during projects meetings. Still, my initial responses to these demands were a bit random and insecure. I arranged workshops with my colleagues/informants where I shared preliminary analytical ideas with them to get their feedback and thereby ensure that I represented them properly. In our open-plan office, among

the colleagues I did fieldwork with, I put up a conference poster I made, so as to visually show them what I was doing and promote openness in my research.

However, as I got deeper into fieldwork and gained better knowledge of DBI, my engagement with my colleagues/informants evolved into a rather collaborative one where collegial tasks and research task where mixed. In the DIGI projects, my role changed once the digital tools had matured to a stage where user involvement was needed. Now I collaborated with project-members by conducting user tests and interviews, facilitating focus group discussions in the expert monitoring groups during product development, and carrying out survey questionnaires. On a few occasions, I agreed to share fieldnotes within the project team written down during project meetings. These notes were used in the project team as elaborate records of selected, important meetings.

Due to my department redeployment, I helped conduct fieldwork and facilitated workshops for in-house programmers on doing ethnographic fieldwork in relation to a major project on digitization. Fieldnotes from such project meetings turned out to be a strange mix of project to-dos and notes on agreements among colleagues on project tasks on the one hand, and notes on ambiences, relationships, expressed attitudes and beliefs on digitization on the other. Thus, on such occasions my participation as colleague on a project fostered valuable data on digitization at DBI for the benefit of my research. With colleagues from this department, I also co-organized an in-house event on digital tendencies and challenges in the construction industry. My participation in planning and carrying through this event yielded valuable insights into organizational power relations, ways of communicating between managers and employees, and how digital agendas are either promoted or toned down by management. These were insights I would not have obtained had I chosen not to co-organize the event. Furthermore, I shared theoretical concepts picked up at academic conferences etc. with my manager/supervisor. One such example is *'path-finding'* (Anderson *et al.*, 2015) which I introduced after having learned about it at the American Anthropological Association's Annual Meeting in late 2018. Not long hereafter, he implemented it as

part of our department's strategic work with digital technologies. Finally, I wrote an academic article with two colleagues on how to merge anthropology and fire safety engineering in holistic risk assessments through transdisciplinary collaboration (Karsten, Ruge and Hulin, 2020). Summing up, I suggest to conceptualize my responses to the tests as *'collaboration'*. I shall discuss this approach in the following.

4.4. Conceptualizing 'collaboration'

Through the various engagements described above, I argue that such an approach is collaborative and that it has been a key component in passing the tests. As described, the tests did not take shape as particular, practical tasks or as identifiable events as such. Rather, they formed as subtle, intangible demands about how and whether I could contribute to the projects and product development carried out at DBI; not only as a qualified researcher but also as a qualified employee. Therefore, *'collaboration'* in my case is not only about a particular ethnographic approach or a way of theorizing preconditions for engaging ethnographically with the field, as described most famously by Lassiter (Lassiter, 2005b). Lassiter writes, *"We might sum up collaborative ethnography as an approach to ethnography that deliberately and explicitly emphasizes collaboration at every point in the ethnographic process, without veiling it – from project conceptualization, to fieldwork, and especially through the writing process. […] Collaborative ethnography, then, is both a theoretical and a methodological approach for doing and writing ethnography."* (Lassiter, 2005b, p. 16, emphasis in original). Lassiter's description of *'collaborative ethnography'* hits the nail on the head for how I have been conducting fieldwork: Starting off with co-writing the project description and funding application with DBI, collaborating on projects with colleagues during fieldwork, co-writing (and publishing) academic articles with colleagues on our work, and finally asking colleagues to give feedback on this article. Elsewhere, Lassiter writes that anthropology has been collaborative all the way back to the works of Malinowski, Boas and Morgan (Lassiter, 2005a, pp. 84–88). As suggested by Rabinow, the collaborative element in anthropology has always been present, but was increasingly removed

from the ethnographic records in the process of making anthropology more academic. The romantic ideal of the lonely fieldworker on isolated location has done its part to scale back the anthropological collaborative approach (Rabinow, 2011, pp. 114–15). More recently, Ingold argued that anthropologists do not do fieldwork *about* people, but rather *with* people (Ingold, 2017, pp. 21–22). In line with these scholars, I believe that *'collaboration'* as a precondition for ethnographic engagements indeed holds true for anthropological and ethnographic research – and for organizational research as well.

However, the kind of *'collaboration'* I aim to describe here is slightly different from the *'collaborative ethnography'* formulated by Lassiter. In my case, *'collaboration'* was not about co-constructing ethnographic texts, but often about co-constructing products or strategic processes. In many cases, my colleagues/informants were not necessarily interested in influencing and co-producing the ethnographic written material, as Lassiter experienced with the Kiowa people or in the Middletown case (Lassiter, 2005b). As noted, my manager/supervisor was more interested in what insights he could gain from my daily presence compared to the insights DBI might gain from the ethnographic texts. Lassiter writes that *'collaborative ethnography'* has the potential to merge ethnography with activism and citizenship, thus turning research into action (Lassiter, 2005b, pp. 152–153). But what Lassiter does not include in his reflections (quite understandably, since it is not part of his agenda) is what may happen to *'collaborative ethnography'* when ethnography is merged with employment. At DBI, I had to participate, listen and learn as an ethnographer, while *also* impact, contribute, suggest changes, and state my opinion as an employee. This way of oscillating between participating (for academic purposes) *and* contributing (for corporate purposes) – of doing anthropology *in*, *for* and perhaps most importantly *with* the field simultaneously (Moeran and Garsten, 2012; Urban and Koh, 2013) – generated much of my ethnographic data, and I argue that it was a precondition for passing the tests of relevance and applicability at DBI.

Thus, with Krause-Jensen's words, my collaboration was both *"a production and reproduction of the phenomena"* I studied (Krause-Jensen, 2013, p. 52). I studied how digitization was practiced and promoted at DBI, while I also collaborated with colleagues/informants on how to advance and do digitization at DBI. I believe that I would not have been able to pass the tests (and keep passing them) and gather valuable insights on organizational rationales, social relations and beliefs, had I not chosen to work *with* my colleagues, share insights, contribute, intervene, listen and ask questions on the projects I also studied. To pass the tests, I had to engage collaboratively with the field, since they expected an impact from me – not only as anthropologist, but also as colleague. Similar experiences has been described by Hepsø, who was employed by an international petroleum company to do ethnography among offshore crane operators employed in the organization to help improve the quality of working life for the operators (Hepsø, 2013). Hepsø describes how he was met by his informants' expectations to conduct, *"meaningful participation and contribution to the work that is undertaken"* during fieldwork (Hepsø, 2013, p. 156). He writes, *"Participation in a community [of practice, red.] leads to role expectations about making contributions to the activities and development of the group"* (Hepsø, 2013, pp. 156–157). Similarly, my fieldwork unfolded as a collaborative process where I continuously worked on how to prove the applicability and relevance of my profession and presence, and thus pass my colleagues/informants' tests. I argue that *'collaboration'* as a way of engaging with the field has been vital for passing the tests, because *'collaboration'* attends to several overlapping interests, purposes and negotiations at one time (Marcus, 2001, p. 521) – that is, the interest of *both* the researcher and the organization being researched.

5. Conclusion

This article considers an ethnographic fieldwork on digitization carried out in a corporate organization in the Danish construction industry, where the author is employed as an industrial PhD student. During this employment, my informants/colleagues demanded that I proved the relevance of anthropology and research as professionally

valid practice, and demonstrated the applicability of anthropology for commercial use and product development purposes in a corporation permeated by technical thinking and ideas of applied research, profit-making, and good business cases. In other words, the tests focused on my ability oscillate between engaging in activities *in* and *for* the organization through a collaborative *'with'*. As Cefkin argues, such requirements for direct relevance and impact changes the requirements of ethnographic practice and urges a rethinking of methods to be used in collaborative work settings (Cefkin, 2010, p. 9). I consider the demands and expectations raised by the field as tests of me as employee *and* ethnographer, and argue that *'collaboration'* was a precondition for passing these tests unfolding during fieldwork and working through them. I venture to suggest that engaging collaboratively with the field (when faced with the dual purpose of attending to *both* corporate goals and research objectives) and daring to co-create products (and not merely ethnographic texts) in addition to knowledge provides fruitful yet challenging ways to consider and perhaps even re-think current ethnographic practices in organizations.

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ARTICLE TWO.

CLOSING THE GAP: MERGING ENGINEERING AND ANTHROPOLOGY IN HOLISTIC FIRE SAFETY ASSESSMENTS IN THE MARITIME AND OFFSHORE INDUSTRIES [1]

ABSTRACT

This article reports on the endeavor to merge the fields of anthropology and fire safety engineering in holistic fire safety assessments within the maritime and offshore industries. The article suggests a combination of the two disciplines to transition from an interdisciplinary approach towards transdisciplinarity. The approach has been developed and adjusted during three cases of risk analyses and prevention strategies on fire safety. The article presents two methodological insights illustrating the necessary attitude of interdisciplinarity as a foundation towards transdisciplinarity. It advocates for the need of willingness in organizations and project teams to consider both disciplines

[1] Karsten, M. M. V., Ruge, A. T. and Hulin, T. (2020) 'Closing the gap: Merging engineering and anthropology in holistic fire safety assessments in the maritime and offshore industries', *Safety Science*, 122. doi: 10.1016/j.ssci.2019.104512.

as equally valid, integrate them in research definition, and create a base for common understanding. Subsequently, it is proposed that transdisciplinary work requires the creation of a group of core members acting as guarantors of transdisciplinarity, thus becoming themselves transdisciplinary humans working in a joined framework of thinking and methods. The article also presents two operational findings integrating the two disciplines within the area of fire safety. The first finding concerns including 'daily operations' in fire safety design, as daily practices and perceptions among crew can have a high impact on fire safety. The second finding concerns 'reclassification of space and place'. It highlights mixing and shifting between work- and leisure-related practices within the same physical space, leading to the identification of new fire scenarios. It also explores the shifts between work, leisure, and emergency places, and their link to the shifts in professional roles of crew.

1. INTRODUCTION

The area of fire safety in the maritime and offshore industries has traditionally been rooted in engineering approaches, relying on standard test procedures and international guidelines (IMO FTP Code, 2010; International Maritime Organization, 2014b; International Organization for Standardardization, 2015a) to address the industry's technical challenges. However, many agents interact with the design solutions and thus, humans are always involved in and often put forward as the primary cause of accidents (Shappell and Wiegmann, 2000; Chen *et al.*, 2013; Cohen *et al.*, 2016; Kongsvik, Gjøsund and Vikland, 2016; Hulin, Jensen and Dragsted, 2017; Wróbel, Montewka and Kujala, 2017). Paradoxically, the centrality of humans and human behavior in fire safety engineering (FSE) studies has not received much attention from the social sciences. The field of evacuation is one exception where psychology and FSE work closely together with focus on behavioral aspects in fire evacuation situations to better understand reactions during emergencies (Proulx and Richardson, 2002; Kobes *et al.*, 2010; Groner, 2016). Furthermore, a limited body of literature exist in which anthropologists and sociologists collaborate with engineering professions to develop deeper understandings of risk perceptions, safety cultures, and fire safety behavior (Kongsvik, Almklov and Fenstad, 2010; Gran *et al.*, 2012; Halvorsen, Almklov and Gjøsund, 2017). Despite these important initiatives to include and combine psychological, sociological, or anthropological studies and perspectives in FSE approaches to fire safety, analyses of fire safety are mostly done separately, and regrettably often without much consideration for the other disciplines (Kuligowski, 2017). Outside the field of safety studies, the amount of research conducted by collaborations of social scientists and engineering professions multiply in fields of design, innovation, sustainability, and development (Børsen and Botin, 2013; Armstrong, 2018).

Thus, we see a remaining challenge in bridging the disciplines of FSE and anthropology in increasingly transdisciplinary collaborations to foster more holistic fire safety approaches. A merge of FSE with anthropology has a particular fruitful poten-

tial, since research on human behavior in fire situations tend to focus only on observable behavior, leaving out (and thus lacking) analyses of motivations, perceptions and beliefs that drive human behaviors not only during episodes of fire, but also prior to and after fire incidents (Kuligowski, 2017). Joint problem solving across disciplines through increasingly interdisciplinary and transdisciplinary engagements is essential in tackling current challenges in contemporary society (Russell, Wickson and Carew, 2008; Lawrence, 2010; Askland, 2013). In line with these arguments, this article proposes a transdisciplinary approach to fire safety based on experiences with interdisciplinary collaboration between anthropology and FSE in three cases in maritime and offshore environments in Denmark. One outcome of this transdisciplinary work is that life as it is lived onboard operating vessels or in offshore environments is foregrounded in the risk assessments. This has theoretical implications for safety research, which we suggest attending to through a focus on reclassification of spaces and places in maritime environments. When referring to both 'interdisciplinary' and 'transdisciplinary' approaches respectively, we acknowledge the remaining lack of consensual or shared definitions of the terms (Lawrence, 2010). However, we distinguish between the two. By 'interdisciplinary', we refer to work where researchers from different disciplines collaborate jointly on a topic, while remaining true to their own discipline (O'Campo *et al.*, 2011, p. 4). By 'transdisciplinary', we refer to work processes where researchers work jointly and employ shared conceptual frameworks by combining and merging disciplinary theories, methods, and analytical styles to shed light on a topic (O'Campo *et al.*, 2011, p. 4). We shall elaborate further on our understanding of interdisciplinarity in the results section 4, and on transdisciplinarity in the discussion section 5. With the disciplinary merging, a socio-technical engagement with fire safety is suggested in theory section 3 to foster a more holistic approach to fire safety.

Merging anthropology with FSE in a transdisciplinary approach allows for the incorporation of social, organizational, and cultural aspects into fire safety assessments and strategies in the maritime and offshore industries. A fire safety strategy encompasses all mitigation methods, technological solutions, and procedures aimed at

ensuring safety in the context of a fire accident. Such a strategy can stem out of a deterministic approach usually based on codes and regulations; it can alternatively be built through a risk based process such as IMO SOLAS 2014 (chap. II-2, regulation 17) (International Maritime Organization, 2014a). One of the main issues identified with traditional risk analyses and their implementation arises from the risk analysts themselves. The literature highlights a lack of scientific foundation in their work, hence leading to strong barriers in the communication of the risk levels which are too closely defined by the perception of the actors involved (Veland and Aven, 2013). This issue could be addressed several ways. We suggest strengthening the scientific foundation of fire risk analyses by merging FSE and anthropology in a transdisciplinary collaboration to grasp fire safety more holistically.

This article presents the effort and methodological process to date, starting with an outline of anthropological and FSE methodologies applied during the process followed by a theory section. Subsequently, we present the cases in the results section. Finally, the article discusses the insights gained from each case and consider methodological and theoretical aspects to develop further. At the time of writing, the development and application of the approach is still ongoing.

2. METHODOLOGY

In this section, we describe the various anthropological and FSE methods applied during three cases of fire safety risk assessments in the maritime and offshore environment in Denmark. One case concerned the implementation of lithium-ion batteries in the propulsion systems on passenger vessels, another investigated fire strategies onboard light-weight vessels, and a third looked at fire scenarios in high-risk offshore environments.

2.1. ANTHROPOLOGICAL METHODOLOGY

In all three cases, ethnographic participant observations (Spradley, 1980) were carried out during five field trips in total. With this method, the researcher immerses him-/herself in the field by closely observing, following, and interacting with relevant informants, e.g. during a workday or specific situation of interest. The method can vary gradually between full observation and full participation respectively. The purpose of the method is to observe and interact with the people, social situations, and physical aspects of a case, problem or phenomenon (DeWalt and DeWalt, 2002). The case or problem may also be approached as an issue, concept, or *thing* which is followed and analyzed throughout multiple environments and sites (Marcus, 1995). Ideally, the researcher also engages in the practices (i.e. participates) of those he/she seeks to understand. In the cases described herein, the method was observation rather than participant observation, as the researcher was only able to stay for one-day visits and was not allowed to engage participatory due to safety regulations. We recognize the limitations it may bring to do such short field visits compared to lengthy fieldworks. Indeed, there is an entire discussion among scholars and practitioners within anthropology and ethnography on the subject with powerful arguments advanced for longer and shorter ethnographic engagements respectively (Gupta and Ferguson, 1997; Wulff, 2002; Marcus and Okely, 2007; Cefkin, 2013). However, we argue that these shorter or more rapid formats of fieldwork do have significant value in providing "reality checks" of everyday practices, indicating beliefs, attitudes and practices among those one seek to better understand (Isaacs, 2013). As long as the researcher is aware of the different strengths and weaknesses of short and lengthy fieldwork respectively in terms of data saturation, representativeness, validity, the two forms may work very well to provide different kinds of learnings and insights to the research.

In total, 17 interviews were carried out prior to, during, or after the participant observations. The purpose of these interviews was to reach a deeper understanding of a specific case or problem (Spradley, 1979). The interviews lasted approximately one

hour and were recorded and transcribed verbatim. The interviews were semi-structured and primarily carried out on field location, or secondarily via Skype or phone. The structure of the interviews altered slightly from time to time according to what was emphasized as most salient and relevant to discuss by the interviewees (Spradley, 1979; Mikkelsen, 2005, pp. 169–192). Prior to field engagement and interviews, fieldwork had already begun with desk research and literature reviews being carried out to better understand the discourse and cultural domain and as a backdrop for drafting interview guides used in interviews and during walking tours (Baarts, 2010; Madden, 2010).

Due to the format of the field visits, primarily on board ships and in rough working conditions, classic sit-down interviews were not always a possibility. Consequently, the researchers switched to a more flexible form of interviewing - a 'walking tour', which refers to a condensed combination of participant observation and interview (Pink, 2016). Through this method, the interviewees demonstrate the case or problem while being in the milieu of interest (Pink, 2016). The method often provides a more relaxed atmosphere during the interview, because the interviewee is in his/her familiar surroundings. This allows for dense data gathering in limited periods, which was often a constraint for the anthropologists. Talks, activities, and experiences during the field visits were preserved through extensive field notes (Tjørnhøj-Thomsen and Hansen, 2013). Upon completion of the fieldwork, the authors worked through field notes and transcripts of interviews. Through this analytical process, we looked for themes crossing the empirical data. All fieldwork was conducted in accordance with the ethical guidelines on anthropological research (American Anthropological Association, 2012) and applied anthropology (Society for Applied Anthropology, 1951). Participation was voluntary and based on informed consent, meaning that participants had the right to decline participation and could withdraw at any time.

2.2. Fire Safety Engineering methodology

The common objective of the three case studies presented herein was to use a risk analysis approach with an increased incorporation of the way daily operations are performed (in opposition to the way they are described in codes and standards) in maritime and offshore operations, as well as how design solutions and procedures are actually used during a fire accident. We performed a literature survey using accident databases, to extract data illustrating the use of engineering solutions and procedures during such events, and to identify whether they fulfilled their functions and participated in promoting safety. We surveyed historical data from European, North American, and Australian national authorities under the form of 45 marine accident reports treating past fires on board ships of all types in order to identify the root causes of these fires. From these reports, it was concluded that almost every fire ignition could be explained by what is commonly accepted as a human-related factor (Hulin, Jensen and Dragsted, 2017). Such conclusions tie to a broader discussion in the (fire) safety literature on the causes of fires and accidents, which we will return to in our theoretical backdrop section 3.

Identification of fire scenarios in terms of ignition source and primary fuel is a major focus of risk-based FSE. The Hazard and Operability Study (HAZOP) served as a basis for this part of the work, involving the organization of dedicated workshops with the aim to share relevant expert knowledge of the necessary fields in order to identify risks as comprehensively as possible (Hyatt, 2003; Dunjo *et al.*, 2010; Crawley, 2015). The HAZOP methodology was favored over the Structured What-If Technique (SWIFT) (Card, Ward and Clarkson, 2012), which turned out to be unfamiliar to workshop participants, and thus more difficult to implement. Selected workshops were organized (one to three workshops depending on the complexity of the project), where each participant represented a stakeholder in the operation at hand (e.g. a ship or offshore installation) with specific expert knowledge as needed for the given analysis. In the case of a ship, workshop stakeholders were the ship owner, master, naval architect, fire safety engineer, risk specialist, and a person responsible for taking notes

and keeping track of time. In the HAZOP, guidewords are defined prior to the workshop and used to stimulate creativity and ensure that all relevant aspects are covered, and must be kept simple enough to avoid limiting the flow of ideas (Dunjo *et al.*, 2010). Such guidewords could be “ignition source”, “temperature”, “primary fuel”, “hot surface” etc. Through this method, a first selection of fire scenarios was obtained.

Previous research shows that the use of a single hazard identification method does not lead to a comprehensive overview of the potential scenarios (Potts *et al.*, 2014). A second, different method should be used in order to identify alternative risk scenarios, and when comparing the results from two different methods it was found that in the total of highlighted scenarios, only 50 % are identified by both approaches. The second method of choice was the Failure Mode and Effect Analysis (FMEA), which focuses on system analysis with respect to their failures (Stamatis, 2003; International Maritime Organization, 2008; Liu, Liu and Liu, 2013). The method was implemented in a systematic way (Liu, Liu and Liu, 2013), considering all systems in a ship or offshore installation. For each system, all possible failures were listed and their causes identified, which provided input data for assessing the frequency of occurrence of a given failure. Subsequently, immediate effects and far-reaching effects were extrapolated as input data for assessing the severity of the failure. The FMEA method can be applied at all stages of a design process, in an iterative manner, with the intention of increasing safety and reliability at every iteration. This makes the method expensive and time-consuming. In the present cases, it was used on the final designs in order to estimate their level of performance in the case of a fire.

Scenarios were ranked according to their risk levels to identify which ones were more critical than others and subsequently receive a high level of attention. The FMEA is well suited to this exercise due to its attention to causes and consequences of an event. As a result, we implemented the fire scenarios produced as output of the HAZOP workshops in the FMEA for further analysis. Using the standard EN ISO 19353:2015 (International Organization for Standardardization, 2015a), we could allocate a score for each risk component: “Severity”, “Frequency of occurrence”, and “Possibility to

avoid harm" to each risk scenario, and produce a ranking. These methods give access to the possible sources of fire, which represent only the first step of the fire risk analysis. This first step is qualitative in nature, and used to make a pre-selection of the risk scenarios to investigate further. For complex systems such as a ship, hundreds of fire-related risk scenarios can be identified but resources allow only looking into a limited number.

The second step is quantitative and uses actual fire safety engineering methods to provide tangible evidence supporting the argumentation around the qualification of the risk levels. The quantitative work uses necessary tests and computer-based simulations. The tests can be classical fire tests at small and large scale, e.g. cone calorimeter tests (International Organization for Standardardization, 2015b), Single Burning Item (Dansk Standard, 2014), Room Corner test (European Standard, 2007; International Organization for Standardardization, 2016), structural fire resistance tests (Dansk Standard, 2012), and ad-hoc tests created to document a specific point. Computer simulations will traditionally be finite element calculations to study e.g. heat transfer through a structure, or Computational Fluid Dynamics (CFD) to study smoke and temperature development within a compartment. Simulation inputs are defined using a range of acceptable values, and a distribution for these values, in order to give a probabilistic dimension to the analysis. These quantitative methods will allow engineers to refine the 'Severity' score of the analyzed risks. In certain cases, it will lead to a reduction of the risk level obtained qualitatively; in other cases it may increase the risk level, and some scenarios which where disregarded may occur to be worthy of deeper attention. The analysis therefore gains in strength and uncertainties decrease when the qualitative and quantitative parts of the analysis can be performed as an iterative process, in which the design team goes from one to the other in loops until the results are conserved from one iteration to the next.

The risk scenarios with a qualification above the accepted threshold must make the object of mitigation. Risk mitigation can be provided through changes in the design, procedures, or training; alternatively, a justification that the risk levels are As

Low As Reasonably Practicable (ALARP) can be put forward (Melchers, 2001; French, Bedford and Atherton, 2005; Jones-Lee and Aven, 2011).

This approach is relatively traditional in fire safety engineering. As a resource-heavy approach, it is not easily applicable outside larger projects. In usual fire safety practice, its scope will most often be kept technical, and focus solely on systems, equipment, or machinery (SOLAS, II-2, regulation 17) (International Maritime Organization, 2014a). Though what engineers refer to as 'human factors' are found in a more obvious manner in the topic of evacuation, it will rarely be object of focus and will be dismissed for lack of knowledge, information, and methodology to account for it (Hurley *et al.*, 2016).

3. THEORETICAL BACKDROP

3.1. HUMAN FACTORS

Considering 'human factors' as expressions of social and cultural aspects of human lives is a well-established entry point for approaching fire safety and safety in general in industries such as aviation, oil and gas, maritime and offshore, and health care. Here, the concept has been widely applied to investigate errors or workflow disruptions caused by human accidents (Chen *et al.*, 2013; Cohen *et al.*, 2016; Kongsvik, Gjøsund and Vikland, 2016; Wróbel, Montewka and Kujala, 2017). The work on human factors in health, risk, and safety environments was initiated by Scott Shappell and Douglas Wiegmann who introduced the Human Factors Analysis and Classification System (HFACS) for assessing human errors in the aviation industry (Shappell and Wiegmann, 2000). Based on reports that 70-80% of aviation accidents can be attributed to human error, Shappell & Wiegmann set out to study the causal sequences and events associated with these high percentages of human errors (Shappell and Wiegmann, 2000, p. 1). Inspired by Reason's Swiss Cheese model (Reason, 1997), Shappell & Wiegmann developed four levels of failures in HFACS (Shappell and Wiegmann, 2000, p. 3). Each of the four levels concern different safety practices and

procedures in an organization and professional workspace, ranging from so-called 'unsafe acts' carried out by individuals and the preconditions for those acts, to 'unsafe supervision' and organizational process also influencing the level of safety (Shappell and Wiegmann, 2000, pp. 3–13).

In this article, we argue for a transdisciplinary approach to create more holistic fire safety assessments exemplified by our merging of anthropology and FSE. Therefore, we want to shift the focus from the individualized, behavioral human factors-approach exemplified in HFACS, to a focus on socio-technical relations, i.e. the interconnectedness between technology and the humans who use it (Bijker and Law, 1992; Børsen and Botin, 2013). We do not wish to disregard the widespread use or applicable value of HFACS. Important work done by researchers such as Rasmussen and earlier works of Hollnagel must not be forgotten, specifically their focus on numerous agendas and individual logics in organizations and among workers which influence safety and risk perceptions (Rasmussen, 1997; Hollnagel, 2009). Indeed, HFACS and other related perspectives provide valuable suggestions on how to work systematically with safety in many areas and how to break down complex workings into manageable and analyzable units. Still, we do contend that a model focusing on errors (caused primarily by humans) presupposes logic causalities in humans' social lives. Here, we echo Hollnagel's important work in his framing of 'Safety I' and 'Safety II' thinking respectively. Hollnagel argues that one should focus on what goes right instead of what goes wrong, and focus on *work as done* (work as performed by practitioners) rather than *work as imagined* (rules and procedures) in daily operations (Hollnagel, 2014).

3.2. Shifting focus from 'human factors' to a socio-technical understanding

Despite decades of research on individual risk perceptions, controversies still exist on how to approach the aspect of risk and humans' response to danger (Bye and Lamvik, 2007; Boholm, Möller and Hansson, 2016). We argue that this discussion has gener-

ated a predominant focus on human behavior and primarily individual factors, downplaying contextual, relational, and social factors surrounding and involving human beings. In anthropology, the premise for understanding humans and their practices is a focus on sociality and the relations they are entangled in, and not the singular 'things' themselves. This is because humans, objects, and technologies are understood and perceived as interlinked, interactive, and related to one another (Latour, 1990; Escobar *et al.*, 1994; Strathern, 1996; Star, 1999; Eriksen, 2001). With a focus on relations and sociality, anthropological research have shown how humans continually shape and are shaped by their surroundings, and how these surroundings (including technologies, infrastructures etc.) are bearers of culture (Winance, 2006; Ingram, Shove and Watson, 2007; Mol, 2008; Schüll, 2012; Gad and Dalsgaard, 2014). This means that very often, people's ways of using and appropriating technologies will turn out to be very different than expected – not because people are wrong or erroneous, but because the design does not fit with the social lives that they are supposed to fit in with (Mosse, 2004; Vohnsen, 2011). Tim Ingold has argued that while skills are often converted by technologies, these technologies are also reshaped by human practice. To Ingold, no machine is final or closed. Rather, humans work with machines that work with them (Ingold, 2011). Ingold argues: *"The essence of skill, then, comes to lie in the improvisational ability with which practitioners are able to disassemble the constructions of technology, and creatively to reincorporate the pieces into their own walks of life"* (Ingold, 2011, p. 62).

Thus, when a technology or given object (e.g. guidelines, safety gear, and evacuation equipment) is used or "misused" in an unpredicted way, it is not indicating flaws or erroneous human behavior. Rather, it indicates creativity and adaption to local contexts, which initially had not been considered in the design of the object or technology in question (Vikkelsø, 2005; Mort, Roberts and Callén, 2013). What makes technologies successful or failing is shaped by a wide range of factors including social, professional, technical, economic, and political commitments, as well as skills, prejudices, possibilities, and limitations (Bijker and Law, 1992, p. 3,7). Thus, it sometimes seems

as if technologies/objects does not fit the reality they are placed into (Akrich, 1992). This aspect also presents itself in the maritime industry. Here, a schism between regulations drafted by authorities and everyday practices on board among crew often exists (Almklov, Rosness and Størkersen, 2014; de Vries, 2016). The challenge is to move beyond potentially maladjusted designs, technologies and regulations, and understand what must be adjusted to best proceed towards better safety, both in terms of technologies and human practices. As Almklov and colleagues argue, *"To be relevant and effective, a safety system must be anchored in, and relevant for, local practice"* (Almklov, Rosness and Størkersen, 2014, p. 18).

3.3. Towards a socio-technical, transdisciplinary approach

We contend that the focus on human errors and causality deserves to be further nuanced, investigated, and opened up. We argue for a different engagement with fire safety analyses and designs. By toning down the focus on flaws, errors, and causality, and increasing the focus on what works, on sociality and local meanings, fire safety in maritime and offshore operations may be conceptualized as interlinked relationships between technology and sociality. However, we wish to push further and expand the notion on what makes things go well in daily operations. If we want to understand the technological *and* the social dimension in a maritime and offshore setting, we must focus on *both*. Therefore, we argue that a transdisciplinary collaboration between anthropology and FSE is highly adequate for attending to interconnections between work routines, risk perceptions, crew sociality, cross-cultural aspects, implementation of procedures, and use of technologies and equipment in the daily operations.

In a transdisciplinary approach, social *and* technical dimensions the maritime and offshore setting are integrated in the design of fire safety strategies, hence creating a holistic dimension. With this focus, fire safety assessments will focus much less on human errors, and a much more on social aspects of the everyday working life

conditions such as different logics, professional boundaries, or organizational structures (Law, 1994; Bowker and Star, 1999; Glynos and Howarth, 2007; Håland, 2012). Having drawn the contours of the article's theoretical underpinnings, we move on to describe our results and our suggestion of a transdisciplinary approach.

4. Results: Experiences from interdisciplinary research

This results section covers the three case studies. The cases show increasing degrees of *interdisciplinary* work as the researchers improved their collaborative skills. We now employ the term 'interdisciplinary' in order to refer to a different kind of methodological integration between anthropology and FSE than when referring to a transdisciplinary approach. We consider interdisciplinary work as efforts that, *"involve the collaboration and cooperation of scientists from at least two disciplines who apply their disciplinary competence to work on common questions and the achievement of shared results. The core characteristic of interdisciplinary approaches is their goal to integrate concepts, methods, and principles from different disciplines"* (Lawrence, 2010, p. 127). As stated, this paper reports on a work in progress. As research team, we are still working towards a transdisciplinary collaboration. The cases we present below reflect what we consider as varying degrees of interdisciplinary collaborations, which are not yet transdisciplinary. Thus, the transdisciplinary approach is what we argue for by reflecting on – and striving for – the interdisciplinary projects so far.

4.1. Case One. New technology implementation and risk perceptions on passenger vessels

This project investigated fire safety in relation to implementation of lithium-ion battery systems as part of the propulsion on large passenger vessels in Denmark (Johnsen

et al., 2017; Karsten, 2017; Wilkens *et al.*, 2017). Previous fire incidents, current attitudes, practices, and beliefs were investigated and recommendations were made on how to apply batteries as part of propulsion systems.

In this case, an in-house anthropologist performed the fieldwork and analyses. Employment in the same organization and participation in selected project meetings ensured a good dialogue and communication in the team, but did not facilitate further methodological integration. Analyses and written reports were performed separately by fire safety engineers and anthropologist respectively. Thus, the majority of the conclusions in the project emerged in parallel as either technical or anthropological and none of them were gained through explicit disciplinary integration. Five anthropological findings were integrated in one of the two FSE reports to support the recommendations. For instance, a heavily theoretical section in the FSE report included references to ethnographic examples in the anthropological report. However, the project team generated the analyses separately and the separate conclusions were not merged in a common analyses. The only integration of the two disciplines is the overall project conclusion, which states that the three studies in their totality describes a paradigm shift in safety considerations related to battery systems on large passenger vessels.

The anthropologist was not involved in the project or project design until well into the process, primarily because the anthropologist was newly employed and worked from a different location than the rest of the project team, which was scattered across Denmark and Sweden in different departments and organizations. Furthermore, this case happened when anthropology was still new to the organization. This created some uncertainties about how to integrate anthropology, despite a conviction of an added value to the project. The challenges of merging the two disciplines in this first case provided valuable learning points on establishing transdisciplinary collaboration, which we will elaborate on in the discussion section 5.

4.2. Case Two. Considering fire incidents on offshore composite vessels

This project focused on evaluating and rethinking fire strategies onboard fiber-reinforced polymer (FRP) vessels by developing new guidelines for fire design based on experiences from past fire incidents (Hulin, Jensen and Dragsted, 2017).

In this case, the anthropological input was defined by what fire safety engineers believed they could gain from this sort of study, prior to any involvement of an anthropologist. An external anthropologist performed the fieldwork and analyses, and the anthropological and FSE reports were written separately with separate conclusions for each field. The anthropologist was not involved in the historical data review or HAZOP workshops. However, the fire safety engineers and anthropologist met repeatedly to discuss their separate research and reflect on ways to embed anthropological findings in a FSE approach and the definition of new fire scenarios. Limited disciplinary integration was achieved by common work on independently gathered data. Furthermore, in the project conclusion it was proposed to consider the fire safety strategy as a problem, which could be investigated by applying classical risk analysis tools, and using anthropological insights as input data. Thus, the project concluded that *"socio-technical aspects of fire safety in design procedures* [should include] *tasks oriented towards the technical topics and tasks oriented towards human factors* [by] *considering the ship in its totality"* (Hulin, Jensen and Dragsted, 2017). Specifically, the role of the actors making safety-critical decisions in the ship, together with the behavior of the crew, were introduced as constitutive elements of the fire safety strategy, opening them for analysis. The case lead to the observation that most fires could be traced back to a human factor though it may appear of technical origin, and a first suggestion of a way to include anthropological findings in FSE work was proposed. The initial separation of the work followed by closer collaboration at later stages provided new learnings yet again, which we return to in the discussion in section 5.

4.3. CASE THREE. ORGANIZATIONAL PROCESSES AND EVERYDAY WORK IN THE OFFSHORE INDUSTRY

This project looked into possible fire scenarios in high-risk environments within the offshore industry sector. The project is a client paid project and due to our non-disclosure agreement with the client, we can unfortunately not go into further details about the project.

In the third case, the anthropological fieldwork and analyses were performed by an in-house researcher who partook in most project meetings and workshops, and shared insights with the fire safety engineers on a day-to-day basis. The anthropologist' analyses were applied actively as input for designing various risk scenarios as part of assessing the current level of risks in the offshore industry. The anthropologist performed the fieldwork after discussions with the FSE team to incorporate specific questions of relevance to their work on the risk assessments. Upon completion of the fieldwork, a brief document was immediately circulated in the project group prior to a follow-up meeting. Continuous collaboration enabled insights, concerns, and questions to be integrated in a HAZOP workshop with the client shortly after the fieldwork terminated. This meant that the fire safety engineers could immediately utilize the anthropological insights in the development of the fire scenarios. In the end, the anthropological insights were outlined in a separate report due to the scope of the project, but these insights were used to identify fire risks in an FMEA. Several recommendations affecting the design were based directly on the integration of both disciplines.

Initially, a lack of understanding of each other's disciplines existed between the fire safety engineers and anthropologists. The shared will to merge the disciplines made it possible to overcome difficulties, yet insight in the other party's discipline was difficult to obtain. However, a first interpretation of what an interdisciplinary (and future transdisciplinary) approach could be was quickly established early in the process by the project manager, albeit not before the project work had begun.

After completion of the project in case three, the project team shared feedback and the client expressed their views on the process. Within the project team, fire safety engineers mentioned that the anthropological work was a helpful resource for their own work and the understanding of the system at hand. They acknowledged that the anthropological work cast light on the relationship between their work on technical items and the real-life use of these items, increasing the relevance of their assessment of safety and of the recommendations put forward. The fire safety engineers expressed a higher level of satisfaction with their work as they could relate better to the impact it has on the daily practice of people interacting with the systems. The level of abstraction inherent to working only with technical systems (disregarding the personnel) was reduced. The project manager of the design team acknowledged direct results (e.g. identification of new fire scenarios, recommendations for training) as a major benefit of the interdisciplinary work. However, he expressed the wish for deeper integration to exploit the advantages of shared methodologies and common thinking. The client was highly satisfied with the outcome of the work, though limited to a tight scope. They retrospectively wished to have had more resources allocated to the anthropological work to increase impact. As a result, the client identified other areas of their operations where such work would bring benefits with regards to safety.

5. DISCUSSION

The following discussion highlights four major outcomes and learning points, which we find to be areas of interest to safety studies in the maritime and offshore industries. The first two concern how to establish interdisciplinary collaborations in teams and how to move towards transdisciplinary collaborations. The latter two concern promising areas, which invite for more research to build better understandings of fire safety in the maritime and offshore industries.

5.1. ESTABLISHING INTERDISCIPLINARY COLLABORATIONS ON FIRE SAFETY

The initial challenges with merging the two disciplines supports the argument of establishing an attitude of interdisciplinarity early on among the project members. We argue that for a fruitful interdisciplinary approach, it is vital that all researchers within the work-group know each other and work closely on a daily basis. Preferably, physically co-located researchers represent each discipline during the project period. This enables a greater common understanding of the collaborative approach, and ensures a willingness in the group to carry out the tasks in an integrated manner. Similarly, all researchers should participate in all meetings and workshops regardless of their discipline or function from the early stages in the project. This ensures that all project members understand and appreciate the importance of inputs from other disciplines than their own. This will ensure that necessary inputs and knowledge are available during all phases of the project.

Additionally, objectives and expectations of interdisciplinary work should be laid out both in the project groups (and perhaps also in the organization conducting the project) in order to characterize what can be achieved by such an approach, and how the integration brings us closer to a holistic perspective on fire safety. Case one and two confirmed the critical need for mutual understanding, openness to other disciplinary fields, and of working in co-location, which was obtained successfully in case three. The material generated by either discipline is valuable when produced independently and this aspect should remain a part of the methodology in interdisciplinary work. However, all involved disciplines should participate in the research definition to ensure that all parties are aware of the needs and strengths of the other in order to propose common research objectives. In this way, each discipline will take into account the perspective of the other in its research and create a base for a common understanding. Thus, we learned that one key to a good interdisciplinary collaboration and for establishing transdisciplinarity was that all input and experiences shared by each project member were considered as equally valid by all involved.

In order to facilitate the best research process, the transdisciplinary work is continuously evaluated and developed during and after the project. As a work in progress, this flowing process ensures that the methodology is always up to date with the findings of the team and incorporates the latest development each time it is applied. In turn, it promotes institutionalized anchoring of the knowledge and experiences.

5.2. ESTABLISHING TRANSDISCIPLINARY COLLABORATIONS ON FIRE SAFETY

Based on the insights gained from the three cases of working interdisciplinarily in varying degrees, we suggest merging FSE and anthropology even further into a transdisciplinary approach to push onwards to grasp fire safety in a more holistic way. The expression "more holistic" carries the notion of increasing the dimensions of safety encompassed in the analysis through the complementarity provided by both disciplines, since it could be doubted a truly holistic method, considering everything, is ever achievable. Working towards a transdisciplinary approach, we think along the lines of four points on transdisciplinarity stated by Lawrence: a) *"Transdisciplinarity admits and confronts complexity in science and it challenges knowledge fragmentation."* b) Transdisciplinarity *"accepts local contexts and uncertainty. It is a context-specific negotiation of knowledge."* c) Transdisciplinarity *"require close and continuous collaboration during all phases of a research project or the implementation of a project."* d) *"Transdisciplinary contributions frequently deal with real-world topics and generate knowledge that not only address societal problems but also contribute to their solution."* (Lawrence, 2010, p. 127). We find that such transdisciplinary endeavor has both theoretical and methodological implications. Here, we focus on the methodological implications as a full description; discussion of the theoretical implications is outside the scope of this article. We will limit ourselves to suggest that one possible theoretical implication of merging anthropology and FSE in a transdisciplinary approach could involve understanding fire safety as a system as part of an encompassing socio-technical network.

Concerning the methodological implications, we argue that a transdisciplinary approach is only fully beneficial and indeed possible if a project is defined and scoped as transdisciplinary from its nascence, and if the team collaborates closely during all phases of the project, as suggested by Lawrence (Lawrence, 2010). In this sense, transdisciplinary work should take place already from the project definition phase and oftentimes even before. We suggest that transdisciplinary research and project work could be carried out with inspiration from the following structure (see figure 1 below). The project group consists of and requires very high commitment from a limited number of members considered as "core members". The core members are in some ways functioning as project managers, but more so than in the traditional way of providing structure and organizing the project tasks. The core members must be involved in every step of the project, continuously evaluating the input from not just the rest of the team but also from themselves. Besides being involved in the project as a working and managing group, the core members must work transdisciplinarily, i.e. working within a joined framework of thinking, evaluating, questioning and reflecting. Additionally, the core members must themselves be(come) transdisciplinary humans integrating methodologies, disciplines and ways of thinking into their own ways of working. The core members then become something more than just a collection of disciplines mashed together, but rather an entity of a discipline and a way of being in itself. In short, the core members are guarantors of transdisciplinarity. Outside the core of the project group, we have a number of engaged "periphery members", who are specialists in their own disciplinary field and contribute with knowledge from their own discipline. The peripheral members do not necessarily have to engage in the transdisciplinary way of working; they can in most ways stay true to their own field and be specialists herein. However, they should inherently work interdisciplinarily, i.e. with a large respect for and understanding of other disciplines and ways of thinking.

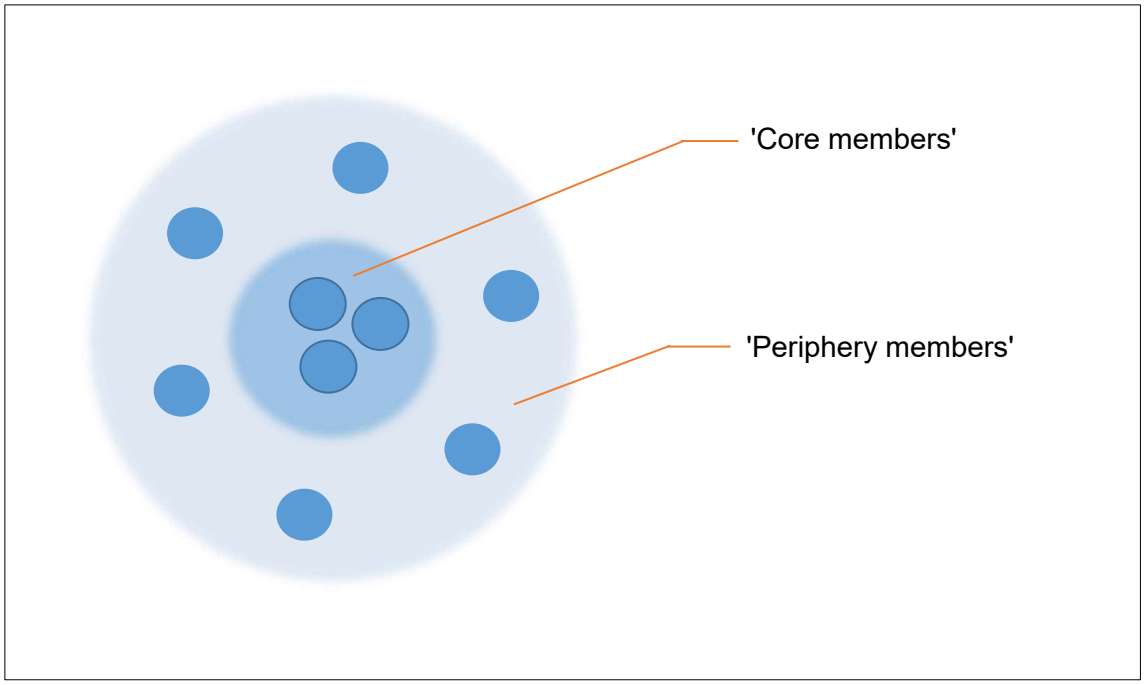

FIGURE 1. EXAMPLE OF PROJECT GROUP CONSTELLATION DURING TRANSDISCIPLINARY WORK.

5.3. EXPANDING FIRE SAFETY ANALYSES THROUGH TRANSDISCIPLINARITY

As stated throughout this article, we argue for a transdisciplinary approach to fire safety analysis. In order to carry this out, we suggest expanding the three standard pillars of fire safety (Hurley *et al.*, 2016) (i.e. 'Detection', 'Firefighting', and 'Evacuation') to include a fourth pillar. We consider this fourth pillar to be a "missing component" in most fire safety analyses and term it 'Daily Operations'.

Anthropological input on 'Detection' may deepen our understandings of how, when, and where a fire is detected. For instance, the work organization in terms of structure (teams vs. individuals), fatigue, or workload is relevant to consider here. Furthermore, with the introduction of more digital and technological devices, systems, alarms, and procedures multiply into complex workings that the employees must understand and act upon. In addition, there may be issues where the guidelines are insufficiently drafted, or not matching the specific environment, leaving crew and other employees to make crucial decisions in stressful situations or emergencies (de Vries, 2016).

An anthropological focus on 'Firefighting' may teach us more about how firefighting is approached and dealt with, including safety training, placement of the firefighting equipment, or the use/non-use of work clothes/gear. For instance, different approaches to training may prompt widely different responses about how crew would react in a fire emergency or how they believed they would and should act. Likewise, what safety gear a crew customarily wears can have a huge impact on the person's ability to reliably fight a fire, operate doors, walk through smoke etc.

Anthropological insights on 'Evacuation' would incorporate a crew's or employees' attitudes on evacuation. For instance, the crew's way of navigating within the facilities can greatly influence how an evacuation plan should be developed. Idealized but unrealistic takes on equipment placement, operation standards, and other procedures do not necessarily match daily operations and could lead to significantly different evacuation times than expected (Almklov, Rosness and Størkersen, 2014; de Vries, 2016).

Anthropological insights on the fourth pillar concerns 'Daily Operations' among crew. This area covers various, highly important aspects to include in fire safety strategies. For instance, cross-cultural differences (both across countries but also across workplaces) and varying risk perception influence the way which people participate in and execute work practices which are crucial to safety standards, e.g. remembering to close doors, how inventory is cleaned and maintained, or which information one finds relevant to pass on to colleagues in potentially dangerous situations. In addition, varying risk perceptions among authorities and crew may result in very different opinions on the necessary safety level where some argue for more guidelines, while others argue that the demands are set unrealistically high. The maritime and offshore industries are often highlighted as places of work where cultural issues are vital points in dealing with safety and risk due to varying nationalities, ethnicities, or organizational backgrounds (Haukelid, 2008; Antonsen, 2009; Dahl-Jørgensen and Rapport, 2012; Boholm, 2015; Boholm, Möller and Hansson, 2016; Durodié, 2017). The anthropological focus on culture also directs attention to shifting risk perceptions, which are highly

individual, social, and shaped by personal experiences (Garsten and Hasselström, 2003; Bye and Lamvik, 2007; Boholm, 2010). Interestingly, members of high-risk organizations are themselves often culturally blind to potential organizational hazards in their organization (Nævestad, 2008). Risk is thus culturally shaped as it is dependent on the observer's knowledge, understandings, and previous experiences; only rarely does society, specialists, or experts agree upon what is "risky" or not (Boholm, 2015).

Thus, we argue that understanding the everyday work practices, when incidents are *not* happening, is of crucial importance. It is an area, which holds great potential with essential, yet unexplored insights on how to build well-working fire safety designs – not just within the maritime and offshore industries, but indeed in other contexts concerned with fire safety. The importance on considering 'daily operations' when drafting fire safety strategies relates closely to the final insight, which focuses on how the working conditions supports what we have termed 'reclassification of spaces and places'.

5.4. RECLASSIFICATION OF SPACES AND PLACES

All three cases share features, which are general across the maritime and offshore industries. Crew and employees spend a great amount of time being on and off duty at their workplace, thus shifting between work and leisure in their work space. Shifts are long and at times tiring, and can last for several days or even weeks on one single ship, platform, or other offshore locality. Here, staff and crew continuously mix and shift between distinctive work-related practices and habits such as attending to technical issues and staying alert of dangerous situations etc., and leisure-related practices and habits such as eating, sleeping, going to the toilet etc. (see figure 2 below). These mixed practices and habits often unfold in the very same, high-risk environment and in confined, maritime/offshore spaces. Such common features invite for a considera-

tion of the categories of 'space' and 'place'. In anthropology, 'space' is defined in measurable and manageable terms, whereas 'place' refers to those elaborate social and cultural meanings, which people attach to a specific, physical space. Thus, locations have double meanings as physically built structures (i.e. 'space') are also lived, experienced, and imagined (i.e. 'place') (Gupta and Ferguson, 1992; Delaney and Kaspin, 2017). We argue that the mix and entanglement of work-related and leisure-related spaces and places over longer periods of time in the maritime and offshore industries result in reclassifications of one type of place to another place within the same physical space. One frequent example encountered in the maritime sector involves workers using safety equipment and following procedure when conducting work in extremely exposed areas (work-related place), but deciding against use of safety gear during their lunch break (leisure-related place), which is decidedly taken in the same exposed area. In many cases the safety gear is also a vital part of the fire evacuation procedure. The insight about reclassification(s) of space(s) and places(s) may significantly affect how we think about risk assessment and fire safety design. Risk scenarios in case three were greatly influenced by ethnographic data on such reclassifications that helped shape the final recommendations.

Reclassification arguably happens in professional roles, and not just in terms of place and space; as soon as an emergency happens, switches will occur back and forth between 'work as done' and 'work as imagined' (Hollnagel, 2014). In this way, the work done during an emergency may not be 'as imagined' by procedures or standards but 'as done' – actually fighting a fire or evacuating a burning vessel. As such, crew may stop being electricians or service engineers, and become human beings who are trying to escape a burning vessel or offshore structure. Here, more research is still needed on how crew will react in an emergency situation due to lack of ethnographic data during such emergencies. As illustrated in figure 2 below, a physical space of a vessel or offshore installation alters dynamically between being and becoming various places *and* various work-forms (i.e. 'work as imagined' and 'work as done'). As we outlined above, maritime spaces encompass several places at one time: places of work,

places of leisure, and places of emergency. The difference between work/leisure and emergency (or in this case fire) is that work/leisure are almost exclusively altered through social agreements, whereas the emergency, or fire, is often a physical change in the space itself.

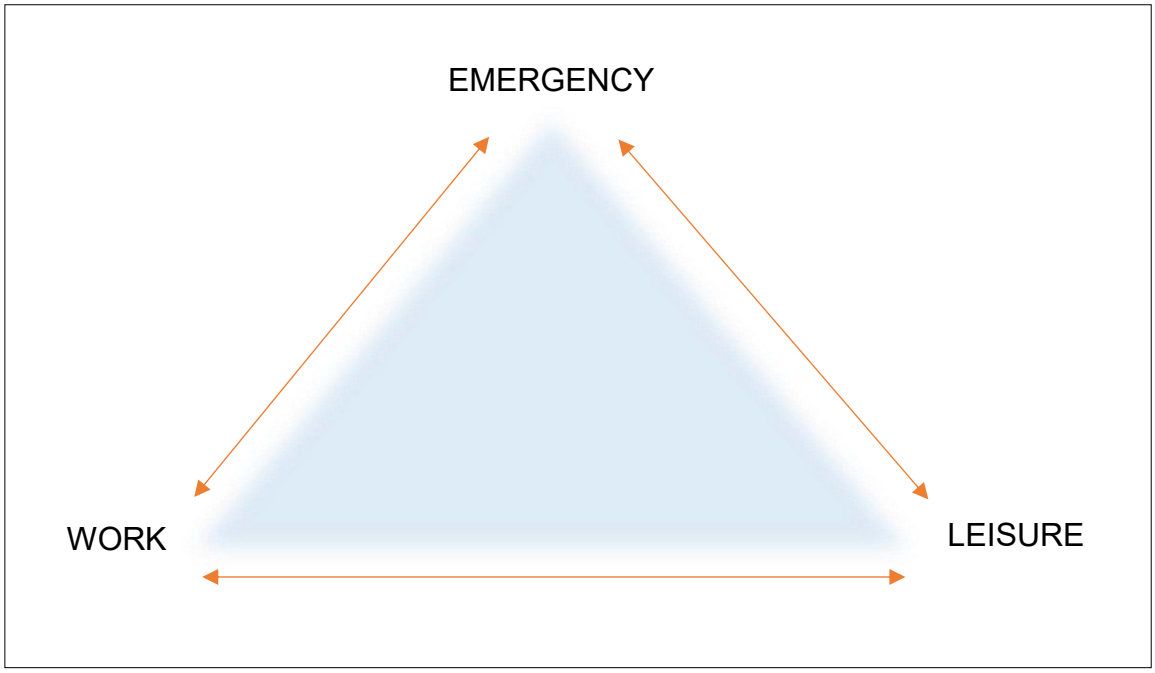

FIGURE 2. RECLASSIFICATION OF SPACE AND PLACE IN RELATION TO EMERGENCIES.

6. CONCLUSION

This article has argued for a transdisciplinary integration of FSE and anthropology for the benefit of developing more holistic, socio-technical fire safety assessments and designs. The results concern methodological challenges and insights gained through interdisciplinary merging of FSE and anthropology during three cases. Based on experiences with working interdisciplinarily, the article argues for a further development of the approach into a transdisciplinary approach to fire safety. The article presents four major insights, which we believe are not exclusive to the maritime and offshore industries, but indeed are applicable across multiple other industries. The first two concern

learnings and recommendations on how to establish interdisciplinary collaborations and suggestions on how to move towards transdisciplinarity. The latter two concern promising areas, which invite for more research to build better understandings of fire safety. One of these areas is the inclusion of 'daily operations' in fire safety designs, as daily practices and perceptions among crew in maritime and offshore industries are highly influential factors impacting fire safety. The other area is the 'reconfiguration of space and place' and how these reconfigurations initiate switches between 'work as done' and 'work as imagined'. This area holds great potential for approaching fire safety design from a new, more holistic perspective.

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ARTICLE THREE.

DISLOCATED DIALOGUE: AN ANTHROPOLOGICAL INVESTIGATION OF DIGITIZATION AMONG PROFESSIONALS IN FIRE SAFETY [1]

ABSTRACT

Like many other industries worldwide, the Danish architecture, engineering and construction industry is currently undergoing digitization of knowledge, processes and standards. Whilst digitization promises great improvements in terms of efficiency and effectiveness, not everyone is convinced that digitization will always lead to the hoped for benefits. In this article, I explore a number of prominent concerns that Danish fire safety professionals have raised with regards to ongoing efforts to digitize their knowledge and expertise. The focus on digitization is deliberate, as I suggest that scrutinizing the implications and concerns raised by professionals in digitization can help us foresee unintended, potentially dangerous, consequences, of digitalization. In building on anthropological fieldwork, I argue that professionals are concerned about digitizing fire safety, and its potentially dark results, because they worry that digitization

[1] Karsten, M. M. V. (2020) 'Dislocated Dialogue. An Anthropological Investigation of Digitization among Professionals in Fire Safety', *Organization*, pp. 1–23. doi: 10.1177/1350508420961527.

may dislocate 'mētis' from 'techne', and that digital outputs may be misunderstood or not applied correctly. Such a turn of events could lead not just to material losses (e.g., destroyed buildings), but to the loss of human lives too. This 'concern' with life and death thus appears to underpin the fire safety professionals' belief in the importance of dialogue in organizationally complex circumstances, and their hesitance to engage with digitization. On this basis, I propose that by shifting from a resistance and apprehension framework to a concern and dialogue framework, we may be able to foster more empathetic, productive and understanding collaborations within and across organizations during both digitization and digitalization.

1. INTRODUCTION

The European architecture, engineering and construction (AEC) industry is currently home to an intense and increased focus on creating interlinked digital systems that may bridge, connect and store all the knowledge and information exchanged and produced during a construction process. Such digital systems[2] are promised to help overcome the industry's infamous challenges of low productivity and project delays (Hardin and McCool, 2015), poor communication and collaboration (Sacks et al., 2018), lack of innovation due to a heavily regulated setting (Håkansson and Ingemansson, 2013), and budget overruns (Georg and Tryggestad, 2009). In this way, digitization appears as a commonsensical agenda focused on improving efficiency, productivity, rationality, and quality, much like agendas of evidence, audit, and optimization (Rod and Jöhncke, 2015; Shore and Wright, 2015b; Brynjolfsson and McAfee, 2016). Information and communication technologies (ICTs) are repeatedly promoted as transformative technologies that bring about new knowledge economies, better access, and more democratic engagement (Tacchi, 2012). Indeed, ICTs are assumed to support effective forms of organizational control and coordination through their capacity to gather, store, manipulate and transmit information effectively (Robey and Sahay, 2001). Thus, digitization is perceived as a key marker of reform, progress and Western rationality based on its ability to secure order, control, democratic involvement and participation in processes (Malaby, 2012; Tacchi, 2012).

Still, the positive outcomes and promised benefits of the digital transformation are long in coming to the AEC industry (Schober, Hoff and Nölling, 2016; Morgan, 2017). While many companies, stakeholders and practitioners are very enthusiastic and appreciative of the industry's digital surge, the promise of increased digitization

[2] The most predominant among the digital systems in the AEC industry is *'building information models'*, which also relates to the practice of *'building information modelling'*. Both model and process are referred to in daily language as *'BIM'*. BIM is a framework describing a common digital platform in the AEC industry. The idea of BIM has developed since the 1970s, primarily pushed by academia rather than the industry. The design process has always contained information models of buildings, but with the spread of information technology, these models became digital and increasingly structured. (Turk, 2016, p. 275).

has received a lukewarm reception from others. In this article, I zoom in on such concern by shedding light on digitization carried out by an organization in the industry, and on the anticipated consequences of this digitization. Specifically, I show how fire safety professionals[3] (FSPs) working with digitization at the Danish Institute of Fire and Security Technology (hereafter referred to as DBI) are concerned about digitization's potential dark sides. To them, fire safety is a matter of life and death; it is no laughing matter. In their opinion, fires happen because someone somewhere messed up and they worry that digitization will not diminish the risks of fire hazards but accentuate them. Thus, they are worried about the consequences of digitization and hesitant to engage with it, because it may ultimately mean the loss of lives.

Existing research highlights conservative attitudes (Håkansson and Ingemansson, 2013), fear of losing one's job (Juma, 2016), resistance towards change (Davis and Songer, 2009), lack of end-user involvement (Morgan, 2017) and perceptions of ICTs as unwanted additions to existing work processes (Howard, Restrepo and Chang, 2017) as reasons for resistance and disengagement with digitization in the AEC industry. Indeed, there is a widespread belief in the AEC industry that construction processes are highly contextual, unpredictable and relyiant on skills and embodied experience (Fyhn and Søraa, 2017a), which renders them unfit for digitization. Yet, I do not believe that explanations such as 'conservatism' or 'reluctance' towards change fully capture what is going on in the case of DBI. As an anthropologist, I find that resistance towards a given implementation or transformation is not a final conclusion, but rather an indication that there is more to discover and investigate (Kaptelinin and Nardi, 2006). In this article, I wish to push beyond vague and insufficient explanations for digital transformation challenges in the AEC industry by doing two things.

[3] In this article, I focus on employees at DBI whose knowledge is the object of digitization. I call these employees 'fire safety professionals' (FSPs). It is not a term used by DBI, but it covers a range of employees in research, development and consultancy who work on assessing, interpreting and applying fire safety regulations and guidelines, and who have extensive knowledge and professional experience within fire safety. I use the term due to ethical considerations to ensure best possible anonymity for the involved.

First, I take an anthropological stance and an ethnographic approach that focuses on everyday work practices and professional lives in DBI. From this perspective, I understand organizations as social processes and formations enacted by their members, and thus as bearers of complex, contested and powerful meanings, values and agendas (Wright, 1994; Garsten and Nyqvist, 2013b). To better understand digitization in organizations such as DBI, we must sharpen our focus on the organizational setting, its members, and their daily practices and experience of digitization (Eriksson-Zetterquist, Lindberg and Styhre, 2009; Plesner and Husted, 2020).

Second, I want to shift the analytical focus from 'digitalization' to 'digitization'. *'Digitalization'* speaks of implementing ready-made technologies into organizational settings, thus bringing about changes in practices and processes (Plesner and Husted, 2020, p. 7). Here, ethnographic studies have produced important and inspiring records of the complex, challenging, and generative processes of implementing and utilizing digital technologies in organizations (Orr, 1995; Suchman, 1995; Baba, 1999; Cefkin, Thomas and Blomberg, 2007; Pors, 2015, 2018). In sum, digitalization describes various modes of utilization or everyday 'mundanization' of digital technologies among users (Willim, 2017). *'Digitization'* is a different process; it is about how practices are transformed and transmuted from analogous knowledge into digital information (Plesner and Husted, 2020, p. 7). Here, research anchored in traditions of actor-network theory dominate, and these studies convincingly argues that technologies are scripted (Akrich, 1992) or designed (Schüll, 2012) in complex human-technology relations. Such relationships shape and are shaped by social, political and economic commitments, skills, affordances and constraints (Bijker and Law, 1992; Candea, 2018). In short, digitization is a site of social and cultural production (Dourish and Bell, 2011, p. 42), which also invokes managerial, societal and governmental ideas and ideals in organizations about improving given industries (Plesner, Justesen and Glerup, 2018).

However, while studies of digitalization are by now abundant in anthropology and anthropology of organizations, studies of digitization remain rare (see Kinder-Kurlanda and Boos, 2017 for a rare but fine example). This is a pity, because I find that

understanding the complex organizing in digitization is a prerequisite for understanding subsequent digitalization. I argue that scrutinizing the implications and concerns (both positive and negative) raised by involved professionals in early-stage digitization can help us foresee unintended, potentially dangerous, consequences of later-stage digitalization; not only in terms or risk and safety, but also in terms of how professionals will organize, appropriate and utilize digital technologies in and across organizations.

In this article, I focus on professional practices among FSPs and organizational workings at DBI, which I deem necessary for understanding digitization and its implications. I employ the notion of *'dialogue'* along with the concepts of *'mētis'* and *'techne'* (Scott, 1998) to show how knowledge, risk assessment and negotiations play a fundamental part of professional practices in fire safety. I argue that the FSPs are concerned about how digitization affects fire safety. Specifically, three key concerns stand out. First, how will digitization change their knowledge and dialogue once transformed into digital information? Second, how might their clients and collaborators, who are mostly lacking in fire safety knowledge and expertise, (mis)understand and (mis)use these programs? Third, will erroneous use or flaws in the programs lead to hazards resulting in loss of lives and values? I argue that the hesitance among the FSPs to engage with digitization is not a matter of *'technology apprehension'* (Nilsen et al., 2016) or *'technology resistance'* (de Graaf, Ben Allouch and van Dijk, 2017). Rather, I argue that it is a matter of *'concern'* (Barth, 1993; Krause-Jensen, 2010a) for how algorithms translate and transmute professional *dialogue*. I suggest that this change of framework – from resistance and apprehension to concern and dialogue – provides new possibilities for understanding professionals' engagement with digitization as expressions of care and dedication. This conceptual change may foster more empathetic and understanding collaborations within and across organizations during digitization as well as subsequent digitalization.

In making these contributions, the article continues from this section with a literature review on theories that inform my conceptualization of 'dialogue' and 'concern'. I then contextualize my subsequent analysis by providing important background information on DBI and digitization in the AEC industry in Denmark, and detail my methodology and research design. With theses tasks complete, I provide my ethnographic descriptions of everyday organizing in fire safety and digitization at DBI. I then discuss the theoretical importance of my analysis with reference to the ideas of *mētis* and *techne* as a way to consider and conceptualize dialogue and concern in particular, before finishing with a brief conclusion.

2. THEORETICAL FRAME

2.1. CONCEPTUALIZING 'DIALOGUE'

Risk assessments dominate the majority of the FSPs' work that I focus on in this paper. Risk defines situations where something of human value (including humans) is at stake and the outcome is uncertain (Boholm, 2015, pp. 13–16). The FSPs who I did fieldwork with perceive risk differently according to their previous experiences and professional backgrounds, not least because the different types of building regulations demand situated assessments based on variations in buildings' function, size and shape. This resonates with anthropological research on risk more generally, which argues that risk assessments are highly individual, social and cultural, and shaped by personal experiences (Garsten and Hasselström, 2003; Bye and Lamvik, 2007; Boholm, 2010). Risk is observer-dependent in that it is dependent on the observer's knowledge and understandings, and only rarely do society, specialists or experts agree upon what is risky or not (Boholm, 2015, p. 16). With risk assessments functioning as a core feature of fire safety practice, FSPs need a particular set of skills and knowledge to perform such assessments. We can understand this knowledge through the lens of *mētis* and *techne*.

According to James C. Scott, *mētis* represents a broad spectrum of practical skills and acquired knowledge in responding to ever-changing surroundings (Scott, 1998, p. 313). *Mētis* can only be learned through engaging in the activity itself, and is often related to the idea of craftsmanship: to the development of a subtle feel for materials and contexts during a long apprenticeship with a master craftsperson or more senior colleague (Scott, 1998, pp. 313–314). *Mētis* concerns the application of knowledge in concrete situations, which makes *mētis* a form of knowledge marked by particularity and localness (Scott, 1998, p. 316). In addition to craftspeople such as carpenters, examples of *mētis*-professions include firefighters, paramedics, doctors and technical crews who share the tasks of dealing with emergencies and disasters (Scott, 1998, p. 314). Conversely, Scott describes *techne* as what can be expressed precisely and comprehensively in rules, standards, and self-evident principles based on deduction (Scott, 1998, p. 319). *Techne* describes universal, settled knowledge. Here, knowledge can be taught in a more or less formalized and impersonal fashion, will often be associated with quantitative information and knowledge, and a focus on explanations and verifications (Scott, 1998, p. 320).

To advance and communicate the knowledge-forms of *mētis* and *techne*, I suggest that professionals make use of dialogue. Based on studies of railway planning in Sweden, Boholm has shown that communication errors between experts and non-experts are assumed to be remedied by effective risk communication through skillfully designed pedagogical presentation of facts (Boholm, 2015, pp. 156–157). Likewise, experts such as the FSPs assume that risks and errors are mitigated through skillful dialogue with non-experts. Indeed, it has been noted that dialogue in corporate settings is a vital foundation for the relationship between an organization and its stakeholders. It provides a means to exchange experiences, views, and knowledge, and to acquire new information and reach compromises (Garsten and de Montoya, 2004; Fyhn and Søraa, 2017b; Boholm, 2019). '*Dialogue*' implies an evolving exchange of knowledge and information between two or more people, whereby new understandings emerge (Stanghellini, 2017, p. 11). In *dialogue* then, knowledge and risk assessments may be

conveyed, exchanged, reconfigured and mitigated through compromises, agreements or creative solutions to problems. Thus, exchange of professional knowledge does not exist in a vacuum or unfold in straightforward processes (Gerson and Star, 1986). However, digital systems' structuring of problems or procedures often seek to capture professional decision processes of a singular expert (Gerson and Star, 1986, p. 265). The trouble is that knowledge experts do not work in isolation. They collaborate, discuss, negotiate, and coordinate with colleagues, clients and collaborators through and by means of dialogue (Orr, 1996, 2006). In this way, dialogue emerges as a professional, relational practice aimed at reaching an agreement between different parties. Dialogue negotiates different risk perceptions and knowledge-forms, which ultimately leads to compromises and final solution.

2.2. CONCEPTUALIZING 'CONCERN'

Social scientists have notedd that organizational transformations tied to ICTs, *"seem not to be carefully orchestrated events, quick and sure leaps into a glorious future, or even terribly jarring disruptions of taken-for-granted practices. Change [...] is slow, halting, incremental"* (Yates and Van Maanen, 2001, p. xiii). Accounts of how new technologies are implemented in organizations show how professionals continuously embrace, resist, contest, and transform them due to a wide range of professional, organizational, societal and personal reasons (Orr, 1998; Orlikowski, 2001; Vikkelsø, 2005). More often than not, professionals are unlikely to absorb or adopt technology precisely as expected or intended by those who design, command and direct the implementations of ICTs (Robey and Sahay, 2001). Professionals reinvent practices, appropriate technologies, resist changes that seem without meaning to them or do workarounds (Gerson and Star, 1986; Winance, 2006; Hartmann and Fischer, 2009). Such adaptions and appropriations happen, because singularized knowledge systems, including ICTs, often fail to appreciate the local knowledge forms and practices (Bowker and Star,

1999; Tacchi, 2012), which spurs concerns among professionals about how digitalization and digitization impact well-established relations and change practices in and across their organization (Broadbent, 2012; Horst, 2012).

The notion of *'concern'* was originally developed by Fredrik Barth in his analyses of life in North Bali (Barth, 1993). Barth stressed that despite their ubiquity in a given context, people's concerns cannot be elevated as foundational features of a given culture or organization, detached from time and place (Barth, 1993, p. 343). Concerns are not norms, because few norms seem to be notably effective in generating action or determining meaning (Barth, 1993, p. 343). Instead, Barth suggests that concerns: *"summarize recurring life experiences: they provide caveats, puzzles and maxims to people who are trying to cope in a complex, unpredictable and imperfectly known world; and they demand forethought, care, and suitable strategies"* (Barth, 1993, p. 343). The notion of 'concern' thus captures how people (and employees) understand, cope and navigate in complex settings (including organizations), and how they make sense of their experiences and unpredictable (business) trajectories. What is key for Barth is how concerns speak of actions, strategies and efforts to make meaning out of unpredictable worlds. In this manner, concerns may bracket how professionals like the FSPs at DBI attend to and do digitization in an unpredictable, imperfect corporate context, which demands that employees are foreseeing, careful and strategic in their engagement with digitization. Barth notes that people only embrace a tradition of knowledge, if the tradition resonates with and reproduces their concerns and the experienced importance of such conerns (Barth, 1993, p. 347). This means that concerns, knowledge and organizational workings and practices link closely together, because *"when persons with concerns use knowledge in situations, a social and material context is generated that can be interpreted as showing the vital importance of concerns"* (Barth, 1993, p. 349). In this way, professionals' concerns not only tell us something about what they care about or how they try to cope in a given situation. They also points towards vital elements in organizations and ways of organizing, which are key to the persons we seek to understand.

Jakob Krause-Jensen has used Bath's notion of *'concern'* in a corporate context to push beyond usually simplified and unexplored relations between ideas and actions in organizations, thereby stressing that there is not a straight line between officially stated corporate values and what employees think and do (Krause-Jensen, 2010a, p. 84). Indeed, Krause-Jensen notes that concerns may be individual or shared, but they do not describe a homogeneous group or view – in fact, those who share a concern may have little in common (Krause-Jensen, 2010a, p. 268). Put differently, *'concern'* is expressed and acted upon differently across organizations, much like risk assessment (Garsten and Hasselström, 2003; Zaloom, 2004), culture (Wright, 1998; Krause-Jensen and Wright, 2015) or values (Krause-Jensen, 2011). Importantly, concerns can be thought, expressed or acted upon, and therefore they provide a sense of direction in ambiguous fields such as organizations, which are often marked by unresolved questions, doubts and dilemmas in changing environments. Furthermore, concerns also often entail emotional dimensions, which otherwise tend to be forgotten in management theories on organizational strategy (Krause-Jensen, 2010a, pp. 268–269). The notion of *'concern'* thus helps to underscore dilemmas, doubts and complexities in doing digitization in a markedly different way than 'resistance' or 'conservatism', as well as underscoring the multivocality of organizations. These features of *'concern'* make it an intriguing concept to help highlight contested everyday organizing and professional practices in studies of organizations engaged with digitization.

3. CONTEXTUALIZING DBI AND THE DANISH AEC INDUSTRY

DBI is a Danish independent, non-profit Research and Technology Organization[4]. DBI deals with fire safety and security technologies through training, consultancy, testing and other services provided to private companies, entrepreneurs, authorities and other stakeholders in the Danish AEC industry and society. The core of DBI's business

[4] For more information, visit: https://en.gts-net.dk/ (accessed on February 6, 2019).

– like so many other businesses today (Adelstein, 2007) – is to create, store, disseminate, manage and control knowledge. DBI employs 259 specialists within this field. Among these specialists are the FSPs with professional backgrounds such as craftsmen, engineers, building technicians or fire-fighters. The FSPs provide consultancy for small and medium-sized enterprises on how to interpret the Danish building regulations, and how to apply these regulations and translate them into fire safety designs and risk assessments in buildings and constructions.

The FSPs most often enter a building process in the design and development phase, after the architect and building owner have agreed upon design, functions and budget (see figure 1). The FSPs' job is to ensure escape routes and safe passage in the case of a fire. They need to ensure that those in a building have time to reach the outside of a building, and to ensure structural integrity of the building so the fire-fighting can take place (Hulin, 2015). As DBI enters, the focus in the process is quality assurance[5] of the building design and chosen materials, and on gaining a construction permit. See figure 1 below for an overview of the process as illustrated by DBI.

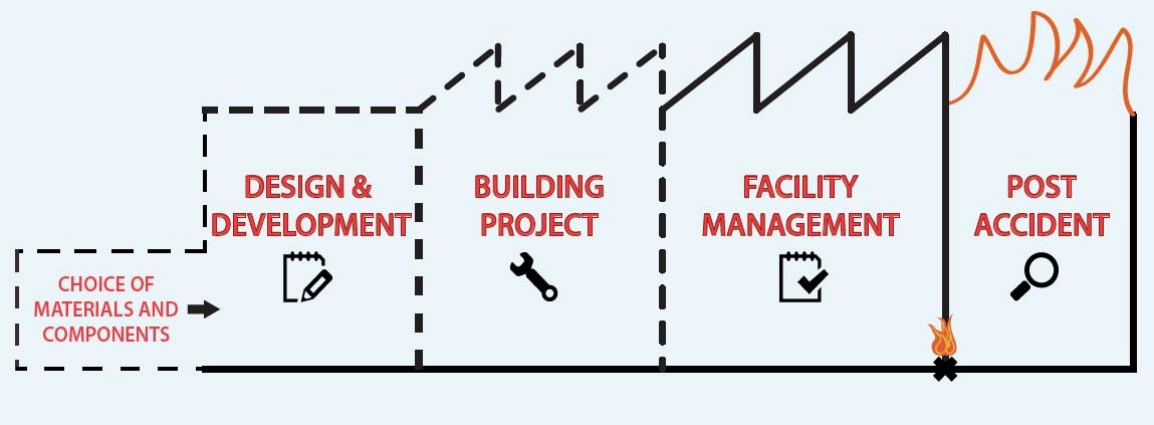

FIGURE 3. THE LIFE CYCLE OF A BUILDING, INCLUDING EARLY BUILDING DESIGN AND CHOICE OF MATERIALS, CONSTRUCTION PROCESS, FACILITY MANAGEMENT, AND POTENTIAL FIRE ACCIDENT WITH SUBSEQUENT POST-ACCIDENT INVESTIGATIONS. THE FSPS WORK PREDOMINANTLY IN THE EARLY PHASES WHERE THEY ASSIST WITH MATERIALS CHOICES AND FIRE SAFETY DESIGN.

[5] After the quality assurance procedure(s) – which the FSPs are part of – the construction project proceeds to the construction phase, which involves contractors and craftsmen assigned to the task. These professions have not been involved until this point, just as the architects are rarely involved in the later phases. Once the building is finished, it is handed over to the building owner and the facility management of the building.

At the time of my fieldwork, a building could not enter the construction phase until the building authorities[6] had approved the fire safety plan in agreement with local fire-fighting departments, the building owner and the FSP. Thus, agreeing on fire safety involves several other parties apart from DBI, each with their own agendas, professional anchorages, risk perceptions, and interpretations of the building regulations. Here, the dialogue may turn into lengthy negotiations lasting for weeks, ultimately delaying the entire construction process, as we shall see in the ethnography below. The construction processes is shaped by coordination, alignment and adaption of several organizational and social networks and actors, which is similar to cases of railway planning in Sweden as described by Boholm (Boholm, 2013, pp. 169–170). The complex coordination demands dedicated dialogue between the parties in order to succeed. As argued by Boholm, such organizational decision-making often follows messy logics of practical and material considerations (Boholm, 2013, p. 169). In the present case, fire safety decision-making is shaped by several different logics of professional, regulative, collaborative and subjective considerations.

Indeed, the entire AEC industry is constituted by a vast number of communities of practice crisscrossing on an everyday basis in the design and construction of buildings. Professional differences and fragmentation have been present in the AEC industry for centuries, since the professions started to become increasingly specialized in designing, constructing and managing buildings (Turk, 2016, pp. 274–275). Thus, the industry is by default highly interdisciplinary with the only thing bringing the professions together – and forcing them to stay and work together for a while – being a construction (Turk, 2016, p. 278). However, what is particular about the AEC industry

[6] This has changed with the introduction of the updated version of the Danish Building Regulations and a certification scheme launched during 2019. According to these regulations and guidelines, buildings still cannot enter a construction phase before a building permit has been obtained. What has changed is that the final approval does not rest with the local authorities anymore, but solely with a certified fire safety consultant.

is that these interdisciplinary collaborations between different communities of practice (Lave and Wenger, 1991) are not necessarily repetitive, but temporary coalitions between two or more organizations (Bråthen and Moum, 2016). The lack of continued collaboration or repetitive meetings leaves few possibilities for learning from past experiences, iterative processes with known collaborators, and for building mutual understanding in cross-organizational collaboration (Muff Christensen, 2008; Håkansson and Ingemansson, 2013). It is these tangled logics, knowledge forms and collaborative challenges during the construction process, which is currently tackled through dialogue, and which digitization is promised to improve even further. Interestingly, research on the implementation of large-scale IT-initiatives meant to rectify industries from fragmentation have shown that the introduction of digital systems can reinforce, rather than reduce, the divisions they are meant to overcome (Hepsø, Monteiro and Rolland, 2009; Turk, 2016). It has even been noted that the implementation and use of ICTs in the AEC industry demands collaboration between users rather than supporting such collaboration (Morgan, 2017).

Since 2015, DBI as an organization has intensified the development of digital tools to assist with decision-making in fire safety designs among clients/collaborators with less experience and knowledge about fire safety. Internal communication from project and senior managers states that such digitization is motivated by the wish to make the FSPs' knowledge and expertise more accessible, understandable and applicable for fire safety non-experts in the industry and to help improve messy and flawed building processes. One of the digitization projects seeks to integrate smoke-simulations[7] into digital 3D-models to help simulate the spread of smoke in a digital building model, so architects might assess fire safety earlier in the design phase to avoid mistakes, costly redesigns and project delays later in the building process. A tool like this could increase the visibility and applicability of fire safety at much earlier stages than

[7] The smoke-simulations refer to so-called CFD-simulations (Computational Fluid Dynamics), which are computational and mathematical numerical models of how fluids behave. In relation to fire safety, CFD-simulations are used to calculate and predict the behavior of smoke, as well as the temperature resulting from the fire. Due to its complexity, a CFD-simulation may take up to three weeks to make.

now, and reduce misunderstandings and miscalculations during the design phase, thus lowering the costs of retrofitting and day fines during the construction phase.

On a general level, increased digitization and digitalization are areas of great concern to DBI. Remember Krause-Jensen's argument that 'concerns' are not homogeneous views but may be individual or shared, and that they provide direction in organizations, where the daily work is oftentimes marked by ambiguity, unresolved questions, doubts and conflicts in changing environments (Krause-Jensen, 2010a, pp. 268–269). Likewise, the concern about digitization at DBI is expressed differently across the organization and among employees. This article is only one part of a multivocal expression of concerns at DBI. But overall, the concerns may be split into two main tendencies. Some employees believe that digitization is the key to unlock better risk assessments and fire safety awareness. Others believe that digitization threatens risk assessments and challenges fire safety. Among employees with no professional background, education or training in fire safety, the concerns often focused on what digitization had to offer, and how DBI could boost, expand and harness the positive, productive and attractive qualities of digitization (and digitalization) for the benefit of expanding knowledge about fire safety. Among employees with professional backgrounds in fire safety (like the FSPs), the concerns were of a darker sort. Consequently, colleagues began perceiving one another as either technology reactionaries or digitization dreamers, and department managers disagreed and repeatedly negotiated different opinions on the scope and purpose of engaging with digitization. While DBI's management initially thought that the greatest obstacles would be its clients/collaborators' reaction to digitalization of fire safety, I suggest that the obstacle should be found in the preceding stages of organizing, developing and building the programs at DBI. Thus, I rephrase it as an issue of digitization.

4. METHODOLOGY

4.1. ANTHROPOLOGICAL APPROACH

This article is based on fieldwork carried out on and off from April 2017 until December 2018 at DBI and among its clients and collaborators during the processes of digitization initiated back in 2015. The fieldwork lay the cornerstones of the author's PhD[8] on how knowledge is digitized in the AEC industry in Denmark. Anthropology focuses on rich, deep understandings of social and complex worlds (such as organization) which defies objectivity, proofs or prediction (Luthans et al., 2013, p. 94). It seeks to build understandings from what is seen, heard, and experienced as opposed to trying to validate or confirm any a priori assumptions (Cefkin, 2013). In organizational studies, anthropologists foregrounds ideas, doubts, actions and reactions, thus focusing on how people negotiate organizational frames and discourses (Krause-Jensen, 2010a, pp. 84–85). This also means that incompleteness and constant change are common in anthropology (Marcus, 2009), since fieldwork is based on continual adaption to the particular field, situation and environment (Kozinets, 2010, pp. 59–60). This means that anthropology is an improvisational approach, which is subject to constant change and adaption, and therefore not a standardized or procedural approach (Malkki, 2007; Marcus, 2009). Consequently, anthropology is an iterative, comparative, open-ended, and yet critical inquiry into human lives (Ingold, 2017, p. 22). Anthropological knowledge accumulates over time and its analytical scope changes during fieldwork. Therefore, participant observation is more than merely a method to an anthropologist; it is a commitment to engage, learn and respond to the surroundings (Ingold, 2017, pp. 22–23).

[8] The research is an industrial PhD project, where a university, a private/public corporation/organization and a junior researcher collaborate in a triple helix constellation to develop and test promising technological possibilities and profitable future innovations for the dual benefit of the organization and academia (Etzkowitz and Leydesdorff, 2000; Innovationsfonden, 2019).

4.2. DESIGN AND METHODS

Such a vantage point calls for several approaches combined with an attentive immersion into the field(s) and the topic of investigation. Studying digitization both as practice and as idea in an organizational setting demands a holistic approach. Throughout fieldwork, I applied different methods and engaged in various forms of participant observation to obtain varying kinds of ethnographic data. Such triangulation (DeWalt and DeWalt, 2002, p. 102; Cefkin, 2013, p. 110) allowed for comparison between different data sources, pattern identification, recognizing variation, validation of past events, and testing and reexamining understandings. Thus, the project investigates social, professional and organizational aspects of digitization by following (Marcus, 1995) digitization as concept and practice in a corporate organization primarily through longitudinal participant observations (Spradley, 1980). In this way, fieldwork was conducted through 'polymorphous engagements' (Gusterson, 1997) where I observed, interacted, and collaborated across a number of dispersed and heterogeneous sites and contexts with colleagues/informants working with digitization (Green, 1999). Fieldwork was thus carried out by tracing four digitization projects at DBI along with a handful of smaller adjacent projects in order to investigate various digitization practices and explore diverse discretions and knowledge forms in different, situated contexts (Baird, 2017).

On describing the particular traits of participant observation, Susan Wright notes that an outcome of the tension in the anthropologist's dual role of immersion and reflection in participant observation during fieldwork is that 'problems' are discovered. These are not research hypotheses set up in advance (Wright, 1994, p. 11). Rather, Wright stresses that fieldwork most often sets out from a general issue to be investigated, but the core of a problem only comes forth after fieldwork has begun and during continuous analysis happening both during and after fieldwork (Wright in Luthans et al., 2013, p. 102). Such is also the case for me. Analysis and detection of these 'problems' has been going on since the first day I entered the field, and it may continue after the finishing of this article.

4.3. Overview of ethnographic data

The data rests upon extensive participant observation (Spradley, 1980) carried out during meetings and activities concerning the digitization projects I traced. Furthermore, participant observation involved spending days at the office, attending team building activities, department seminars, social activities, and joining industrial conferences with colleagues/informants[9] from the organization. During these days at the office, small-talk, research interviews and exchange of opinions mixed and melted into ethnographic data. Such conditions are well-described challenges for researchers researching their own organization, where the formal parameters of an interview may blur as interviews are continued afterwards by the coffee machine (Tietze, 2012, p. 58; Karsten, 2020b). Netnography (Kozinets, 2010) also served as a crucial entry point, where participant observation was carried out online through daily e-mail correspondence with colleagues/informants and via access to intra-organizational communication platforms.

By and large, ethnographic data may be ordered into primary and secondary data respectively, according to what they consist of and when they were collected (Madden, 2010, p. 137). Primary data in the form of fieldnotes were written during participant observations whenever possible, yet always on a daily basis during fieldwork. Furthermore, the primary data consist of semi-structured interviews (Spradley, 1979) with 40 interviewees in different job positions (see table 1 below) lasting 1-3 hours, all transcribed verbatim. The secondary, complimentary data gathered before, during and after fieldwork consists of 250 pages written material produced by DBI, i.e. press releases, newsletters, articles, brochures, and a book about the company history. After fieldwork, fieldnotes and transcribed interviews were coded and categorized using

[9] I use the slash between colleague and informant to indicate the close relation and yet recurring indistinguishability between my colleagues and informants, as they were often (if not always) both. For more perspectives on this matter in organizational anthropology, see Jordan (2013, pp. 69-70) and Garsten and Nyqvist (2013a, pp. 15-17).

NVivo, and recurring themes across the data were condensed and elaborated in different thematic and analytic directions (Glaser and Strauss, 1967).

TABLE 1. INTERVIEWEE DETAILS

	n = 40	Percentage
GENDER		
MALE	32	80
FEMALE	8	20
JOB POSITION		
FSP	12	30
DEPARTMENT MANAGER	7	17,5
PROJECT MANAGER	6	15
ENGINEER *	5	12,5
SOFTWARE DEVELOPER	5	12,5
CEO	3	7,5
RESEARCHER	2	5
PLACEMENT		
INSIDE ORGANIZATION	26	65
OUTSIDE ORGANIZATION	14	35

* The job position category 'engineer' is composed of different engineering disciplines such as naval architect, mechanical engineer, and fire safety engineers.

5. ETHNOGRAPHY

This section provides an ethnographic account of how dialogue and concern plays out on an everyday basis among the FSPs. I show how contextual risk assessments, professional negotiations, and dialogues among the FSPs themselves, and between the FSPs and their clients, make the basis of FSPs' concerns about digitization. According to the FSPs, an absent dialogue caused by digitization would hamper their possibility of educating and helping clients and collaborators in due time and thus mitigate mistakes, misunderstandings and flaws (which ultimately may lead to hazards) during the

design phase. Based on the ethnographic material presented below, I argue that we must achieve a greater understanding of how dialogue unfolds in professional settings in organizations in order to comprehend why and how professionals are concerned with digitization's dark sides.

5.1. Assessing risks and negotiating fire safety through dialogue

One spring morning at DBI in the first months of my fieldwork, I talk to Stefan, an experienced FSP and engineer who got hired by DBI fresh out of university some 12 years ago. Stefan and I sit opposite of each other in the grey cubicles in the open-plan office, which we share with some 40 colleagues on this floor. Here and there, lush and neat, almost artificial, looking plants are placed strategically yet somehow casually in arrays to work as room dividers and sound absorbers. There is a buzz of people typing on their keyboards, others talking on the phone and yet others chatting with colleagues at the coffee machine. Stefan rotates on his black office chair while reflecting on a question I just asked him about how they assess fire safety. He stops rotating and looks at me: *"There's a really big difference on how you interpret the regulations and law stuff, which are seemingly standard and alike. I guess we use the same knowledge differently? There's a big difference at this office. No, I mean we agree on most of it, but that's only because we've discussed it for many years and gradually built up a uniform opinion on the matters we advise on. We talk with each other about what we do, all the time. I would say that 90% of what we do is fairly similar among us. But the rest varies."* I study Stefan's expression, which is slightly humorous and yet thoughtful. He studies me back, as if he is expecting another question from me. Next to me in a neighboring cubicle sits Hans, another FSP. Like Stefan, he has extensive experience in the field. His background is as a building technician and he is one of the most knowledgeable at DBI about the use of digital technologies within fire safety.

As I talk with Stefan, Hans looks up from his computer screen, breaks away from the work he is doing, and starts talking. It is clear that he has been listening to our

conversation: *"You know, there's a standard requirement of twenty-five meters escape route. You could say that twenty-five and a half meters would be okay, because it's a minor variance. Twenty-six might perhaps also be okay, but at some point it'll be too much, like thirty. But in some cases I would accept the thirty, for instance if it's a room with a high ceiling and a few people, then you could argue for the extended escape route. But if it's a night club with a three meter ceiling and it's dark, I would under no circumstances accept an extended route. Because then there's a higher risk that it might go wrong. But in a storage building with two people in it, then it's not so important whether there'll be five or ten meters longer to an escape route, because before the smoke descent reaches a critical stage, people will already be out of the building. It's a constant weighing and evaluation you make from case to case. You can't assess the cases identically. But at the end of the day, it all comes down to agreeing on one solution and sticking with that. You might have a handful of equally good fire safety designs, but ultimately the best fire safety strategy is the cheapest one or the one which most parties can agree on."* Stefan nods his head while Hans talks, seemingly agreeing. I also nod, as I try to understand what Hans just told me.

* * *

A few months later, I am in a car with Astrid, a senior FSP with more than 20 years of experience in the field. We are returning to the office from a site meeting between DBI, the architect, the building owner and the local fire-fighting authority. We discuss the meeting and the issues raised by the different parties present. For instance, she and the representative from local fire-fighting authorities were in complete disagreement about risk factors and safety levels, despite the fact that they were former colleagues. The negotiations on the fire safety design have been going on for months, and the construction process has been paused until some agreement is reached, much to the

dissatisfactions of all parties. Astrid looks thoughtful while driving. During the meeting, matters of collaboration, communication and different risk assessments took center stage, as they so often do. Astrid starts talking: *"I guess architects must sometimes feel powerless in this whole process? They draw something, and once they reach a new phase, typically where we are, it's forced upon them to adhere to all sorts of regulations, which they do not understand fully or are capable to navigate properly. Then we come and tell them that they need to redo the whole thing or that they need to add this and that. Of course, that makes fire safety an annoying part of the construction phase, and also known for the most expensive one, because everything we want costs extra money and time which no one counted in initially. If the building owner was promised this and that, and we come and force a massive aluminum escape staircase onto their design and glass facades, demand sprinkling and all that…then we're the bogeyman. But someone has to be the bad guy, because who else cares for those who cannot run fast, the weak ones, the ones who sleep, the children?!"* She looks at me questioningly. I shrug my shoulders to signal that I have no answer to her question.

To Astrid and her colleagues, differences in the assessments and designs are sources of dangerous mistakes, costly retrofitting and potentially disastrous outcomes. It might have terrible consequences with fatal outcomes if a client/collaborator misunderstands the consultants or do not comply with the designs. However, the FSPs often feel that the entirety of a fire safety design is rarely considered by anyone other than them. Therefore, the FSPs perceive the dialogue as the direct way to attend to the core of their task: to manage the powerful and potentially lethal forces of fire, which no one else fully understands or respects.

Back in the car, none of us say anything for some time. Then Astrid continues, her eyes fixed on the road ahead of her: *"Fire safety is not a straight line, but an up-and-down movement like a wave.* [Astrid removes her right hand from the steering wheel and slides it up and down in the air] *You cannot decide in advance that this* [Astrid signals an invisible line with her raised hand] *is the fire safety level, and then you obey by that. That's why we so often have discussions with the local authority:*

because that's the way they perceive it. They follow the building regulations so strictly… I think it's because we have different perceptions of the safety level? Fire safety is subjective, and you cannot describe it properly in a regulation or a guideline. Once we had this case with a fashion show in a big storage house, where we did a simulation on how long time it would actually take until people would be affected by the smoke before they would reach the exits. The local authority completely rejected the simulations, because the fire we'd made was not big enough. To me it was a rather big fire compared to what could happen." According to the FSPs, one of the major sources of error are the mistakes and misjudgments made by non-expert professionals in the industry, because they do not know, lack professional insight to consider everything affecting the process. Therefore Astrid and her colleagues perceive their assessments as crucial for the building process, because it seems to them that they are the only ones capable of comprehending all aspects of fire safety, while they perceive other professions' assessments as dangerous (due to lack of knowledge), rigid, or as slowing down the entire building process.

Summing up, a diverse interface of cross-organizational negotiations, different risk assessments, contested meanings and professional differences demands dialogue. Despite their acknowledgement of differing, subjective, risk perceptions, the FSPs strive to communicate clear-cut fire safety solutions through dialogue due to past experiences with misunderstandings, misinterpretations, flaws, and rigidity. These experiences serve as a backdrop for the FSPs' digitization concerns.

5.2. Concerns when digitizing discretion in fire safety

In June 2018, there is an afternoon status meeting on simulations at DBI. Peter, a young FSP with expertise in simulations like Hans, is responsible for advancing the development of the integration of the simulation into 3D-formats. He is very enthusiastic about the idea – but also concerned about the potential implications of it. Peter describes the digital cleansing-process during a simulation as a difficult work process,

which demands continuous attention from a specialist. He explains that this specialist must sit in front of the computer screen and manually cleanse the model and assess which obsolete objects he/she might remove to obtain an optimal simulation process. I raise my hand to ask a question. Peter pauses and nods at me. I ask him what it is in these models, which is dirty and must be cleansed. Peter smiles tolerantly at me as if I just asked a question of a 4-year-old. He explains that there are tiny cracks in the walls, invisible distances, or sharp edges, which you might not notice when you design a building in a computer program. Furthermore, elements such as door handles, toilets or acute angles in the building hamper a smoke simulation and will only make it packed with flaws or slow down the entire simulation. Peter tells us that Hera [one of DBI's collaborators, red.] believes it is indeed possible to program a kind of cleansing in the software where one could remove an inner shell from the construction and run a simulation based on that. In Hera's opinion, this will allow for a much faster and smoother simulation than what is possible now. Peter shakes his head with a doubtful expression on his face. He argues that it is a challenge and not possible to perform this kind of programming on buildings the same way as the project Hera had done, where they did it on the insides of a tunnel. Continuing onwards, Peter and another of the FSPs, Petra, agree within minutes that it makes good sense to digitally remove a shell from the insides of a tunnel and do simulations on this geometry, but not on complex buildings or constructions. None of the other meeting-participants oppose their reasoning.

Peter and Petra's arguments and concerns centers on how certain knowledge-forms are fit for digitization. They argue that it should not happen without the close company of assessments performed by a consultant in person. According to the FSPs, digitization makes good sense in simple building designs not deviating from the building regulations. An algorithm might very well perform standardized repetitive tasks more efficiently and correctly than a FSP. For instance, a fire safety design must indicate fire compartments and fire-separating elements in the building. As it is now, the FSPs mark these elements and compartments either manually by drawing with red

and blue markers on paper drawings, which they subsequently scan and e-mail to their collaborators; or digitally on the computer where they draw the colored lines on top of existing lines with the mouse in a PDF-program. Subsequently, an architect will redraft these colored lines more minutely in a shared, digital model of the building. The FSPs perceive a procedure like this as ideal for digitization. However, buildings vary and quite often deviances occur and call for more specialized, contextual assessments. The rule of thumb is that the more complex a building is, the more deviance must be made from the building regulations. The FSPs believe that digital decision-support tools may help with the standardized processes until a certain, yet unarticulated point, when the building designs start to deviate from standard procedures in so many ways that assessments form an FSP is needed.

Later during the status meeting, the project manager asks Peter to what extent he thinks it is possible to do what they had initially set out to do in the work package: integrate smoke simulations into 3D-models. Peter looks towards an undefined point in the room. His gaze is heavily absent for a few seconds. Then he re-focuses his gaze, looks at the project manager and replies, *"I think it's possible to some degree, but I also think it's problematic if the computer is going to make human assessments. It's difficult to make this kind of product, which is able to provide indication for actions and which we trust and dare to release into the public. But perhaps it's possible to make some light-version, which would be able to say whether one was totally off?* [...] *It's dangerous to make a product which people trust that DBI vouches for, because we have developed it. I mean, it would be really unfortunate if our clients start to put too much trust in some tool, which would ultimately mean that DBI could be held responsible for the advice or output given in the tool."* [...] The meeting concludes with the project team deciding not to proceed with the integration due to the risks they foresee. Instead, the team decides to develop a kind of light-product which may provide rough, suggestive indications on the fire safety level, but which will not be sufficient to assess the fire safety level independently without involving a fire safety consultant.

The final discussions at the meeting circles around how clients/collaborators will react to the output and recommendations in the tools and how much (and how blindly) they will trust them, because they have been made by DBI. To the FSPs, digitization implies a demotion of validity and an imposed compromise. Here, validity describes a professional, situated, sentient assessment where several contexts and options may be compared and weighed, and not a computational process where a pre-defined number of options are available and the end-user might not know the background for each option. The discussions result from recent experiences with competing tools similar to the one, which Peter, Petra and their colleagues are also trying to build. Some weeks earlier, Peter and Petra performed trouble shooting on these competing digital tools, which were supposedly able to assist satisfactorily with fire safety. After these tests, the verdict was clear among the two: the tools signal very interesting and promising technological developments, but they are still highly flawed and potentially dangerous to use if one does not know how to interpret the output or know how to read a fire safety design. I sat next to Petra during the trouble shooting session. She argued this way while testing the rivaling tool: *"This tool is really dangerous if those sitting at the other end of the computer don't have any clue about fire safety. There's so much knowledge defined by dependencies, and everything is conditioned by the information you feed to the program. As a user, it seems difficult to know what is set as default mode in the tool, whether the information it gives you is valid, and how the tool models human factors*[10]*? I'm not sure I would want externals to be the ones defining the dependencies, cells and sections."* Thus, the FSPs argue that to support validity in fire safety, digitization and subsequent digitalization must always begin with FSPs feeding a computer with calculations, regulations or models, and end with FSPs analyzing the output and presenting it in a meaningful way to the clients/collaborators. This is how

[10] *'Human factors'* form a great risk factor in fire safety engineering, supported by theories on accident causation, as accidents are direct or indirect results of human actions and errors (Shappell and Wiegmann, 2000; Chen et al., 2013; Kongsvik, Gjøsund and Vikland, 2016). Examples of such human errors may be flaws in the design and building process, communicative misunderstandings, design corrections or additions throughout the building process, lacking professional skills, and insufficient knowledge on fire safety.

it is currently done with their use of digitized smoke simulations. Trained to plan for the worst possible outcome, the FSPs are concerned with how fire safety practice will transmute in digitization. What they have seen so far has not impressed them; on the contrary, they are deeply concerned with the potential dark sides of digitizing the dialogue, which usually frames their risk assessments, negotiations and interpretations.

6. Discussion

6.1. Considering 'dialogue'. Framing fire safety as mētis and techne

Stefan, Hans and Astrid described the constant negotiations and agreements that must be settled during processes of fire safety design. Their careful assessments of regulations, temperature and statics combined with observer-dependent, experience-based knowledge fused through a professional dogma stating that *"fires never behave as the textbooks teach"* guided them in judging the risks and values at stake. Thus, I suggest that the FSPs' fire safety practice expresses a complex intertwinement of *mētis* and techne, which is framed and balanced through dialogue. We remember that *mētis* speaks of embodied skills and acquired knowledge through employee-to-employee training, which is applied in concrete, particular situations (Scott, 1998, pp. 313–316). Recall also that *techne* finds expression through universal, settled and impersonal rules, standards and principles of explanation and verification (Scott, 1998, pp. 319–320).

By unpacking fire safety through *mētis* and *techne*, I argue that fire safety is composed of four equally important and interrelated factors, which shape and influence fire safety dialogue, practice and expertise. The factors are 'objective factors', 'subjective factors', 'building regulations' and 'collaborators', and are presented in figure 2. The four factors are constantly balanced, weighed out against each other and negotiated through dialogue. The 'objective factors' refer to inputs such as temperature, smoke behavior, fluid dynamics, evacuation time and statics. The second factor are 'subjective factors' which describe so-called *"gut feelings"*, professional backgrounds,

and individual risk assessments. The third factor is 'building regulations', which the FSPs must often interpret and apply to fit with specific designs and/or situation. The last factor is 'collaborators', which designates a mixed group of equal colleagues in and outside DBI, ministries, local authorities, fire-fighter authorities and clients. This group consists of a broad continuum ranging from experts to non-experts in the field.

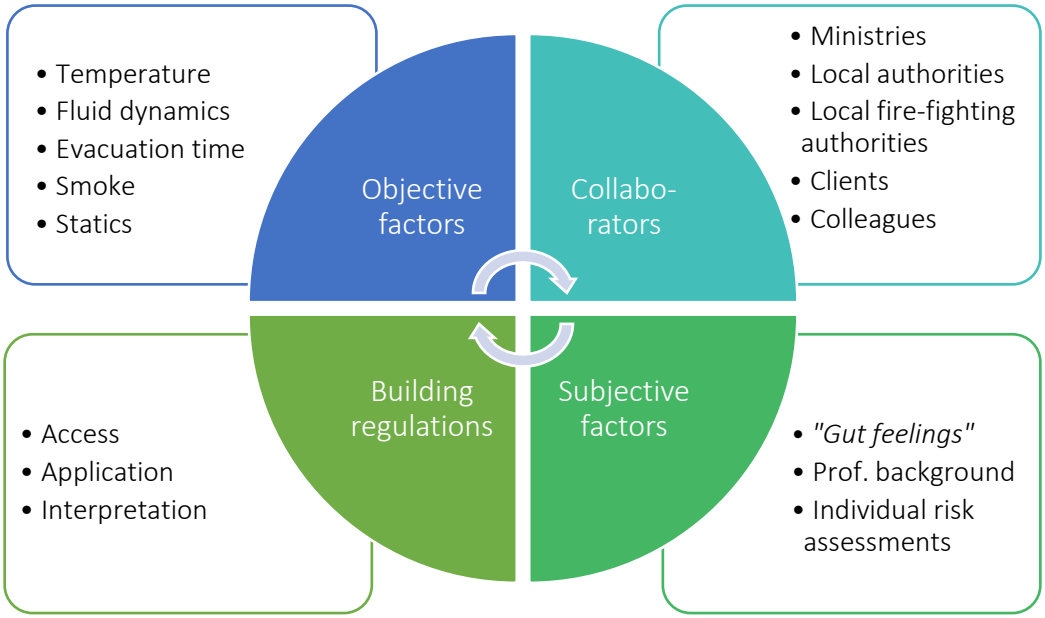

FIGURE 2. THE FOUR FACTORS OF FIRE SAFETY. FIRE SAFETY AS MĒTIS AND TECHNE IS COMPOSED OF FOUR INTERRELATED FACTORS; OBJECTIVE FACTORS, SUBJECTIVE FACTORS, REGULATIONS AND COLLABORATIONS. THE FIGURE IS NOT AN EXHAUSTIVE MODEL FOR FIRE SAFETY

The illustration of fire safety as *mētis* and *techne* visualize the inherent complexities and entangled interests, and presents fire safety designs as full of negotiations, contestations and compromises between these two knowledge forms. Indeed, fire safety is not merely about knowing the building regulations by heart, or knowing limit values for smoke temperatures or decoding fluid dynamics (i.e. *techne*-like knowledge forms). While it is widely assumed in risk communication that risks may be defined by quantifiable measures, scientific standards, and statistical calculations (Boholm, 2015, pp. 91–92), practicing fire safety is just as much about interpreting the regulations, knowing when to deviate from them, applying knowledge about local stakeholder agendas, and finding creative solutions to challenging problems (i.e. *mētis*-like knowledge

forms). In short, fire safety *mētis* and *techne* is about interpretation, negotiation and balance, which makes fire safety practice full of ambiguity and uncertainties. Woods notes that ideas *"prevail not because they are the 'best' ideas in technical or professional sense but because they meet social, organizational and political needs of key actors"* (Woods, 2007, p. 69). Likewise, a good fire safety strategy and design prevails and rests not only on techne, but equally (and perhaps most importantly) on *mētis*. This is similar to what was found by Boholm in her studies of the Swedish construction industry. Boholm argues that despite prevalent notions on standardization, regulations and objectivity (i.e. *techne*), risk assessments among professionals in the construction industry rest primarily on informal, pragmatic and intuitive use of experience and inference of subjective probabilities (i.e. *mētis*) (Boholm, 2015, p. 92).

I suggest that dialogue describes a way of attending to these entangled decision-making processes and complex knowledge forms inherent in fire safety, in an ever-changing environment, where different disciplinary points of view and compliance with client frameworks affects what counts as knowledge, risk and safety. Through dialogue, the FSPs *'frame'* (Goffman, 1986) a combined 'package' of techne and *mētis* for their clients. Through such framing, they are able to make knowledge understandable, thus enabling them to define and manage it (Czarniawska and Löfgren, 2012, p. 7,11). It is a well-established argument that professions create and warrant knowledge (Knorr Cetina, 1999). Professionals exercise control by defining reality, devising frameworks, creating typifications and organizing our ideas about such reality (Scott, 2008). Van Maanen contends that if professionals have a sense of collective identity, they will claim a mandate to define the proper conduct of their work, not just for themselves but for others as well (Van Maanen, 2015). I suggest that the FSPs claim such a mandate to define valid fire safety knowledge and practice through dialogue and management of the complex, contextually dependent knowledge. Such specialized knowledge often turns into an esoteric knowledge difficult to assess by any other than the professionals who master the knowledge (Alvesson, 2011, p. 1645). Indeed, Cochoy

writes that managers of overflow may be thought of as modern alchemists who transmute one matter into another (Cochoy, 2014, p. 277). Czarniawska makes a similar point by suggesting that *"consultants are merchants of meaning"* (Czarniawska, 2013, p. 12). The FSPs might be considered as exactly that: as professionals who sell and manage meaning, and transmute intertwined and complex fire safety *mētis* and *techne* into concrete actions and designs through dialogue.

6.2. NOTES ON 'CONCERN': DIGITIZING DIALOGUE AND DISLOCATING MĒTIS FROM TECHNE

However, digitization may dislocate the transmutation performed by the FSP in dialogue by foregrounding *techne* and muting *mētis*. The FSPs argue that digitization might increase risks of fire hazards rather than mitigate it, because contextual, embodied knowledge (i.e. *mētis*) seems to spin uncontrolled through cyberspace in becoming digital information (i.e. *techne*) deprived of context, and thereby loses its origin and meaning. In this respect, knowledge implies an individual knower, while information may be stored, retrieved, selected and organized for use and reuse by many people (Blair, 2010, p. 2). Information is thus seemingly separated from bodily practice and beyond one's own experiences (Peters, 1988, pp. 15–16), whereas knowledge – as I argued – is made up of context, experience and individual background.

Despite the fact that digital tools are propagated in the AEC industry through their ability to transfer knowledge across contexts, I suggest that these digital tools communicate and organize knowledge in significantly different ways from what has been standard in the industry. The typical relationship in consultancy (Czarniawska, 2013) between a provider of knowledge (i.e. the FSPs), who transforms knowledge into sensible information and thereby reduces uncertainty and offers interpretation, and a receiver of such information or interpretation (i.e. the client/collaborator), who is then able to make sense of uncertainties, changes with digitization. I argue that this is because digital tools tend to operate according to a techne-like understanding of

knowledge, rather than as a balance between *mētis* and *techne* as the FSP usually do. In a digital regime, knowledge is codified, quantified, made into rules and standardized information, and moved from one context to another (Miller and Horst, 2012; Almklov and Monteiro, 2015). Digitization enables the creation of abstract yet approachable, commodified and consumable entities, which can mobilize knowledge and move it across contexts (Almklov and Monteiro, 2015). In the case of fire safety, I argue that *mētis* is condensed and ordered in standardized rules in a digital system, subsequently lifted out of its context, and formed into *techne* for interpretation by fire safety non-experts. Practicing good fire safety is about knowing the regulations by heart and applying ranges of standardized rules and values, which supports its digitization potential and underlines the *techne*-aspects of fire safety. The trouble is that practicing good fire safety is also about knowing by intuition and embodied experience when to deviate from the regulations, which underlines the *mētis*-dimension of fire-safety and supports the argument of keeping the dialogue-based agreements and designs.

The dark sides of digitization lies in the yet unknown implications of standardizing professional dialogue and dislocation of *mētis* from *techne*, thus jeopardizing the fire safety assessments made and adding a new layer of risk to already existing risks. Digitizing fire safety not only implies risk of fire hazards, but also about risks of dislocating *mētis* from *techne* and the risks of non-experts misunderstanding digital outputs or failing to use the programs correctly according to the FSPs. Thus, concerns about dislocated dialogue raised by the FSPs during digitization flags additional areas of concern in later digitalization. For instance, the FSPs are deeply concerned to what extent and how clients/collaborators will follow the(ir) fire safety directions and how they will be held liable when algorithms and not FSPs make the decisions and provide the solutions. Above all, they worry if these dislocations and transformations of dialogue and knowledge will cause more fires and hazards, which introduces the terrible risks of lost lives and values. Will the clients/collaborators accept the claims made by the digital tool all too easily, as feared by Peter and Petra. And if clients/collaborators trust the digitized dialogue, how does it impact fire safety and the dialogue? As the

programs are still in the process of digitization, such questions will remain unanswered until the later phases of digitalization have unfolded.

7. CONCLUSION

This article reports on anthropological research on digitization of professional knowledge and practice in an organization among FSPs, whose knowledge face digitization in the near future. I focus on digitization rather than digitalization, because I find that improving the understanding of digitization and its potential dark sides is crucial to our investigations of digitalization. I approach digitization as a social, cultural and organizational practice through the concepts of *'dialogue'*, *'mētis'* and *'techne'*, and *'concern'* to consider how various knowledge forms, risk assessment and negotiations play out in fire safety. I show that the FSPs' concerns center around clients/collaborators' potential misunderstanding of digitized output, liability issues, and possible wrong use of the digital tools leading to faulty fire safety designs with fatal consequences looming. I have particularly zoomed in on their concern for the possible dislocation of *mētis* and *techne* currently framed through dialogue. I argue that professionals are concerned about digitizing fire safety because of the potentially drastic consequences of dislocating professional knowledge. I show that contrary to current focus on technology resistance or apprehension among professionals, 'concern' more aptly captures professionals' engagement with digitization as it underscores complex organizational contexts and professionals' dialogue as defined by several competing knowledge forms, interest and stakeholders.

Therefore, I suggest that this change of framework – from resistance and apprehension to *concern* and *dialogue* – provides a different entry point for understanding professionals' engagement with digitization as expressions of care and dedication. This conceptual change may foster more empathetic and understanding collaborations within and across organizations during digitization as well as in subsequent digitalization. I argue that scrutinizing the concerns and implications raised by professionals

in early-stage digitization can help us foresee unintended consequences of later-stage digitalization; not only in terms or risk and safety, but also in terms of how professionals will organize, appropriate and utilize digital technologies in and across organizations.

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ARTICLE FOUR.

CHANGING EXPERTISE: ORGANIZATIONAL CHALLENGES OF DIGITIZING FIRE SAFETY [1]

ABSTRACT

Like many industries worldwide, the Danish architecture, engineering and construction industry is currently in the midst of digitizing knowledge, procedures and standards to achieve better productivity, collaboration and communication. However, the task of digitization is also one of many challenges, especially when it comes to translating 'real world' practices into digital information, which ultimately produce value. This article provides anthropological perspectives on the digitization of fire safety expertise in the Danish AEC industry based on longitudinal, ethnographic fieldwork in an organization undertaking digitization projects. The organization in question is the Danish Institute of Fire and Security Technology (DBI), a medium-sized research and technology organization specializing in providing fire safety and security training and consultancy. In the article, I show how professional and organizational notions about what constitutes knowledge and expertise organize digitization, and how the very same expertise is transformed and dislocated by digitization. I argue that while the organization aims to

[1] Karsten, M. M. V. (2020). Changing Expertise: Organizational Challenges of Digitizing Fire Safety. Submitted to: *Organization Studies*.

digitize knowledge, they are in fact trying to digitize expertise, which is entangled in organizational practices and professional backgrounds. Questions about authority, validity and expertise of these take center stage during digitization in organizations, while it also demands new kinds of expertise and collaborations. The article proposes three key challenges of digitization. First, organizations oftentimes underestimate the scope of digitization. Second, expert knowledge is confused with professional expertise when digitizing. Third, due to the nature of digitization clients are unintentionally involved in assessing context-dependent knowledge, which they may have no prerequisites for assessing. Managers of ICT implementations and digitization initiatives may benefit from considering these challenges as they develop and implement digital technologies.

1. INTRODUCTION

Since the mid-1990s, the use and implementation of different information and communication technologies (ICTs) in organizations and corporations have mushroomed, oftentimes due to their so-called 'collaborative advantages' (Baba, 1999, p. 332). For more than two decades, technological ubiquity in organizations has promised to increase efficiency and accuracy, create more controlled and frictionless operations, speed up work processes and reduce administrative tasks, enhance products by making them 'smart', boost innovation, and hinder human errors, conflicts, and misunderstandings (Kinder-Kurlanda and Boos, 2017, p. 198). In the architecture, engineering and construction (AEC) industry, where this article reports from, ICTs like computer-assisted drawing programs and BIM[2] are seen as key to improve collaboration, coordination and communication both within and across organizations (Smith and Tardif, 2009, p. 27; Abdelmohsen, 2011, p. 1). Such hope and faith in ICTs should be viewed in light of the industry's preoccupation with problems such as low productivity and delays (Hardin and McCool, 2015), poor communication and collaboration across organizations (Sacks *et al.*, 2018), and budget overruns (Georg and Tryggestad, 2009).

In other words, the performance of organizations – not only in the AEC industry, but across industries – is increasingly linked with the ability to share knowledge successfully within and across organizations. Such performance of expertise is increasingly linked with implementation and use of ICTs, which must capture organizational processes and practices, and hence transform professional practices (and knowledge about those) into digital information (Knox *et al.*, 2007, p. 22). Generally, digital systems are thus perceived by organizations and corporations as a way to ensure that knowledge is 'captured' in organizations as assets and owned as products (Adelstein,

[2] BIM is an abbreviation of 'Building Information Modeling'. The main concern in BIM is to create computer-integrated construction multi-dimensional models, which support a common language and methods to collaborate across the industry (Turk, 2016, p. 275). DBI's intention with project 'Plugin' is to add a 'layer' of fire safety dimensions onto the BIM models.

2007, pp. 861–862), and as a means to help establish shared language and joint practices for knowledge sharing across boundaries in and across organizations (Yeow, 2014). The backdrop for such attention to knowledge sharing in contemporary corporations is the politico-economic idea of 'knowledge-based economies', where smart machines, digitization and ICTs are perceived as enablers of innovation, knowledge transfer, and flexibility, which are seen as key components in capital accumulation (Schou and Hjelholt, 2018, p. 47). Consequently, 'knowledge work'[3] is highly valued as an economic, social and political desirable differentiator closely linked to professional status, economic change and business performance (Adelstein, 2007, p. 858; Schou and Hjelholt, 2018, p. 47).

Thus, ICTs and digitization present contemporary organizations with the possibility to transform and move knowledge across contexts, and with the prospect of value generation (Knox *et al.*, 2007, p. 27). But digitization *also* presents organizations with the challenge of what kinds of knowledge to include and exclude in the making of ICTs. This means that we must ask what happens with knowledge during digitization, and what this transformation tells us about recurrent challenges in succeeding with digitization (e.g. Yeow, 2014; Sims, 2017; Balslev, 2020). Oftentimes, explanations for such challenges refer to professionals' 'deskilling' or 'reskilling' (Eriksson-Zetterquist, Lindberg and Styhre, 2009; Susskind and Susskind, 2015), imposed new approaches to work (Plesner and Husted, 2020, pp. 240–257), end-user involvement (Høstgaard, Bertelsen and Nøhr, 2011), or management's role (Dubé, Bourhis and Jacob, 2005) to name but a few examples. For instance, Eriksson-Zetterquist and colleagues conclude in their study of ICT implementation in organizations that, *"professional skills and identities may be affected by the technologies used"* (Eriksson-Zetterquist, Lindberg and Styhre, 2009, p. 1166). Such conclusion does indeed point to

[3] Peter Drucker coined the term 'knowledge work' in 1959, which denotes productive applications of knowledge, organizational activities that systematize and standardize knowledge, and capital investments through formal education (Drucker in Adelstein, 2007, p. 854).

the important interrelationship between ways of organizing and implementing digital technologies in organizations. But it does no more than scratch the surface.

Regrettably, discussions of transformative ICT initiatives and implementations often fail to capture the powerful and normative intra-organizational organizing, reshuffling, and negotiations of knowledge, procedures, and practices that go into developing, implementing and using digital technologies in organizations (Suchman, 1995; Baba, 1999; Orlikowski, 2007; Pors, 2018). Indeed, from an anthropological perspective, organizations are highly complex, political, and shaped by continuous negotiations, contestations and reworkings of ideas, relations, tensions and power (Wright, 1994, pp. 4–10; Garsten and Nyqvist, 2013b, p. 10; Wright in Luthans *et al.*, 2013, p. 103). In this article, I present ethnography from a longitudinal, collaborative fieldwork at the Danish Institute of Fire and Security Technology (referred to as DBI), where I traced digitization of fire safety knowledge across multiple sites in the Danish architecture, engineering and construction (AEC) industry. The ethnography shows how ways of organizing fire safety expertise at DBI are intrinsically entwined with how digitization of such knowledge unfolds in the organization. Thus, I argue that professional expertise *is indeed affected* by technologies, and that notions about what constitutes expertise and how it is organized likewise affect and shape digitization's evolvement in organization. Consequently, when we investigate how organizations digitize and ask why digitization of professional knowledge or practices is challenged, I believe we should ask how professional expertise is entangled with the organization it is wielded in and by, and how such expertise changes with digitization.

2. Transforming Expertise Into Value: Theoretical Perspectives

Deeming knowledge (work) carried out by professionals suitable for digitization presupposes that knowledge can be condensed and moved across distances. To understand such assumption about digitization's transformative capacities, I turn to the idea of 'transformation' proposed by Hannah Knox and colleagues (Knox *et al.*, 2007) which

is a simple yet apt manner to conceptualize digitization from an anthropological perspective. In their studies on the development and implementation of digital enterprise resource planning (ERP) systems in corporations, Knox and her colleagues show how information becomes re-synthesized and reorganized to produce managerial 'knowledge', which can later be used to perform tasks and make strategic decision about organizational paths and change (Knox *et al.*, 2007, p. 22). Such idea about how digitization transforms knowledge is based on the reasoning that 'real world' phenomena becomes abstracted into data, which gets turned into information. Information is then mobilized as knowledge that returns to transform the real world with the intention of creating value of some sort, e.g. generating profit (Knox *et al.*, 2007, p. 27). I include Knox's work, because I find that it helps to nuance our understanding of what digitization entails and importantly what it promises to deliver (i.e. value) in organizations. It helps us refocus our analytic gaze away from being primarily interested in end-users or give professional groups during implementation of digital technologies, and alerts us to the organizational transformations that digitization may cause already during development.

Interestingly, the notion of 'transformation' highlights that the constitution of professional 'expertise' changes with the transformations that digitization causes (Knox *et al.*, 2007, p. 27). They argue that the more classic notion of expertise as *"knowledge gained by trial and experimentation"* has changed with digitization in more recent management discourse to mean the mastery and ability to manipulate objectified abstractions (Knox *et al.*, 2007, p. 36). Expertise in the wake of digitization is thus not only about how experts produce and apply knowledge in the classic sense of experienced 'knowledge workers' – it is also about how experts gain the ability and authority to perform contested and contingent transformations (Knox *et al.*, 2007, p. 37).

How can we theorize such expertise? As Knox and her colleagues write, expertise is in its classic notion based on gaining knowledge through trial and experimentation (Knox *et al.*, 2007, p. 36). But in fire safety and practices of risk assessments, expertise is more than that: it denotes a learned ability to know when to follow numbers, rules

and standards, and when to deviate from them to allow for experiences from previous cases and discretion to shape the assessments (Boholm, 2010; Almklov *et al.*, 2018; Karsten, 2020a). Exploring such expertise a bit further, I draw on James Scott's distinction between *'mētis'* and *'techne'*, which he uses to conceptualize the skills that constitute complex activity in high-modernist endeavors (Scott, 1998). For Scott, *mētis* encompasses a range of practical skills and acquired knowledge, which are used to adapt to ever-changing environments and circumstances (Scott, 1998, p. 313). Thus, *mētis* denotes skilled application of knowledge in particular, local situations (Scott, 1998, p. 316). *Mētis* can only be learned by practical engagement, whereby the apprentice develops a sense of the craft, the materials and contexts among master craftsperson and senior colleagues (Scott, 1998, pp. 313–314). Conversely, Scott considers '*techne'* as knowledge which may be formulated comprehensively in standards, rules and principles based on deduction (Scott, 1998, p. 319). Thus, *techne* refers to universally agreed-upon knowledge, which may be taught in a more formalized and impersonal manner than *mētis*, and that is often associated with quantitative information, including a prevalent focus on universal science-based explanations and verifications (Scott, 1998, p. 320). I find Scott's concepts useful to highlight the close entwinement, continuous negotiations, and balancing between embodied knowledge (i.e. *mētis*) and general rules (i.e. *techne*) in fire safety expertise. I return to this later.

What then becomes of such *mētis* and *techne* once organized and digitized – what are the professional and organizational implications of such transformation? Years before Knox's study, Shoshana Zuboff (Zuboff, 1988) set out to explore ICTs' impact on information, power and authority among professionals in organizations. According to Zuboff, ICTs challenges and alters organizations, especially because of a particular duality (Zuboff, 1988, pp. 6, 9). On the one hand, ICTs '*automates'* work practices and knowledge held by employees in organizations, which ensures continuity and control over processes (Zuboff, 1988, p. 8). But simultaneously, ICTs also *'informates'*, which means that the technologies generate information about the practices, knowledge and procedures it automates and through which an organization accomplishes its work

(Zuboff, 1988, p. 9). Prior to digitization and automation, such practices were oftentimes opaque in the organization, but by means of *'informatig'* knowledge, events, and objects are made visible (Zuboff, 1988, p. 10). This means that information and knowledge on work practices are suddenly made visible and accessible not only to managers, but also to employees, who can now take more control over their work: authority is redefined and traditional hierarchies unravel (Zuboff, 1988, pp. 6, 400–401). I intend to take Zuboff's argument a bit further in the discussion by including external clients as another group beyond managers and employees to whom work practices are made visible and accessible by means of digitization. Such externalization or outwards implosion of knowledge (Jiménez, 2011, p. 184) may destabilize existing professional hierarchies in the AEC industry.

3. THE CASE

DBI is a specialized research and technology organization[4] in the Danish AEC industry. DBI's 250 employees draft, produce, disseminate and sell information, knowledge and expertise about fire safety and the application of fire safety regulations by providing consulting, training, testing and advice to public institutions and private corporations. During the past 100 years, DBI has developed a prominent and peculiar position in the industry. On the one hand, fire safety is but one dimension of constructions, in which decisions on statics, plumbing, technical facilities, inflow of light, ventilation etc. all affect the design of a building. At the same time, DBI assists the Danish Building authorities in drafting the fire safety regulations, which the Danish AEC industry must

[4] Research and Technology Organizations in Denmark are partly state-funded and engaged in tasks of promoting innovation on technologies and infrastructures in industries and society (GTS, 2019a). RTOs undertake these tasks through consultancy, training and participation in national and international research and development activities (ERATO, 2019).

adhere to, and which DBI eventually offers consultancy on how to understand, interpret and apply. Consequently, DBI is a central political player with economic interests in running a profitable business in the Danish AEC industry.

Since 2015, fire safety professionals (FSPs) at DBI have worked on digitizing fire safety knowledge by turning the fire safety regulations into an interactive tool called *'Lookup'* and by building a digital program called *'Plugin'* for computer-assisted drawing programs used by their clients and collaborators. These programs target fire safety non-experts like architects, who may use the program in their decision-making process during building design. DBI takes great interest in this digital transformation to make fire safety knowledge more accessible, understandable and applicable for fire safety non-experts in the hope that it will help bring down the number of fire incidents, save lives, and help avoid budget overruns. A key motivation for the FSPS has been to convert *"dead knowledge"* in drawings in pdf-documents, which are rarely possible to interact with or adjust into *"alive knowledge"* in interactive 3D-models. Another key motivation among the FSPs has been the benefits of digitized *"knowledge sharing"* internally at DBI and externally among clients, which they believe will provide better services, design more safe buildings and help boost organizational learning.

Framing knowledge through dialogue is crucial in FSPs' work (Karsten, 2020a). The FSPs spend much time on aligning opinions and discussing and negotiating assessments among FSP colleagues as well as between collaborators and clients. In this dialogue, context is everything because it decides what is included or excluded in the risk assessments. I find that such construction of context is bound up with how DBI organizes its expertise. Until now, the FSPs have been responsible for constructing fire safety contexts, because they believe risk assessments are slippery, difficult to manage, and challenging to get a hold on. But with digitization such construction of context and framing of knowledge through dialogue will be reshuffled and distributed across multiple sites to also include clients and collaborators in unprecedented ways. Thus, when it comes to digitization in organizations, context not only relates to narrow definitions

about inclusion or exclusion of given knowledge. I argue that context *also* denotes issues of power, authority, expertise, and ways of organizing.

4. Research Setup and Anthropological Engagement

The article is based on fieldwork carried out on and off from April 2017 to December 2018 at DBI and among its clients and collaborators. I was employed by DBI to investigate how expertise and knowledge is digitized in the Danish AEC industry. Thus, I was employed by the organization which I was also researching, and carried out a sort of 'contract ethnography' (Fayard, van Maanen and Weeks, 2016). In this setup, interlocutors were always also colleagues (I refer to them as 'colleagues'), and I was also always both an outsider (as researcher) and an insider (as colleague). Such blur of lines during fieldwork is well described in organizational ethnography (Hepsø, 2013; Järventie-Thesleff *et al.*, 2016; Karsten, 2020b). I decided to grapple with such methodological and ethical challenge by acknowledging this close-knit relation between business and research, and engaged collaboratively (Lassiter, 2005) during fieldwork.

This meant that I joined colleagues on projects and helped them out as part of fieldwork. We co-produced products, articles and events, and I shared drafts of manuscripts and presented analytical ideas to them, which they provided feedback on. Studying digitization as practice and idea at DBI thus demanded a holistic methodological approach. The *'Lookup'* and *'Plugin'* projects cut across multiple departments, questioned existing knowledge hierarchies at DBI and economic structures, and involved decisions of up to twelve top, department and project managers on different levels, who all had a say in the matter. To account for such complicated medley of actions and actors, I traced and followed digitization across multiple sites (cf. Marcus, 1995) and in the hands of multiple people during the development and making of digital products. I traced digitization by means of participant observation (Spradley, 1980) during meetings and activities such as team building activities, seminars, social activities, and joined colleagues at expos on digitization. Participant observation also

entailed office days, where I would sit by my desk, get coffee, and work on a paper, write emails etc. like my colleagues/informants. Here, small-talk and interviews mixed and melted into ethnographic data. Such blurring is a well-described challenge – but also a source great insight – for researchers researching their own organization (Tietze, 2012, p. 58).

Such anthropological engagement was complicit (Marcus, 1997, 2001). It was carried out across multi-sited and contested spaces among colleagues and counterparts similarly positioned as myself and with their own critical sensibilities which they brought into common projects (Marcus, 2001, p. 524), including a shared endeavor to try and understand the powerful processes of digitization in an organizational context. Ultimately, such collaborative research setup and positioning led to ethnographic data and analytical insights, which I had not been able to reach or gain access to otherwise, as other organizational or corporate ethnographers before me have also argued (Oliveira, 2012; Røyrvik, 2013; Lex, 2016).

I strived to obtain different kinds of ethnographic data. Such triangulation (DeWalt and DeWalt, 2002, p. 102; Cefkin, 2013, p. 110) enabled possibilities for comparing different data sources, tracing patterns across fields, recognizing variations in beliefs, attitudes etc., and continuously testing and reexamining understandings among my colleagues. In sum, the ethnographic data consists of fieldnotes written during participant observations throughout the entire fieldwork period spanning over twenty months, as well as semi-structured interviews (Spradley, 1979) with 40 interviewees positioned differently in relation to the digitization projects (see table 1). I gathered complimentary data and information before, during and after fieldwork, i.e. press releases, newsletters, brochures, etc. Upon fieldwork, fieldnotes and interviews were coded and categorized using NVivo, and recurring themes were condensed and elaborated in different analytic directions (Glaser and Strauss, 1967).

TABLE 1. INTERVIEWEE DETAILS	N = 40	PERCENTAGE
SEX		
FEMALE	8	20
MALE	32	80
EDUCATIONAL BACKGROUND		
ENGINEERING	18	45
SOFTWARE, PROGRAMMING & DESIGN	6	15
BUILDING TECHNICIAN + CRAFTSMAN	5	12,5
ECONOMICS, BUSINESS & MANAGEMENT	5	12,5
EMERGENCY MANAGEMENT	2	5
ARCHITECT	2	5
COMMUNICATION, MARKETING & SALES	2	5
JOB POSITION		
FIRE SAFETY PROFESSIONAL	13	30
DEPARTMENT MANAGER	7	17,5
PROJECT MANAGER	6	15
ARCHITECT/ENGINEER	4	12,5
SOFTWARE DEVELOPER	5	12,5
CEO	3	7,5
RESEARCHER	2	5
PLACEMENT OF INTERVIEWEE EMPLOYMENT		
INSIDE THE ORGANIZATION	26	65
OUTSIDE; CLIENTS & COLLABORATORS	14	35
INERVIEWEES AFFECTED BY THE DIGITIZATION PROJECTS		
EMPLOYED IN DEPARTMENT(S) IMMEDIATELY AFFECTED	13	37,5
EMPLOYED IN DEPARTMENT(S) PARTIALLY AFFECTED	6	15
EMPLOYED IN DEPARTMENT(S) NOT AFFECTED	7	17,5
EXTERNAL COLLABORATOR INVOLVED IN PROJECT	2	5
EXTERNAL COLLABORATORS NOT INVOLVED	12	30

5. ETHNOGRAPHY: ORGANIZING DIGITIZATION

DECEMBER 2017

The meeting with the expert monitoring group was well under way. We had discussed 'Plugin', and now we turned to 'Lookup'. Erik – a senior manager and FSP who had been involved in the projects since their beginning – explained the overall purpose of the 'Lookup'-tool:

"Instead of having the entire guideline in a dead pdf as a kind of publication, we've put it into this html-format and made the content searchable. You can add notes to the text, and what's most important is that you can knowledge share internally at your workplace or organization. You can knowledge share your notes and your 'list of demands' for different building with colleagues and collaborators. In that way, you can use the tool to build knowledge exchange and knowledge sharing".

The participants in the group listened to Erik. The all come from major architecture firms, and had extensive experience with working in computer assisted drawing programs, but not with fire safety as such. As Erik spoke, many nodded; knowledge sharing, collaboration and remembering which parts of the regulations must be applied where are major concerns in fire safety. Participant A asked, with hope clear in his voice: *"Will there be links to DBI's recommendations and assessments?? Whenever we call you, you say 'You have to check in appendix this or that'. It would be A LOT easier, if you just linked directly to that in the tool!"*

Erik nodded, and faced Participant A as he replied: *"That could be one way to do it. We're nowhere near that stage yet. Right now 'Lookup' is a platform, and we're trying to figure out if this could be a way for you to work*

with fire safety. And it is indeed possible that we'll have a full library where you can check whichever information, guideline or regulation you want."

Participant B nodded and continued along the line of Participant A's concern: *"Well okay, that's all very cool. And we really like that we're now working according to performance-based rules*[5]*. But that still does not solve our problem! Sometimes those regulations and guidelines are just too abstract and disconnected, because what does the text actually mean? What precautions must be made more specifically? What must be done in terms of design and structural aspects? That's why we use your examples and guidelines so much. For instance, what does it mean when the regulation say that: 'The party wall must be connected with the weather screen'? How far out must that wall reach? That needs to be contextualized and explained further..!"*

Erik replied attentively: *"Well, that could be one way of doing it, definitely. But that's not what's most important for us. What we're asking about now is what features you'd like, how many options do you need.."*

Participant C seemed baffled by Erik's reply and the prospect of using a tool developed by DBI that would present fire safety regulations without accompanying help, instructions for applications or suggestions for contextualization. He interrupted Erik and asked in disdain: *"So wait, there will be no premade checklists or 'lists of demands' that will help me or enable me to say: 'Okay, show me everything on housing, show me everything on hotels? Lists where DBI indicates which paragraphs, pieces of regulations or other stuff to include or consider in relation to a given building?"*

[5] Performance-based rules are defined in relation to what function the building is meant to have, as opposed to prescriptive rules which concern simple buildings that do not deviate from the building regulations. For instance, a storage building with few people inside must meet different criteria than a retirement home with mobility-impaired persons in case of evacuation.

The project manager of 'Lookup' – Sofie – was also at the meeting. She looked inquiringly at her colleagues and replied hesitatingly: *"Uhm, no…?"* Participant C scowled and replied, clearly taken aback: *"So what…you want us to search for all of this information ourselves anyway??"*

One of Sofie´s colleagues came to her rescue, and argued: *"It could be something that would be added over time! Maybe you have some FSPs at your company that can make those 'list of demands', and these lists will be the baseline for how you and your company assess fire safety in buildings. You would be able to access documents in which your in-house FSP have added his comments, assessments and previous experiences in relation to this or that piece of regulation. And since the 'list of demands' are made digitally, they can follow a construction project throughout the building process and across your company, so you don't have to search again and again for all those sticky notes in the books and guidelines. But DBI will not make any predefined 'lists of demands'."*

Participant C maintained his disbelief: *"Because!?? It would be worth its weight in gold to be able to retrieve the top five – or how many it is that you have? – the top fire categories, that you see people are looking for, and then make them available for us in that tool..!"*

As I listened, I remembered a meeting among some other FSPs a few weeks before, where 'Lookup' had been discussed. Here, Erik had also stressed the value of the knowledge sharing that the program could facilitate, both within DBI and among the clients. One of the other FSPs looked deeply troubled and asked: *"Does that mean that others will be able to see what we write and read our comments and memos? I mean, those outside: our clients? Because what I write, my memos, they're only for internal use! I write very specific stuff in those notes, and not general stuff!"* The Erik reassured her that the knowledge sharing would be for internal use only, and that their clients would have to make their own knowledge sharing.

I refocused my thoughts back at the meeting, where Erik answered more questions: *"This is not very different from when you query in a pdf-document. We all know how to do that, and the program highlights the words you searched for. But the 'list of demands' are our way of suggesting how organizations can share more knowledge internally…add some space for free text, allow for writing and communication, make it accessible to all in the organization. We have no ambition to be the arbiter of taste and tell you what is right and what is wrong. But we do wish to support knowledge exchange about fire. And it's always tricky to teach old dogs new tricks – your colleagues will have to change and start doing things differently."*

Participant A supported Erik's ideas, but also challenged his rejection to include DBI's interpretations in the tool: *"At my company, there are quite a few who never use the guidelines, but ONLY use your recommendations that DBI made. My colleagues believe that the regulations and even the guidelines on how to understand those regulations are way too non-specific and vague! We can make nothing out of it, and then we'll have no benefit of a tool like this.. We really need someone to can interpret all the bullshit for us. We don't need that piece of text or information; we need explanations to what this piece of test or information means? What are the implications of it?"*

AUGUST 2018

Sofie had called for a steering committee meeting today about 'Plugin'. As project manager, she briefed the committee members, who were all senior managers. A core issue in the project collaboration in had been to bridge gaps. One major gap existed between different departments at DBI. Here, it was a recurrent discussion who would be responsible for maintaining and running 'Lookup' and 'Plugin', once the development ended. A example

of such unresolved responsibility had been which email the clients would use if the needed to get in touch with DBI or had questions concerning the program. Should there separate emails; one for technical support and one for fire safety support from the FSPs? Or one email? In that case, which department should that email refer to? Sofie thought that the email should refer to the FSPs, but she was not sure, and had left the decision with the steering committee.

Erik was one of the members of the steering committee. During another meeting a few weeks before, Erik had argued fiercely against the use of technologies like virtual reality as part of sustaining an educative dialogue with non-experts or as part of training sessions. He had pointed out that it would compromise the FSPs' professionalism and the validity of their assessments, be too costly, take too many years to develop, and that it was unclear who would willing to pay for it. But after Sofie was done talking, Erik was the first one to speak: *"I don't want to ask the users about the content of this program – because we can easily vouch for that, since we made the calls on the content and the knowledge sharing. I want to focus on the added value that this program provides. It's no use to ask the users what they want, because we don't know yet what we can give them. We're dealing with the question about whether the features that we've put in the program are relevant for their work."*

Helena was also in the committee, although she is not an FSP. She has extensive experience with research and development project work. Therefore, she agreed with Erik that it was time to test the program, but unlike him she wanted very much to involve the users: *"The next step is to test among the users whether this way of thinking and this kind of logic proves to be the right one and fits with their way of working. We might have our ideas as experts about what kind of knowledge they need, but that's not necessarily what is needed and gives value right now among the users."*

> […] As the meeting ended, the steering committee and Sofie had concluded that yet another meeting was needed with involvement of more senior managers to decide the fate and future of the programs. As our colleagues left the room, I stayed while Sofie collected her things. I asked her how she felt about the entire process. She exhaled, and shared her concern: *"It's so difficult! Everyone is so busy with what they are doing on a daily basis. Everybody is hoping that they will not be selected to continue with the development of this product, because it involves so many people from different departments, because it's a totally new way of thinking about fire safety and doing business in our field. Maybe there's not a significant need out there in the market right now, and the business is running smoothly at the moment. But what about in three years? Five years? What then? This digitization is a way to future-proof DBI. But still, it's so difficult to kick-start!"*

6. Discussion

In the meeting with the expert monitoring group, the participants from the architecture firms asked for help and assistance in 'Lookup' to better understand the regulations and guidelines. Erik and his FSP colleagues avoided the topic. To them, knowledge sharing should *not* travel unverified and unauthorized across organizations and contexts from DBI to their clients. Rather, fire safety knowledge sharing should remain within DBI and the architecture firms respectively, and thereby ensure that fire safety was continuously managed, controlled and framed by the FSPs. This belief shaped how the programs were developed and the features that were coded into them. Erik suggested that the participants change their way of working and thinking about knowledge sharing to adapt to programs like these. Eighteen months later at the steering group meeting, Sofie and the senior managers were still discussing what the architecture firms wanted these tools to be able to do, and how they could be incorporated into their work. The design of the 'list of demands' had not been changed. Despite recurrent discussions about which kinds of professional expertise were needed or seen

as prerequisites for the success of the digital tools, the pivotal importance of fire safety expertise in relation to other involved knowledge domains remained unquestioned, as the example with the email indicates. Yet, the overarching question that Sofie, Erik and the senior managers kept circling around – how to convert expertise by means of digitization, and why it caused such troubles – remained unanswered. In this discussion, I propose three challenges that may illuminate some of the causes for DBI's digitization difficulties.

6.1. Challenge One: Underestimating the Context of Digitization

The ethnography shows how my colleagues consider fire safety knowledge as something which can be (relatively easily) digitized, and that the troubles do not arise until later stages of digitalization where 'users' must be convinced of the value of the tool. I would like to challenge this notion, because I believe that they miss a crucial point. In their discussions about the value of the digital programs, my colleagues quickly jump to talk about profit, usability, and whether it works well as part of architect's daily work practices. That is indeed an important discussion to have, but they completely skip any discussions about context, how to construct context in those programs, and ways of organizing such context construction at DBI.

In other words, my colleagues focus on issues of *digitalization*, which refers to processes where technologies must be implemented in organizations and adopted to end-users (Plesner and Husted, 2020, p. 7), while I believe that the issue at hand is *also* equally important one of *digitization*. To put it bluntly, they underestimate the organizational magnitude of digitization. I do not refer here to digitization in its narrow semantic meaning; i.e. a singular process of converting analogous knowledge into digital information by means of binary numbers and algorithms (Plesner and Husted, 2020, p. 7). Digitization is a much more socially and culturally encompassing phenomenon than its definition indicates. As this article shows, it is a practice which ties together and questions ways of organizing professional expertise, and which demands new forms of expertise and collaborations. Digitization kick-starts *'transformations'*

(Knox *et al.*, 2007) in organizations, which ultimately results in external *'informating'* (Zuboff, 1988) of fire safety expertise. None of these processes are neutral, easy or simple; they are infused with politics, power and competing notions about expertise. Digitization challenges and changes DBI's ways of displaying and organizing fire safety across the organization and particularly in the departments affected by such transformation, and it reshuffles how DBI produces, manages, and frames expertise.

Thus, digitization does something – it changes expertise, it questions prevalent ways of organizing knowledge in an organization like DBI, and it transforms parts of the FSPs' practices because it denotes much more than merely a conversion of one matter into another. It triggers an array of transformations from practice to data to information to knowledge to value, as Knox and her colleagues argued (Knox *et al.*, 2007, p. 27). In this way, fire safety is transformed from being subtle practices carried out in the 'real world' by FSPs into binary data bits and information describing a series of predefined actions or particular pieces of building regulation/guideline in a computer program. It is assumed that such digitized information will generate and improve knowledge about fire safety matters, thus creating value for clients and customers and generating profit for the industry as well as DBI. Through such transformation, digitization redefines ambiguous practices and particular knowledge into objective, neutral and standardized data-bits and informational categories, which can then be fitted into digital programs (see e.g. Hepsø, Monteiro and Rolland, 2009; Almklov and Monteiro, 2015). Thus, it dislocates knowledge, validity and professional dialogue (Karsten, 2020a).

6.2. Challenge Two. Digitizing Knowledge Or Expertise?

Digitization is *not just* a matter of transforming a piece of building regulation or knowledge about how to interpret such regulation into a digital format and seeking to generate value. Rather, digitization intersects with entire ways of wielding knowledge and expertise in organizations and industries. Not only does digitization transform and

shape expertise, as argued previously and as Knox and her colleagues would also have it. The expertise, or the professional and organizational self-perception about such expertise, also shape digitization. The FSPs' ideas about fire safety knowledge and expertise, what constitutes their professionalism, and what kind of knowledge they believe they wield in relation to their clients shaped the development of the *'Lookup'* and *'Plugin'* tools. For instance, Sofie's ideas and caution about hierarchies, and her weighing of fire safety knowledge compared technological knowledge shaped how the program will assist and help users. This is where the question and challenge of how organizations organize enters the stage and becomes highly relevant to consider in relation to digitization. While DBI try to digitize *knowledge* about fire safety, I argue they are in fact trying to digitize *expertise*, which is much more challenging to convert and transform because it is particular, contextual and entwined with ways of organizing at DBI. The FSPs perform risk assessments and devise safety strategies based on how they interpret and apply the fire safety regulations. They construct contexts, and as the example with Stefan showed, the FSPs assess whether four minutes is enough time to escape a building. I consider such work practice on interpretation and contextualizing as more than expression of professional knowledge. I consider it as highly social practice and a distinct professional expertise (Dilley, 2002; Grytnes, 2018; Karsten, 2020a).

If we conceptualize fire safety expertise with help from Scott's notion of *mētis* and *techne* (Scott, 1998), we see how fire safety practices are firmly based on *techne*, but also that practicing fire safety presupposes a *mētis*-based feel for the fire safety *techne*. In other words, there is much more to fire safety than just *techne*. Yet in the *'Lookup'* and *'Plugin'* projects at DBI, the FSPs do not factor in such entwinement of *mētis* and *techne*. Rather, they focus solely on fire safety *techne*, and the distribution of such knowledge. Such focus illustrates the assumptions at DBI that fire safety practices can be transformed into – and almost already is – available knowledge, and how such knowledge can be made into information for clients, which they will readily grab to create value in their projects. Even though the participants in the meeting ask for

interpretation and contextualization/*mētis* rather than knowledge/*techne*, DBI maintains the notion that transformation and sharing of *knowledge* as asset and commodity is the core of digitization and digitalization. This links to a widespread notion at DBI and in the AEC industry[6] that access to more and better knowledge among non-experts can mitigate 'human factors' and reduce mistakes, hazards and accidents (Wróbel, Montewka and Kujala, 2017; Corrigan *et al.*, 2018; Lawani, Hare and Cameron, 2018). ICTs and particularly BIM-models are seen as a means to achieve dissemination of knowledge from experts to non-experts and thus heightened fire safety (Smith and Tardif, 2009; Wang *et al.*, 2015). I argue that this predominant focus on knowledge marks the core of the second challenge. DBI believes that fire safety *knowledge* is what must be digitized, and they seek to do so in the 'Lookup' project. However, I suggest that DBI miss the fact that *expertise* is what they try to digitize, because they try to include notes on how to assess a given piece of regulations, design a feature called 'list of demands' which is intended to help include or exclude pieces of knowledge from a context that the user must create. To sum up, I suggest that misconceptions about digitizing knowledge and digitizing expertise respectively is also part of the challenge in doing digitization.

6.3. Challenge Three: Unintended Guests

Knox and colleagues write that digitization reshuffles previously fixed distributions of authority and thus changes the parameters of what expertise looks like, which also introduces new needs to skillfully master processes of transformation in new ways (Knox *et al.*, 2007, p. 27). In the context of digitization, expertise is not only about how to produce and apply knowledge – it is also about how to gain expertise and authority in carrying out contested and contingent transformations (Knox *et al.*, 2007, p. 37). In this regard, DBI appear not as professionals with a century of expertise to draw on–

[6] Conversely, in social science research on risk and safety in the AEC industry, the dominant argument is that risk and safety practices are learned, situated and embodied within organizations in which they are carried out (Gherardi, Nicolini and Odella, 2008; Haukelid, 2008).

but also as novices, when it comes to digital transformations of fire safety. With Knox, we see a clash of expertises at DBI between established ways of fire safety expertise and a new, untested way of digitization expertise. It alerts us to shifting notions about what yields expertise: mastery of contextualization or mastery of transformation. Thus, digitization presents fundamentally different ways of working with knowledge dissemination, and it questions the expertise as well as the validity of the FSPs' professional assessments that DBI have worked for decades to establish.

Following this realization, I would add to Zuboff's argument that not only does digitization make knowledge more visible internally among colleagues – it also does so *externally* towards the clients. The ability of digitization to *'informate'* reaches beyond internal organizational workings and hooks onto external relations. Indeed, Alberto Corsín Jiménez notes that one of the consequences of the intense preoccupation with reporting and outwards distribution of information in organizations is that *"knowledge 'implodes outwards' in the form of information for external use"* (Jiménez, 2011, p. 184). Such reporting enables a redefinition of ambivalences and ambiguities into neutral terms: it transforms knowledge obtained at one place into questionable information in another place (Jiménez, 2011, pp. 183–184). Adelstein also observes how digitization enables expressed knowledge to be captured in organizational technology systems and subsequently made available and accessible for appropriate, external others (Adelstein, 2007, p. 863). So far, DBI has legitimized the FSPs' expertise through its capacity as a trusted organization. But with digitization and its more or less unintended ability to *'informate'* fire safety, the FSPs' expertise may be scrutinized by clients and collaborators, who now have to legitimize it through their use of the digital programs. This marks the third challenge: the unintended invitations of clients and collaborators into constructing fire safety contexts, which DBI has traditionally constructed.

7. Conclusion

This article rests on ethnographic data from a longitudinal anthropological fieldwork carried out at the Danish Institute of Fire and Security Technology (DBI), where I traced digitization projects across multiple sites in the Danish architecture, engineering and construction (AEC) industry. A crucial aspect in fire safety is to assess and account for contexts, determine contexts, decide what must be included or excluded, and ultimately frame and communicate these contexts and their implications for non-experts such as clients or collaborators. For over a century, DBI has been responsible for constructing such context. But with digitization, such expertise in constructing contexts is reshuffled and distributed across multiple sites and now involves clients, collaborators and algorithms. In this article, I show how professional and organizational notions about what constitutes knowledge and expertise in fire safety organizes and shapes digitization at DBI, and I show how the very same expertise is profoundly transformed by digitization. I argue that while DBI aims to digitize *knowledge* about fire safety, they are in fact trying to digitize something much more encompassing and entangled in organizational practices, professional background, past experiences and particularities: fire safety *expertise*. Consequently, questions about the authority to construct context and the professional validity of these take center stage, while demands for new kinds of expertise, collaborations across organizations and involvement of external clients rise. Thus, digitization not only denotes conversion of given knowledge; it *also* describes socially and culturally pertinent matters of authority, expertise, and ways of organizing in contemporary organizations.

The article discusses these arguments through three summarized challenges, which I believe describe primary reasons for why digitization appears as a tricky endeavor. First, I suggest that organizations or project managers of digitization projects underestimate or neglect the scope and magnitude of digitization. Second, I argue that during digitization of professional knowledge at DBI, such knowledge is confused with expertise. Third, I find that in the wake of digitization, external clients/collaborators are unintentionally involved in assessing context-dependent knowledge. It is advisable

that managers of ICT implementations and digitization initiatives factor in these challenges as part of driving development and implementation of digital technologies.

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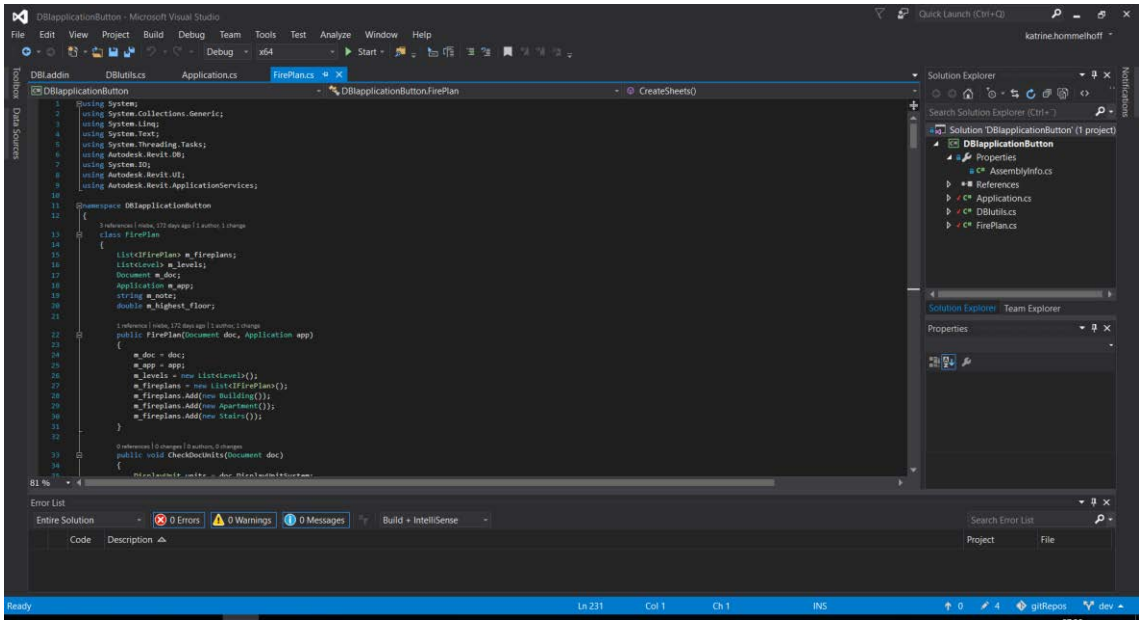

FIGURE 15. SCREENDUMP OF CODING IN THE 'PLUGIN' TOOL.

CHAPTER EIGHT.

CONCLUSIONS

The guiding question in this thesis has been what happens when expertise is digitized by the organization that wields this expertise, and why digitization in organizations often turns out to be a challenging endeavor that does not work out as expected. I have pursued these questions in the context of fire safety expertise in the Danish AEC industry, specifically at DBI. Here, I have conducted fieldwork among FSPs at DBI, who face digitization of their practices and knowledge in the near future. Consequently, this thesis investigates how digitization organizes, i.e. how fire safety expertise is

transformed into digital information intended to create value among external clients/collaborators, and equally important how organizations digitize, i.e. how ways of organizing fire safety expertise at DBI affect and shape digitization's trajectory in the organization.

My overall argument is that in digitization, knowledge is dislocated from the practices (i.e. expertise) that contextualizes it at DBI. Digitization changes professional knowledge, but the problem with such transformations is that the dislocation affects not only the particular knowledge that digitization intends to target, but an entire area of expertise containing practices, workflows, and relations in and across DBI. As DBI digitizes the FSPs' knowledge, they simultaneously dislocate expertise and practices that make DBI flow and function in the first place. Digitization thus changes expertise while also fueling the need for new kinds of expertise, which creates ruptures and barriers in the daily organizing. In effect, digitization in organizations like DBI describes challenging endeavors to engage with powerful imaginaries while balancing these with ways of organizing professional expertise. Here, a field of tension between ways of digitizing and ways of organizing marks the challenging space which DBI navigates and negotiates as they seek to digitize fire safety expertise.

In the introductory chapters one to four, I lay out the context and empirical setting of digitization at DBI and in the AEC industry. I show that at DBI, wielding expertise and navigating in a highly politicized and transdisciplinary field such as the AEC industry has fostered a need among the FSPs to pay close attention to how fire safety non-experts understand regulations, how professionals collaborate, and how construction projects continuously must adapt and attune to changes. In chapter two, I consider what kind of organization DBI is, and elaborate on my anthropological understanding of organizations. This leads to chapter three, in which I draw the contours of the field of fire safety and the regulatory landscape surrounding the work of the FSPs and DBI

as an organization. In chapter four, I sketch out global, Danish and local imaginaries and initiatives on digitization, both inside and outside the AEC industry.

The introductory chapters indicate that digitization is a highly ambiguous, powerful and contested practice shaped by, and shaping, social and cultural workings in organizations. Indeed, in articles three and four I show how digitization seeps into everyday organizing among professionals at DBI, and how organizational workings steers digitization in given directions. In short, I suggest that understanding digitization is integral to our understanding of organizations, and vice versa. Thus, I argue in chapter five for a theoretical interweavement of 'organization' and 'digitization', because I find that these closely entwined social and cultural phenomena amplify the their shared ability to powerfully transform and relocate expertise, practices and relations across contexts. Digitization dislocates '*dialogue*' from its context and adjacent dimensions of '*mētis*' and '*techne*'. Conversely, DBI's way of organizing expertise, tasks, and powerful relationships profoundly shapes how digitization is done at DBI.

In chapter six, I focus on methodological and ethical considerations. During fieldwork at DBI I worked as both researcher and employee, and engaged in complicit collaboration with my informants, who were always also my colleagues. In article one, I consider this setup and the challenges of doing organizational fieldwork through the idea of *passing tests*. I suggest that my choice to engage collaboratively and focus on proving the relevance and applicability of anthropology in DBI were decisive for my access, acceptance and engagement. However, in chapter six I also argue that this idea of being either 'inside' or 'outside' during a fieldwork like mine makes little sense. Therefore, I turn to the notion of '*correspondence*' and '*complicity*' to better conceptualize and grasp my ethnographic engagements. At DBI, I worked alongside colleagues, where all parties tried to understand the impact of digitization on DBI, and how the industry engages with digitization. Our complicit collaborations crystallized in parasites of transdisciplinary dialogue. Article two is an example of this. It is written with colleagues Aqqalu Ruge and Thomas Hulin, and in it we discuss how to merge anthro-

pology and fire safety engineering and transgress disciplinary as well as epistemological differences. Such complicit collaboration turned out to be a fundamental precondition for carving out an understanding of digitization in organization.

Chapter seven precedes articles three and four. Here, I touch upon the curious dichotomy that while digitization may serve to underpin FSPs' dialogue with clients/collaborators and promote desirable safety practices, regulations, and risk assessments, digitization also introduces new risks, dislocates the FSPs' carefully constructed dialogue and calls for new kinds of expertise. Thus, I suggest that what makes digitization a challenging effort at DBI is the continuous negotiations of how to digitize and how to organize.

In article three, I argue that the FSPs use *'dialogue'* with clients and collaborators to best communicate about fire safety, mitigate risks and ensure quality in fire safety strategies. In this way, fire safety expertise is a balancing of '*mētis'* and '*techne'* framed in dialogue; these are knowledge forms, that speak of particular, embodied knowledge *and* objective, technical knowledge respectively. I argue that the risk of dislocating mētis from techne in the dialogue is a major concern among the FSPs. Thus, contrary to current focuses on resistance or apprehension among professionals, I show that the FSPs are '*concerned'* about digitizing fire safety because of the potentially stark consequences of the dislocated dialogue. This shift provides us with a different entry point when studying digitization in organizations and with the possibility to foster more empathetic, productive and understanding collaborations during digitization.

In article four, I turn to the question of how DBI organize the 'stuff' they intend to digitize. Constructing, assessing and accounting for (fire safety) contexts has been a core task for DBI and the FSPs for more than a century. But with digitization, the FSPs' as well as DBI's expertise in constructing contexts is reshuffled and redistributed across sites, and clients, collaborators and algorithms stand to be involved in this decision process. What is interesting is that DBI does not talk of 'expertise' but solely about 'knowledge' in relation to the benefits of digitization. However, I argue that

while the digitization at DBI intends to digitize *knowledge* among the FSPs, the projects are in fact trying to digitize *expertise*. Such task is far from easy and severely underestimated, based on what we learn about fire safety expertise in article three. During such transformations of expertise, questions about the FSPs' authority, the validity of their assessments, and the value of their expertise take center stage – followed by demands for new kinds of expertise in understanding and applying the digitized output.

The conclusions in this thesis have implications for how we theorize and work with digitization in organizations. For one, how do we engage with digitization from here, knowing that it dislocates the dialogues and expertise we seek to get a hold of digitally? Second, how do we build transdisciplinary collaborations that take into account and take seriously the concerns raised by professionals during digitization? Finally, I find that the diversity in anthropological knowledge production experienced during fieldwork and the need for rethinking the ethnographic approach in terms of complicit collaboration in para-sites begs the question of whether contemporary, anthropological fieldwork in organizations demands an epistemological change of gears? Questions like these indicate, that that there is more to be done, investigated and discussed about digitization and ways of organizing – both among scholars and practitioners. Therefore, this thesis ends with thoughts and reflections on the implications of anthropological fieldwork. These reflections in chapter nine preface six recommendations and suggestions in chapter ten for concrete actions on how organizations and managers may go about digitization.

FIGURE 16. TOOLS FOR ENSURING GOOD FIRE SAFETY. PHOTO BY DBI AND AUTHOR.

CHAPTER NINE.

IMPLICATIONS OF THIS THESIS

This chapter serves as a preface to the recommendations arising from this thesis. In this chapter, I consider anthropologically informed recommendations in relation to the discipline and its practice, knowledge creation and professional impact.

In their review of the development in anthropological studies of organizational cultures, Wright and Krause-Jensen explain the difference between anthropological

and non-anthropological approaches to organizational culture (Krause-Jensen and Wright, 2015). They conclude:

> *"A major difference is that much nonanthropological description of culture shares an appetite for 'how to,' which often leads to treating culture and values as 'variables' that cause or regulate behavior in uniform ways. There is a huge difference, however, between the lived experience of working in organizations, with their ambiguity and confusion, and the tidy management texts and reports on 'organizational behavior.' A major tenet and ambition of anthropology is to capture those experiences and understand them in the context in which they are situated. […] and to do a cultural critique (in the enlightenment sense) of the culture concept and the way it has been understood and put to use in organizations and among management researchers"* (Krause-Jensen and Wright, 2015, p. 350).

This distinction is instructive and indicative of the different disciplinary approaches to organizational culture, and it aptly gives the context of the expectations I met during fieldwork about anthropology and what it can do for organizations (see chapter 5, including article one and two): If I was interested in culture, I should be able to suggest how to improve it. Yet to me, Wright and Krause-Jensen's observation that anthropologists capture experiences, understand them in their context, and do cultural critiques of organizations also illustrates the complicated relationship that anthropologists continue to have with organizations they do fieldwork in and with, and how to voice critiques that fieldwork and collaboration with powerful institutions yield (Baba, 2009, p. 380). Despite increasing blur of the boundaries between anthropology and businesses/organizations in recent years (Baba, 2012, pp. 56–57), anthropologists continue to claim more nuanced knowledge, better methodology and a particular ethical grounding compared to other disciplines (Jöhncke, 2018a).

In my opinion, this is a shame. Based on the experiences gained during this fieldwork, I believe that it is no longer a question of *whether* anthropology should burst its own disciplinary boundaries and apply knowledge, skills and competencies 'outside academia'. Indeed, a growing number of colleagues engage in new inspiring collaborations, apply social sciences across disciplines, professions and industries, and devise new ways of getting their messages across (see e.g. Podjed and Gorup, 2014; Gorup and Podjed, 2016; Jöhncke, 2018b; PEOPLE Project, 2020). Rather, what I believe anthropologists should start discussing is *how* we draft recommendations, apply knowledge, and make impact, and *how* we integrate such activities better in professional practice – instead of considering them as a sort of opt-in possibility and possibly leave the task to other disciplines (Hale, 2018, pp. 180–181).

Guidelines on how to draft recommendations and what aspects to take into consideration in such process are not part of the AAA Code of Ethics; the code is primarily oriented towards academic professionals in anthropology (Baba, 2009, p. 385). Nevertheless, professionals in the applied branches of anthropology are expected to adhere to this code, even though is does not provide guidelines for their practice or even recognize it (Baba, 2009, p. 385). It seems to me that the predicament for current anthropological practice is the question of what comes after the cultural critiques, or rather how we might start to frame and communicate this critique differently. Devising cultural critique to help create better worlds and societies is lifeblood for *all* anthropologists regardless of their professional employment. That being said, what is there to lose from framing our insights and analyses differently from time to time, for instance as 'how to' input in Power Points that are more accessible and understandable for non-anthropologists? It may be awkward and challenging to do so - and I am not suggesting that we should only do the light-version of ethnography that many organizations expect us to do. As observed by Dourish and Bell, there is a widespread assumption in corporate organizations that ethnographic work is an empirical process of going 'out there' and finding facts lying around in the 'real' world, dusting these facts off, and then bring them home to inform, educate, and delight the principals (Dourish and Bell,

2011, p. 66). I believe we should take such assumptions as a challenge to throw ourselves into the fray in order to explore how recommendations can be part of anthropological, professional practice (see Oliveira, 2012 for a fine example of this). Such an effort is tricky and anything but straight-forward. Indeed, Dourish and Bell argue:

> *"Even in cases where such recommendations can be concisely and effectively formulated, to focus on those as the outcomes of ethnography at best distracts from, and often completely obscures, the analytic and conceptual work that lies behind them, which is frequently where the substantive intellectual achievement is to be found. What matters is not simply what those implications are; what matters is why, how they were arrived at, what kinds of intellectual (as well as moral and political) commitments they embody, and what kinds of models they reflect."* (Dourish and Bell, 2011, p. 85).

Thus, there is always more to anthropologically informed recommendations or critiques than what meets the eye. Such condition should not stop us from trying to make these recommendations, but rather encourage us to kick into high gear and start discussing and considering *how* to integrate recommendations (if they are requested) as part of our practice.

The following six recommendations are my humble attempt at thinking differently about how my fieldwork b can inform actions to take on digitization in organizations. The recommendations are not a continuation of the conclusions; they express meta-thoughts and ideas on what could be done differently, which came to my mind during fieldwork. Since the recommendations are based on the fieldwork carried out at DBI, they are specific in that regard. Yet, I believe they extend to knowledge intensive organizations beyond DBI. For instance, the health care industry is preoccupied with *"digitalisering"* in the same way that the AEC industry is absorbed in the possibilities of BIM and ICTs. Vikkelsø (Vikkelsø, 2005) have noted that in the health care industry, electronic patient records are assumed to improve coordination through

smooth information exchange; improve intra-organizational efficiency and productivity through improved information sharing; and create higher quality and fewer mistakes through standardization and streamlining of processes (Vikkelsø, 2005, p. 4). Thus, the recommendations are most likely to be highly relevant in organizations beyond the AEC industry alone.

FIGURE 17. CONSTRUCTION SITE. PHOTO BY DBI

CHAPTER TEN.

RECOMMENDATIONS

Digitization is often mistakenly believed to only denote the development of digital tools to enhance and improve communication, collaboration, production and bottom lines. Yet, such understanding misses crucial aspects of what digitization is *also* about. It is just as much about formats, frameworks, and processes, which redefine and redistribute professions, collaborations and organizations. Digitization's inherently generative and distributive capacities present us with pressing questions about its implications

for organizations and ways of organizing. I hope the following sex recommendations (see table 1 below) help managers and employees who work with or manage digitization in organizations to start useful discussions on these issues.

RECOMMENDATIONS	
1.	Define concepts clearly and discuss them openly
2.	Map out what kind of knowledge you want to digitize
3.	Assume complexity rather than simplicity when you digitize
4.	Digitization demands respectful, interdisciplinary collaborations
5.	Involve all disciplines in a core team throughout the process
6.	Upper-level dedication and organizational motivation are key

TABLE 1. TABLE OF RECOMMENDATIONS. MADE BY AUTHOR.

1. DEFINE CONCEPTS CLEARLY AND DISCUSS THEM OPENLY

At DBI, *"digitialisering"* appears as strategy, action points and value. However, values are multi-vocal and thus they are practiced and perceived differently across organizations (Krause-Jensen, 2010b). Multiple and contested meanings may be advantageous, because they enable different employees to identify with the values and their meanings. But such multivocality may also pose challenges, because the value may be interpreted differently to a point where employees are in open disagreement about it and how the organization should adhere to it. I want to stress the importance of discussing openly and communicating explicitly about digitization. It is important that employees and management explicate what they mean by 'digitization', 'digitalization', 'automation' etc. Organizations in the AEC industry sometimes try to demystify *"digitalisering"*

by referring to it in over-simplified, mainstream ways (e.g. as 'science fiction') to create less worry and concern; but this may have the opposite effect. Top management and the communication departments should pay attention to the subtle differences between concepts to avoid confusion about impact, strategies, responsibilities, and decision-making power. The inherent multiplicity in understandings of digitization and digitalization cannot be harmonized. Therefore, DBI should keep an ongoing, open discussion on the topics, and encourage and legitimize different opinions among employees to avoid organizational trenches between digital 'front runners' and 'reactionaries'.

2. MAP OUT WHAT KIND OF KNOWLEDGE YOU WANT DO DIGITIZE

It is advisable that DBI ask the question of what it is that their knowledge wants. Curious as it may sound, information, knowledge and data have agendas: it wants certain things, it has demands (Bell, 2015). This thesis suggests a discord between digitization and fire safety. Fire safety and digitization want different things; digitization fosters and demands transparency, sharing, equality, and universal involvement in digital collaborations, and fire safety demands contextual, particular assessments of situations combined with regulated discipline and professional knowledge hierarchies. The thesis shows how such discord fosters conflicting imperatives of doing and failing digitization. In order to curb such conflicting imperatives, employees and management should start asking themselves what kind of knowledge their organization wields, what digitization wants, and what digitization can do for their particular organization. Above all, they should start considering how their organization organizes, as this will be decisive for their digitization process.

3. ASSUME COMPLEXITY RATHER THAN SIMPLICITY WHEN YOU DIGITIZE

DBI should anticipate ambiguities in work practices and contestations over professional expertise and knowledge as part of digitization. In DBI jargon, *"low-hanging fruits"* describe pieces of information, knowledge or work practices which are just waiting to be digitized by those passing by, and therefore are perceived as easily converted into digital information. It is implicit that this easy-to-accomplish task is foolish not to complete. The digitization of these low-hanging fruits carries promises of easy money and smooth processes, because the effort seems straightforward and the end-product creates obvious added value. But low-hanging fruits are not picked up from the ground. They are attached to trees with vast, complex treetops and interweaving, far-reaching roots. To retrieve the low-hanging fruits, they must be picked from these trees – and the question then becomes from where on the tree they are picked, how easily they come off, whether any branches are broken in the process, or if any vital wood fibers do not survive the unfastening.

Professional knowledge and expertise are deeply entwined in social, professional, and collegial relations in and across organizations. DBI might not want to digitize internal decision-making processes requiring complicated communication, negotiation, or dialogue in the first place, but they end up trying to do exactly that. Problems arise if knowledge is seen as objective and regulation-based, which renders it easily translatable and movable, when in practice such knowledge is constituted by cultural and social processes nested in organizational workings and professional practices. Employees and management should keep this entanglement and complexity in mind when they plan and carry out digitization and subsequent digitalization. To put it bluntly: organizational workings, power structures, and decision-making processes *will* impact the work on digitizing in-house expertise and knowledge – the question is how much and in which ways.

4. DIGITIZATION DEMANDS RESPECTFUL, INTERDISCIPLINARY COLLABORATIONS

DBI and other organizations should remember two dominant perceptions that discourage successful collaborations on digitization projects. The first perception is that digitization refers to processes where unchanged domain knowledge (e.g. about fire safety) is placed inside a custom-made digital shell, and that this digital shell can move the containing knowledge frictionless across organizations. The second perception is that such domain knowledge trumps software programmer knowledge about how to develop a digital shell, as well as knowledge about how users appropriate, understand and use the digital tools. Instead, I recommend that the balance between different disciplinary standpoints and input in digitization teams be equal and respectful in that all team members recognize the necessity of all involved disciplines in terms of creating the best possible product. Digitization demand complementary competencies and require new forms of collaborations, because they cut across professional boundaries and call for different and oftentimes new domain knowledge compared to existing ones in the organization. It does so, because digitization create abstractions, whereby knowledge is decontextualized and subsequently recontextualized in new contexts. Knowledge and information travel across organizations and crisscross different communities of practice in the industry, where professional communities do boundary work to demarcate their professional group in relation to others. This means that hitherto uncharted (or fragmented) collaborations in the AEC industry must be forged, oftentimes with professionals who have not previously collaborated.

Digitization thus takes an interdisciplinary effort, rather than a multidisciplinary one. In other words, the promised output and benefit of digitization – improved collaboration across professional boundaries and organizations – is also its greatest need. Digitization demands a coordinated and *integrated* collaboration between different disciplines, rather than a juxtaposition of *separated* professional approaches (Lawrence, 2010, p. 125,127, emphasis added) in order to work well. However, it is my

impression that cross-disciplinary collaboration at DBI as well as in the AEC industry is generally based on pure necessity; it is not expressed as a value in itself that might generate new insights, but as something linked to economic interests and client-satisfaction. For instance, at DBI initiatives to break down organizational silos and work in cross-departmental, interdisciplinary teams are not linked to desires for producing good professional results in and of itself, but primarily to an economic and client-oriented focus.

5. INVOLVE ALL DISCIPLINES IN A CORE TEAM THROUGHOUT THE PROCESS

It is a challenge to establish interdisciplinarity in the AEC industry – also at DBI. Employees and managers alike do not verbalize their tasks as a common, cross-disciplinary effort towards shared ends. Rather, stories of collaboration are often ridiculed with a focus on professional differences, flaws, and mismatches, whereby one's profession and disciplinary vantage point are verbalized in opposition to others. As a response to the challenge of collaborating across disciplines, I suggest the following core team constellation on digitization projects. The constellation is inspired by the work in Karsten, Ruge and Hulin (2020). Such projects should be guided by key questions that each project member is responsible for answering. The core team should be assembled from the beginning of a project, and all members should participate throughout the process (although to varying degrees):

- *WHAT is being digitized?* One/more member(s) have domain knowledge about the expertise and knowledge which is being digitized.
- *HOW are we going to do it?* One/more member(s) have domain knowledge on software programming, coding, development etc.
- *FOR WHOM and WHY do we digitize?* One/more member(s) have domain knowledge on sociality, culture, and usability to ensure the product's relevance

for its end-users. This person will also be a critical inquirer into assumptions and ethical implications.

- *Who will VOUCH FOR IT?* One/more member(s) have organizational impact and managerial authority. This person is responsible for taking the project smoothly through various decisions and departments across the organization.

6. UPPER-LEVEL DEDICATION AND ORGANIZATIONAL MOTIVATION ARE KEY

Digitizing expertise at DBI is considerably affected and challenged if management does not support the process (see also Dubé, Bourhis and Jacob, 2005 for a fine study of this). Difficult traps defined by power, economy and knowledge control will arise, which affect and challenge digitization. For instance, if a department at DBI feels that engaging in digitization projects is too risky and affects the department's (and thus its manager's) relative position and profit in the organization, then the department/managers may delay or divert the digitization process. Thus, the success of digitization is closely interweaved with organizations' ways of organizing and management opinions on the matter. When knowledge assets are defined as 'overflow' – i.e. when fire safety is described as a complex universe rarely understandable for non-experts – it is a way to manage and control such knowledge. The harnessing of such knowledge and mitigation of fire risks are ways to reproduce or scale up the overflow of knowledge in order to maintain control (Czarniawska and Löfgren, 2012, p. 7). In short: the bigger the overflow, the bigger the need for control supervision by experts. From a critical perspective, digitization of expertise is *also* a question of power and politics: it links closely with management's will or reluctance to distribute knowledge democratically, and the will or need to keep control of the knowledge through a reproduction or magnification of knowledge.

Therefore, organizations and managers of digitization processes might benefit from considering who will/will not benefit from the planned digitization in order to kick-start discussions, reflections and most importantly ensure early detection of organizational mismatches, miscommunication, and potential pitfalls. Managers should discuss the forms of expertise/knowledge, political influences, industrial monopolies and economic relations impacted from or impacting on digitization. For instance, who benefits from the digitization and subsequent digitalization, and who does not? Which monopolies are sustained, and which are challenged? Questions like these should encourage an ongoing, open discussion throughout the digitization process.

APPENDIX.

SHORT-TERM ANTHROPOLOGY: THOUGHTS FROM A FIELDWORK AMONG PLUMBERS, DIGITALISATION, CULTURAL ASSUMPTIONS AND MARKETING STRATEGIES [1]

ABSTRACT

Long-term fieldwork and the methodology that goes with it have long set the golden standard for anthropological practice. Quick deadlines, relevance for economic growth, and bigger commercial market shares rarely equal solid anthropology. However, conditions like these are more often than not daily reality for many anthropologists working in the private and public sectors. Through an ethnographic case report this article emphasises the ability to scale up and down anthropological research methodologies and analytic tools used when performing "short-term anthropology". It will be argued that short project deadlines within days or weeks, specific goals, and commercial settings do not exclude anthropological practices. On the contrary, such conditions and the requirements involved encourage methodological adjustments and specificity.

[1] Karsten, M. M. V. (2019) 'Short-term anthropology: Thoughts from a fieldwork among plumbers, digitalisation, cultural assumptions and marketing strategies', *Journal of Business Anthropology*, 8(1), pp. 108–125. doi: 10.22439/jba.v8i1.5718

The article reports on fieldwork carried out during employment at AnthroAnalysis, a small research unit within by Department of Anthropology at University of Copenhagen. See https://anthropology.ku.dk/collaborativeprojects/ for more information.

INTRODUCTION: REALITY CHECKING OF THE BARRIERS TO "NO BRAINER" PRODUCTS

In the autumn of 2015, I became part of a short project at AnthroAnalysis (AA) at the Department of Anthropology at University of Copenhagen (UCPH). AA is an innovative teaching and research unit that develops collaborative projects between university researchers on the one hand and partners in private companies in industry and commerce, national or local government agencies, or civil society organisations (such as patients' associations and other NGOs) on the other. The unit had been contacted by Helo, an international company specializing in sale and distribution of 150,000 electric and plumbing spare parts to small and medium-sized construction companies in Denmark as well as in several other European countries.

With five other major electric and plumbing wholesale dealers in Denmark, and several similar undercutting low-price companies, Helo competes in a tough field to obtain the biggest market share and persuade the customers – in this case plumbing companies – to use their products and distribution service of spare parts. An element in this strategy has been to launch an app named Transport for mobile phones and tablets. In this app the plumbers are able to order spare parts directly on their phone/tablet and receive the delivery by courier within one hour at the specific place they work and are in need of extra (and often unexpected) spare parts. Helo's competitors had developed and launched similar app solutions. This digital solution saves money for the plumbing company, optimises the work time of the plumber, and lowers the potentially wasted time that is a daily part of the plumbers' work, as they may be forced to leave the specific task, drive across town to a wholesaler and purchase the missing spare parts. The plumbers usually have a stock of spare parts in their cars, but they are not able to foresee every plumbing spare part they might need during a day and thus a digital solution like Transport comes in handy. Helo wishes to help the masters (the bosses of the plumbing companies) bring down the extra driving, time, and money spent on collecting spare parts. At the end of the day, Transport will help to reduce the bill for the clients of the plumbers and thus increase client satisfaction and encourage them to stay with the company. Furthermore, the plumber will have to drive

less, will be able to perform more tasks during the day, perform them better, and all in all optimise his work day and avoid wasted time and stress.

AA was contacted some time after the app had been launched. The reception had been very enthusiastic from some customers and somewhat more lukewarm from others, and all in all the take-up was not quite what Helo expected. The concept as such seemed to be a no brainer. But what could be done better? During a project set for two months, AA was asked to develop hypotheses and analyses on the drivers and barriers of the app solution. Anthropological practice was going to provide ethnographic first-hand impressions of the daily conditions of Helo clients and users, establish a "reality check" of the plumbers and their work day, and provide insights into how Helo's services might become more useful and meaningful for their customers and users. Because of the short time at hand to conduct fieldwork, and since it would be a little too obvious why an anthropologist was tagging along the plumbers in their cars, it became important to pay attention to the design of the study and the time spent in the field, when literally every hour counted in the data collection. These project conditions set up specific methodological and ethical challenges which I will reflect upon in the following sections.

Scaling the fieldwork up and down: thoughts on adjustment, conversations, and feedback

The first part of the project was spent conducting fieldwork at four different small- and medium-sized plumber companies that Helo supplies with spare parts. In Denmark, the majority of the performing companies in construction specialise in various crafts such as carpentry, masonry work, electricity, or plumbing. These companies typically comprise a master (the boss of the company), a number of skilled craftsmen, and a number of apprentices supervised by the master and his craftsmen.[2] A master is

[2] In Danish, the native terms for master, skilled craftsman and apprentice are "mester", "svend" and "lærling".

allowed to supervise two apprentices and a skilled craftsman can supervise one apprentice. It takes four years to become a skilled craftsman and the educational process consists of theoretical training combined with longer periods of internships at a company. The training is completed with an apprenticeship and the title of a skilled craftsman. In some areas, i.e. plumbing and electricity, you have to be a certified installer in order to obtain the title and privilege of a master.

The plumbing companies I visited used the Transport app to varying degrees. The fieldwork lasted one week at each company, each day spent with a new plumber[3] or master during his work day. Due to the short time available, Helo was responsible for setting up the contacts and choosing which companies were to participate in the project. This set-up created a delicate situation with regard to positioning and anonymity. Helo knew the four companies which formed the ground for the empirical data and it would be relatively easy for them to trace findings and quotes back to the company and potentially to the specific plumber. Helo's perspectives on the case issues were added to the analyses by conducting fieldwork in one of their storehouses, doing focus groups with management and participating in a series of meetings. It was also relevant to include quotes from employees in the Helo management as part of the feedback and in the final report in order to clearly deliver the messages and conclusion about existing assumptions and generalisations in the company. This required thorough anonymising and raised questions as to what I chose to report back and to leave out from these semi-anonymous sources in order to maintain the trust and confidentiality between me and my interlocutors.

The second part of the project was spent analysing the data and writing a report in the form of a Power Point presentation of 35 slides consisting of primary insights and findings underpinned by statements from informants and field note excerpts. Helo's expectation was that the report could be easily disseminated throughout the company and that the conclusions had to be quick and easy to understand and act upon. This form of feedback required a balance between traditional anthropological

[3] The term plumber refers to the skilled craftsmen in the various plumbing companies.

analyses and a visual form of presenting the results. The report was stripped of explicit theoretical references, the conclusions consisted of take-home recommendations for future actions, and quotes and field note excerpts were emphasised to underline a feeling of doing a reality check and being "out there". The findings were presented to the Helo top management during a 45-minute presentation followed by a one-hour discussion of the results. A business relation officer from Department of Anthropology and the head of AA also participated in the presentation to provide sparring during the discussion of how Helo could take action on the results.

With fieldwork carried out at various locations, the study design of this project resembled what anthropologist Helena Wulff has named "yo-yo fieldwork": a multi-local fieldwork where several fields are linked to each other through a kind of coherent network (Wulff 2002:118). This term reflects a more recent discussion in the discipline concerning how to handle the questions and situations of modern social life, where almost everything is in motion, and anthropology still lays down traditional fieldwork covering one year, with more or less undisturbed participant observations in a distant (and often exotic) village or neighbourhood perceived as a unit (Gusterson 1997; Gupta & Ferguson 1997; Wulff 2002; Tjørnhøj-Thomsen 2010).

In the application of anthropological theory and methodology on the Helo case, a specific and limited area and problem was studied from the first day in the field rather than starting off in an explorative and questioning manner, which is often standard in a typical piece of anthropological fieldwork. Short one-week field visits require different planning, execution, and analytic attention than long fieldworks do. It challenges and alters the way in which the anthropologist acts and relates to the surroundings and interlocutors. It is a classic methodological move in anthropology to tag along with your interlocutors and observe and participate as much as possible, so as to achieve a holistic and deeper understanding of what is going on and who they are as human beings. But the shortened fieldwork changes these rules. For instance, the shortened time and the often very specific research questions alter the rapport that

can be established during one day with the people you wish to get to know. There is simply less time for slowly building up a natural rapport. Conversely, this often makes it much clearer to the interlocutors what it is that you are doing in their field and why you are there. It does not mean that the anthropological insights will be less good; it just means that the insights will be different and that the anthropologist will have to bear in mind the scale of the study and adjust to that. You have to turn more quickly to the research questions and issues when communicating with the field, while keeping in mind to still be extremely attentive to the surroundings of that which you study. There is no time for beating around the bush. Wulff makes the same point about time management and involvement during field visits in her article about yo-yo fieldwork. She argues that the time in the field is spent more efficiently than during traditional lengthy fieldworks. Due to the short time available, it is important for her to push herself forward if she is to get anything done, and her field weeks are filled to the brim with meetings, interviews and other field activities (Wulff 2002:121).

The limited time available meant that there was not much time to build rapport in the same way as during longer fieldworks. This called for clarity and honesty about what role I had or wished to have and why I was there. Everybody knew I was there for a specific purpose, so it was a waste of precious time (both research time and the time of the ones you want to get to know better) to not say exactly what I was interested in. It became valuable for me that I was associated with UCPH and not Helo directly, and that I knew almost nothing about plumbing or technological innovations within plumbing. It urged my interlocutors and me to go through procedures and routines which I did not understand yet, but which were implicit to the plumbers and which an employee from Helo might not question either. I acquired the role of an independent messenger, because I had to report back to Helo but was not a part of the company. This spurred many conversations starting with "*Can you please tell Helo that…*" Thus, my primary association with a research institution rather than the stakeholder turned out to have great value for the data collection.

It was precisely conversations rather than regular interviews that became crucial in the data collection. Trying to conduct typical, semi-structured interviews with the attention solely focused on the interview would disturb the daily routines and work day of the plumbers. I had to shift from questions suitable for lengthy interview sessions to questions suitable for interviews on the go during the day: in the car in during rush hour while we were waiting for the green light, on the stairs while carrying gutters, building materials and trash, under the sink holding a flashlight and assisting, in the shower while observing how the plumber painstakingly and skilfully installed the water system and closed the pipes with "horsehair", and at the wholesaler while he measured lengths of pipe, gulped hot coffee, and made jokes about women and football with former colleagues. The questions had to be relevant to the specific situation we were in, express interest in the work performed at the time, benefit the rapport building and the general investigation, and provide insights into the everyday work life of the plumbers and the place of technology in this work day. The conversations during the day jumped from friendly small-talk about children, my pregnancy, the weather, the traffic, what on earth an anthropologist is, and politics; to highly focused and more philosophical talk at other times, when the plumber would reflect on stress levels, his work-life balance, feelings of independence at work, management strategies of his work day, the role of technology in society, and his own situation in relation to prejudices and generalisations about craftsmen in general. Usually during fieldwork (or even just in normal conversations) it can become awkward to make sudden changes of topic and deliberately steer the conversation in a very obvious direction. But since my presence was not natural in any way (I was the only female in the field apart from a few secretaries, I would not obtain the role as an apprentice or skilled craftsman during a single day, and since I was unskilled, I was not allowed to help out very much) and I had so little time at hand, the plumbers seemingly accepted these changes in the conversation and followed my shifts. The data collection thus became sporadic and the knowledge gathered during these weeks was a mix of these untidy conversations/interviews, observations in-between and emotions that I picked up on between the lines during my days there.

With this kind of short fieldwork and an intense process of analyses and feedback, the question arises whether this kind of anthropology has any legitimacy as anthropology. Is it possible to make any anthropologically well-founded statements after such a short time? Is it possible to grasp complex connections with what could be called "short-term anthropology"? It turned out that it was indeed possible after just one week of fieldwork to take useful ethnographic insights back to Helo that were new and exciting to them. After an additional three weeks, the insights became more full-bodied, specific and now turned into tentative analyses, arguments and hypotheses that gave input to how Helo could direct their current and future work with the app and sales work in general. Some of the knowledge gathered was completely new to them and altered essential ways of viewing their practices, and the company courageously engaged in these challenges. In the following sections I will give some examples of the insights that the short fieldwork provided.

The plumbers: assumptions, independence and the "real" users

During the short project time, it became clear that there was a certain prevalent understanding among the masters, salespersons and marketing personnel, indeed the whole industry, that a plumber's behaviour was controlled by a special "craftsmen culture". "Culture" was perceived as a major contributing factor to the barriers of implementing new digital practices or tools that ultimately could or would change their work routines. After just a few weeks of fieldwork, it became clear that there was a certain expectation in Helo that it was particularly the plumbers, their independence, and the "craftsmen culture" that were the core of the problem and therefor in need of investigation in this project– rather than ideas, beliefs and manners of communicating with the customers within Helo. This, of course, reflects a classical observation in anthropology, that it is easier to notice and wonder about the culture of others than the culture of oneself.

The cultural explanations created a generalised understanding of the plumber and overshadowed the understanding of the plumbers as representing a broad continuum. One element of this alleged "craftsman culture" was that the plumbers would take many and long breaks (during their visits at the wholesalers), eat a lot of junk food, and love white buns, pastry and chocolate milk for breakfast. The wholesalers, including Helo, tend to base their marketing strategies on assumptions like these, spurred on by experiences, stories and impressions among the marketing personnel, some of whom had been craftsmen themselves some twenty years ago. The generalisation fits certain plumbers, but it is far from the whole picture. During my field visits, less than half of the plumbers ate lunch because they would rather go home earlier, because it disturbed their work flow, or because of too heavy a work load. When they finally did eat lunch, it was salads, kebab, rye bread with cold cuts or paleo-diet food. One day when a plumber and I received a Transport delivery from Helo, he laughed when he opened the package of nuts and screws. Inside the delivery box was also a Snickers chocolate bar, which I knew Helo had put there deliberately as a promotion move and a way for the plumbers to use Transport more often. The young plumber commented dryly: *"It would be better if they [the deliveries] arrived on time instead of spending time putting Snickers into the boxes."* He asked if I wanted the chocolate bar; he was trying to avoid sugar at the moment and had no intention of eating the Snickers.

Another generalisation among the masters and wholesalers was the idea that plumbers felt too independent and that this was a potential barrier to making changes in their work, e.g. introducing more digital tools or trying to change the plumbers' visits to the wholesalers. The plumbers would decide that they did not want to adapt to any changes that would alter their possibility of making independent decisions or taking long breaks and socialising as much as they wanted at the wholesaler. A master put it like this: *"Many plumbers feel very independent and that means that they won't do things differently. Many guard this independence. They may even believe that they're*

their own master and that they don't have to take responsibility for the company." During my short time with the plumbers, I saw how the plumbers' feelings regarding independence were expressed more as a need to take control over their work day and work flow, level of stress, contact with the client, shopping new spare parts, and longing for socialisation with colleagues as opposed to just denying all new alterations. The plumbers liked to practise what Danes call "frihed under ansvar", which can be translated as "freedom with responsibility". The feeling of independence was not so much a denial of new things as a way of coping with work flow, stress, and taking control over the tasks performed.

The independence among plumbers was an aspect some masters saw as a hindrance for business improvements while others saw it as an aspect that helped them make smart economic choices about which tools to invest in. An overall important insight in the process was an updated and more nuanced understanding of the plumbers as clients and consumers of Helo's products. The empirical findings managed to break down generalisations about the plumbers and their masters and started to fine-tune the differences between the masters as the company's clients and the plumbers as the actual users of the products. One day, the following conversation took place between a master and a salesperson from a major international company selling tools and workwear for craftsmen:

> Out on the parking spot in front of the company a salesman has opened up the entire right side of his big, orange marketing truck. Einar [the master] comes out to meet him. It is obvious that they know each other from previous business relations. Einar asks the salesman*: "So, why should we buy precisely your drilling machines rather than all the others?"* The salesman who is wearing a neat suit and tie exclaims enthusiastically*: "Because you have them already!"* The master, who himself is in his working clothes and dirty shoes, doubts him: *"Well I'm not so sure about that. One year it's this, the other year it's that. I let my boys decide that."* The salesman goes quiet,

> with a speechless look on his face: *"You let your plumbers decide what tools you're going to use in this company?"* The master replies confidently while waving dismissively with one hand: *"Oh yes! And I don't want to buy anything unless I have my boys with me. Because it's worthless buying something that'll be left untouched in the corner. I damned well can't afford that. So you'll have to come back another day with your stuff when they're here."*

If the plumbers did not like the new drilling machines, flashlights, working clothes etc., they would not be used. So choosing whatever the master himself wanted for his company would be extremely bad business for him as opposed to listening to the needs of his staff and buying what they wanted to use. The masters had great confidence in the plumbers' assessment and evaluation of the tools; one told me that *"they know what they need, and I don't."* This reality was different from general expectations among wholesalers. The real users of the products were the plumbers, and the masters were merely the clients purchasing the tools and new equipment. By contrast, it appeared that the wholesalers' marketing strategies, benefit groups, and overall communication and contact focused on the master, assuming he was the one going to use the tools and spare parts. Thus they would find themselves in situations where the products they launched – like Transport – did not appeal to the market if they did not answer to the needs of the actual users. Instead of perceiving independence as a negative trait, the tables had to be turned and the plumbers seen as quality-minded users and deliberate consumers of Helo's products. It turned out that when the plumbers did not embrace the new app right away, it was mostly because they as users did not feel that it improved their work day. The problem was not that they were rigorously controlled by a certain "craftsmen culture" turning them into "too independent" plumbers.

TIME AND FUTURE AS A FIELD OF NEGOTIATION: MONEY, INDEPENDENCE AND WORK FLOW

Generalisations about craftsmen also pre-assumed what the plumbers would do when they visited the wholesaler and why they would go there – apart from the obvious fact that they had to shop for spare parts. During a discussion at a lunch meeting with key managers from the sales and marketing departments, three of the Transport developers explained the situation to me this way:

> Helge, a fast speaking and senior sales manager tells me: *"We've destroyed an entire generation that thinks it's written into their agreement that they can just drive around the city and misuse one hour during the day where you go [to the wholesaler] to get some free coffee and participate in a competition."* Aage who is the manager of one of Helo's warehouses in town joins in: *"There is only one thing that matters to a plumber, and that is his one hour of free time [at the wholesaler's/driving to the wholesaler] during a work day!"* Across the table sits Mads, one of the newly employed marketing guys and apparently quieter than Helge, looks a bit thoughtful as if he tries to fine-tune the picture a bit, at least for his own sake as a newcomer: *"Going to the wholesaler is a very social thing for them, because the staff and visitors are very often the same time and time again. And then you can talk about the match in Champions League the previous night, talk a bit, and drink some coffee. I don't know if they need it – but it seems that they are allowed to do it."*

It appeared to be a general belief that the plumbers had other agendas than making a purchase when it came to going to the shops: it was free time or even misused work time which was solely spent chatting, drinking coffee and eating whatever junk food or pastry that the shop would tempt the plumbers with for between 30 minutes and

one hour. By contract, during my own visits to the wholesalers with the plumbers, I saw how the plumbers focused primarily on choosing the materials they needed for a specific task ahead of them and took solid, professional decisions about which parts to choose – rather than hunting for pastries and hot dogs. The following field note excerpt illustrates this:

> At the wholesaler's, Asger [the plumber] uses a folding rule several times to measure the various water pipes he might need. He speaks to himself, mumbles and visualises the task he is going to perform while he waves the pipes about in the air in front of him to illustrate to himself how the slightly difficult joint behind the gas cooker will be fixed. He walks up and down the rows of spare parts quietly determined, picks up different items from different shelves, regrets one choice and searches specifically for the right missing part. To me all the parts look the same, but judging by the satisfied look on Asger's face when he chooses one specific spare part, it is obvious that they are very different. When he is having difficulties tracking down a specific item, he yells loudly throughout the shop to catch the attention of one of the staff members. He yells back just as loudly with directions as to how to find the specific part. Asger grins at me and tells me that it is his old partner and colleague over a period of six years. Asger tracks the last spare part down quickly. We wait in line for a little while in order to pay. Meanwhile, Asger quickly drinks a cup of coffee and urges me to do the same, while at the same time he finishes a few of his time sheets on his mobile phone. While Asger makes the payment, he chats with the cashier about football and makes jokes about their wives at home and women in general. It will be weekend in just a few hours, so they wish each other a good weekend before the payment is taken care of. We leave the shop again after less than 15 minutes of shopping.

As the field note excerpt shows, the plumbers would often focus on the professional task ahead of them and use the wholesaler as a way to get a sense of and feeling for the materials. As a bonus and because of a twinge of loneliness during a work day which is often spent on their own, the plumbers would socialise and network with former colleagues, school friends and partners while shopping, paying, grabbing a quick coffee and using the toilet facilities. A young plumber told me that *"…it's nice and cosy with a cup of hot chocolate. And you sometimes get a bit frayed from being on your own an entire day, so you need something social from time to time."* Thus the wholesaler represented a place for socialising, networking, seeking new job opportunities, and getting updated on the newest gear and parts while also focusing on making professional decisions – all in the space of 15 minutes.

It turned out that particular notions about craftsmen and their work formed a barrier in understanding why the plumbers and masters chose not to use the Transport app more. Generalisations about the plumbers' misuse of work time at the wholesalers made it difficult to realise that for the plumber, time and the management of it was in fact an extremely valuable factor. Peter, who had participated in previous Helo projects about testing technological solutions to improve the work day of plumbers, put it very bluntly: *"If they cannot deliver standard spare parts on time, if their app isn't working, and if the parts don't arrive within one hour as they have promised, then I'm really not interested! I'll bloody well just drive straight out to Jensen or Madsen [wholesale shops]."* In effect, delivery time itself turned out to be a major factor affecting the plumbers' choice to drop the use of the app and drive straight to the closets wholesaler instead or chose to do without it before having even tried it because of bad reputation among colleagues.

A major barrier to using the app was that the plumbers have experienced deliveries taking up to two hours when they had been promised a maximum one-hour delivery service. Helo had a hunch about this problem, and at the time of the project they were considering alternative delivery methods for the city centres in major cities, e.g.

deliveries by bike. Normally, a plumbing task took no more than 15 minutes or perhaps 30. These tasks were scheduled one after the other during days when the plumber would go "on service" (referring to minor service calls). Here the plumber would seldom have other things to do while he was waiting for the delivery except eating lunch, smoking, killing time, or becoming more stressed because of a potentially delayed delivery. At times like these, he would choose to drive to the nearest wholesaler himself, because very often he could go there, get the spare part, and be back again at the workplace some considerable time before the delivery would arrive. And the clients would very often be more pleased with this solution. Alex explained why to me: "Y*ou cannot just sit back and wait for the things to arrive at Mrs. Hansen's doorstep. She doesn't understand that! She understands much better that you have to go for a quick drive to get some spare parts and that you'll be right back as soon as possible. Then you're actually doing something about the problem.*" At other times the plumber could be "on site" (referring to construction sites), where they would perhaps renovate entire bathrooms or kitchens or where they participated in building entirely new houses, i.e. installing four of the same type of toilet during one day. Here, the plumber would work the whole day at one location and could continue performing other tasks while waiting for a delivery. He would not mind too much if there was a delay "on site", but he would mind it very much if he was "on service". The wholesalers' promotion of their apps as a uni-size solution contrasted with the fact that the work days of the plumber were very often varied, dissimilar, and fragmented.

Helo's concern was that the app was not used more because the plumbers *de facto* refused to use it, presumably because the "craftsmen culture" told them not to. The concern was also that new technology might appear too unfamiliar for the plumbers and that they were so used to their routines and habits that adapting to new technology was a considerable problem. What we found was that the plumbers were very much used to technology and it was a big part of their everyday lives. If the plumbers did not use the app, it was rather because it did not always work or corresponded to their

needs – they might even experience that it slowed down their work flow rather than speeding it up, and it kept them from socialising during the day.

This interrelated network of assumptions about a certain "culture", relative skills in using technology, social behaviour and commitment towards completion of work tasks connotes to arguments advanced by sociologists Wiebe Bijker and John Law more than 20 years ago. According to them, technologies always involve compromises in the sense that what makes technology work or fail is shaped by a wide range of disparate factors including social, professional, technical, economic and political commitments, skills, prejudices, possibilities and limitations (Bijker & Law 1992:3,7). This means that when considering technological changes, one must also take social changes into consideration. Put differently, if we want to understand either the technology or the social dimension, we need to understand both since they are intertwined and interlinked (ibid.:4,11). With the plumbers' unexpected reception and use of the Transport app, the Helo case is an excellent example of this connection between sociality and technology.

Technological services, such as apps, are constructed from certain (often unacknowledged) assumptions about their use in real life (Akrich 1992). In this case, the Transport app involves the assumption that the assessment of which spare parts are needed for a certain task can be generalised across plumbers, tasks, clients, and companies. It all comes down to the plumber being able to foresee what the problem is and what he will have to do, so he can order the missing parts in time. If the plumber is not able to do this, it is because he lacks professional skills and sufficient training. The skilled plumber will be able to foresee many tasks that lie ahead and order one delivery for many parts during a day because he knows his schedule for that day. But the plumber does not know what may happen, especially not when they are "on service", which they are most of the time. Very seldom will the problem the client has explained over the phone to the secretary who plots it into the plumber's work schedule be what actually confronts the plumber when he is actually confronted with the

task. He seldom knows exactly what awaits him. His skills are partly based on intuitively sensing the materials and visualising the task with the materials available. The app does not address these needs. Put differently, one could say that the plumber thinks in 3D but the app works in 2D. According to anthropologist Tim Ingold, technology alters the abilities and practices of skilled workers such as craftsmen into rationally applicable principles that are without any connection to human experience or perception (Ingold 2011:61). This is exactly what has happened in this case. The app tries to fill a need where the wholesaler is now, but fails to do so in many situations, because it cannot work together with the skilled sensing of the materials which the plumbers possess. On the surface, the app and the functions seem rational, advantageous and ultimately profitable. But this short "reality check" study helped visualise a great barrier in the use of the app: the lacking ability to couple the experiences and intuitive skills of the plumbers when handling materials with work flow and time management

To sum up, the plumbers cannot foresee everything, not because they do not want to or are not skilled enough to do so, but because their work tasks and practice are often unpredictable. Their needs for spare parts during a work day change according to the type of work they perform. Conversely, when working "on site" it is much easier to foresee the things that will be needed, because the plumber know that he will perhaps set up four identical sinks during a day. So they choose the app when it is the best option in the specific situation, while at other times they may choose driving to the wholesaler. The masters agreed with the plumbers' decisions in this case. Oswald, the master who was perhaps most fond of the Transport app and very pro-technology in his company, put it this way: *"It's not a stand-alone thing. It has to make sense! If you can be down by the wholesaler and back within 30 minutes, well then you've saved that half hour. So in that situation it's much better to go straight to the wholesaler [instead of using the app]."* This experience does not support the idea that non-use of the app was due to a resistance among the plumbers to use technology (even thought it is a big part of their daily life), too strong feelings of independence, or a lack of

education among them. Instead, we found informed and rather well-considered choices that focused on saving time and minimising costs.

KEEPING ANTHROPOLOGY RELEVANT: DISCUSSING FIELDWORK LENGTH AND CULTURAL IDEAS

Among graduate students of anthropology and in academia in general there is a deafening silence about how to approach short periods of fieldwork. In this article, I have tried to reflect on the methodological implications of short periods which seemingly go against accepted anthropological norms. Ten years ago, anthropologist George Marcus reflected on this topic by asking how short fieldwork can be (Marcus 2007). For Marcus, this is not so much a question of methodological implications as one of the professional culture and identity within anthropology which challenges fieldwork and thus needs to be questioned and rethought (ibid.:355,357). The objective for Marcus is to reflect on the aspects of anthropology's professional culture which prescribe a certain level, duration and particular research practices as the core of the anthropological professional identity (ibid.:353). In line with his colleague James Faubion, he argues that what is distinctively anthropological are certain ways of (re)defining and problematising issues and objects rather than a particular methodology and specific form of inquiry deeply rooted in a professional culture of craft (ibid.:354).

Following Marcus (and being a recent graduate of anthropology at the time of the project launch) I too felt challenged by the professional culture in anthropology, which insists on particularly lengthy research practices. Would I be able to complete this project in time and contribute with satisfying and insightful results with so little time available? Was it possible to do short-term anthropology and still be able to achieve something worthwhile? The Helo case has proved that it is indeed possible. I believe Marcus would agree. He calls anthropological practice a design process where everything else apart from the research focus on individual conceptions has to do with

collaborations, collectivities, arrangements, institutions, and various kinds of networks which are all an inherent part of the knowledge-making process in a traditional individual fieldwork (ibid.:355). In design processes, the individual and collective are agents of knowledge production and they are constantly interacting and in feedback with one another. The result is never final and a solution may always be subject to revision because of some later, differing project (ibid.). This makes incompleteness and open-endedness the norm and brings out the experimental dimension of anthropological research practice, as it recognises collaboration as a normative principle (ibid.:355-6). Other anthropologists such as Luke Lassiter and Paul Rabinow have problematised the same area. Lassiter has pointed out that the collaborative part of anthropology has previously been erased from anthropological records in accordance with the increased focus on academic anthropology and the quest for producing a more "objective" science (Lassiter 2005:89). This has helped create a romantic view of the lone anthropologist as the hero in isolated locations, which in turn has impeded the realisation of collaborative anthropology until the present day (Rabinow 2011:115).

With these arguments in mind, the Helo case is a fine example of the collaborative nature of anthropology as a design process, where stakeholders, interlocutors and anthropologist work together (some more aware of this than others) in generating new knowledge on a specific topic. The fieldwork would not have come about without the actions, interests and enthusiasm of Helo and the specific choosing of companies and problem area, or without the plumbers making their points clear to me and choosing to accept me into their work and explaining to me their use of the Transport app. Meanwhile, due to the holistic focus in anthropology on *context* in the field, it transpired that the key problems in the project were not only "out there" among the plumbers but was just as much present "inside" the stakeholder organisation. Most importantly, it demonstrated that doing good anthropology is less about a certain number of semi-structured sit-down interviews, lengthy research design and oceans of time spent in the field than about a trained eye turning issues upside down and about ap-

proaching problems in a holistic way. Such an approach relies heavily on a methodological ability which is anchored in a theoretical, anthropological mind-set that anticipates interacting relations, networks, disruptions and local logics. Anthropological methodology includes a stock of theoretical concepts in its tool box which are triggered when we enter a field curiously, carefully, and with our minds focused and yet open. It is thus possible to approach issues in an anthropologically and theoretically grounded way if the adopted methodology is scaled up and down accordingly.

At a more general level, collaborative anthropology in this case also relates to various forms of knowledge prevalent in different areas, i.e. a form of "commercial knowledge" in the business field and "academic knowledge" in the research field. In this study I met a good deal of "commercial knowledge", established truths and perspectives that were not always up to date within the actual field of operation. Here, anthropological "academic knowledge" helped provide a reality check in just a few weeks, which made a great impact. This shows how little is sometimes needed to make big changes and it supports the argument for practising short-term anthropology. Bringing together different prevalent forms of knowledge in such a short time also creates a challenge to come up with results. Some stakeholders may bridle at the information ("Who are you to tell us?") instead of being open to the possibility that they themselves are as much a part of the problem as anyone else and therefore also a part of the solution. In Helo, we found a willingness and openness to listen and be challenged by anthropology rather than merely seeing it as a source of practical market information. Collaborative anthropology is also about bringing these various fields of knowledge together and creating a fruitful balance and a constructive dialogue between them.

Take-home messages

The empirical insights in this project were gathered during four weeks. With such a framework and less details, it is not fitting or relevant to talk about representative data

or grounded theory in the same manner as with longer anthropological fieldworks. Even so, the field visits kick-started tentative analyses, created hypotheses, and spurred on ideas about where Helo can direct their attention in the future. And so the anthropological fieldwork and analyses made a great impact in its short and compact form despite the apparent lack of time to carry out traditional anthropology. With short-term anthropology you will get a different kind of anthropology, a more agile anthropology, one which is capable of providing empirically based hypotheses, ideas and tip-offs about how to handle problems and view challenges differently within a short period of time. The work conditions are different and it takes practice to scale fieldwork down accordingly, and to be more specific, straight-forward, and focused than in lengthier periods of fieldwork. But it is a form of anthropology that we must practise if we want to keep our profession up to date and relevant in society. As Marcus states, this is exactly what anthropology is about – grasping cultural ideas and beliefs and scrutinising them critically – rather than getting stuck in ideas about how long fieldwork must of necessity be. Yet, because lengthy fieldwork has been the golden rule for so long, it will also take time and practice to scale the methodology and research design down (or up) accordingly, since different goals and prerequisites call for different measures.

I want to end this case report with a little thought experiment regarding cultural prejudices. Perhaps we as anthropologists can learn something from the Helo case about prejudices. In the spirit of the project, we could perhaps benefit from the following take-home message: when we trace, scrutinise, and often problematise people's cultural prejudices and actions based on certain generalisations, we would do well to remind ourselves that within anthropology we have similar cultural prejudices about how to go about things and understand the world "out there", and that these ideas would sometimes benefit from a reality check too.

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