Working with Algorithms

A discursive analysis of agency in the context of algorithms and work

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Tiivistelmä – Referat – Abstract

Algorithms are effective data processing programs, which are being applied in an increasing amount of contexts and areas of our lives. One such context is that of our working lives, where algorithms are being adapted to take over tasks previously performed by human workers. This has sparked the discussion about capabilities and agency of algorithmic technology, and also whether or not technology will be replacing the human workforce. Public discussion has actively taken part in constructing both opportunities and fears related to algorithmic technology, but very little research exists about the impact of algorithmic technology at work. A lot of discussion has also centered around the agency of algorithms, as due to the advances in technology, agency is no longer something only only assigned to, or possessed by human actors. While some research has been done on the construction of algorithm agency, very little research has been conducted to explore the phenomena in the context of work. Research about adapting algorithms in companies is very scarce, and the gap in this research is especially crucial due to its lack of research from a social scientific perspective.

The purpose of this thesis is to investigate how algorithmic agency (or lack thereof) is constructed in the discourse of five employees of an IT company that has applied an algorithm in their operations. I further want to investigate what consequences these constructs have on the work of the employees and the flow of agency in the company. The theoretical and methodological framework is rooted in social constructionism and discursive psychology and the analysis focuses on the construction of accounts of agency in the context. In order to answer the research questions I have conducted a semi-structured focused interview with each of the recruited employees.

The results show that algorithmic agency is constructed in multifaceted ways and several constructs of agency coexist in the discourse of the employees. The agency is constructed as an independent actor with agency, but that this agency is also restricted by its human developers and operational staff intervening in its decisions. While accounts for algorithmicx agency exist, agency is also constructed as something possessed by the developers and company, who develop the algorithm in order to reach certain goals. The results also show that the algorithm is constructed as an enabler and restrictor to human agency, but that the adaptation of the algorithm has also created new flows of agency, where agency flows from human to algorithm and vice versa.

This thesis contributes to previous research on agency, algorithms and work by taking a contemporary, employee-centric perspective on agency, not yet taken by previous research. In order to take into account the dynamic processes of agency when adapting algorithmic technology in companies, an extensive social scientific perspective is needed to inform organizational change. In order to achieve this, more qualitative research is needed to further understand the impact of automation on agency and other interpersonal dynamics.

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1. INTRODUCTION

The Merriam-Webster Dictionary defines an algorithm as "*a procedure for solving a mathematical problem (as of finding the greatest common divisor) in a finite number of steps that frequently involves repetition of an operation*" (Merriam-Webster, 2020). More specifically, an algorithm usually refers to a program, or a computer code, which possesses and processes data in order to perform a certain task or reach a given goal. Algorithms are created for various reasons, often involving efficiency, as algorithms are capable of sorting through vast amounts of data a lot faster than a human can. At their current state, algorithms have been created to solve problems identified by humans, but they are encoded to work automatically, with no or very little human intervention. Humans however provide algorithms with data and play a vital role in *"identifying goals for automated programs and making decisions about how databases are constructed and how data will be put together through particular combinations and sequences associations to arrive at a desired output."* (Reyman, 2018: 113-114). Thereby, algorithms are not free from human intervention and influence, nor completely independent entities (Reyman, 2018;Johnson, 2018).

Algorithms and algorithmic technology are designed to blend into our everyday lives, and people come into contact with algorithms both knowingly and unknowingly throughout their days. Our phones find things for us, our streaming services suggest which movie we should watch next, and our GPS asks us if we'd like to see the shortest route to work in the morning, without ever indicating where it is we are going. Through tracking what we do, and datafying our everyday behavior, the technology around us has gained an ability to predict, suggest and guide what we are doing, or even suggest to us what we should be doing. As these technologies have developed, technology has become an extension of ourselves, following us everywhere we go either in the form of a smartphone, a laptop or maybe even some wearable device or clothing (e.g. activity tracker) to which we outsource some of our responsibilities, and arguably, our agency (e.g. Ruckenstein & Shüll, 2017). Public discourse about algorithms, AI and data-driven technology has certainly sparked an interest in the field, but this discourse is not always a realistic

representation about what these technologies actually do and what kind of social impact they might have (Beer, 2017; Elish & Boyd, 2018).

Algorithms do not only assist us in the task we choose ourselves, but they are being applied in various areas of life, without people knowing about it. Algorithms are efficient and powerful, and if left unchecked, can have potential negative effects on individuals and society. There has been a lot of public discussion about algorithmic technology in social media, search engines, and even in surveillance of public spaces. Some of the discussion has for example centered around how algorithms can be used to influence voters (e.g. Newitz (2016) about "fake news" on Facebook, or Tufecki (2016) about the role of algorithms in the 2016 USA presidential elections) or more recently, facial recognition software as means to track people (see e.g. Mozur (2019) about China profiling and tracking of minority Uighurs). Algorithms and AI in the workplace has also gained attention, and discourse has shifted between robots taking our jobs, to algorithms and AI working with us, or even managing us (e.g. Dzieza (2020) about intelligent machines as managers). Mainstream discourse about algorithms at work has been focused on their efficiency, but less attention has been paid to impact on employee experiences, agency and other dynamic processes in companies adapting these technologies.

Agency has been something traditionally assigned to human actors, who engage in intentional and meaningful action in their behavior. The environment in which these actors operate however, consist of several objects and other actors that interfere, assist, extend or even restrict this agency. Human actors have for a long time taken advantage of a variety of tools to enact their agency, but with the development of algorithms, these tools are becoming more invasive and prominent. It is thereby important to expand the discussion of agency to include more than the human agents, and explore agency as something that flows through and is enabled by various entities, coexisting in an environment. Taking this perspective to investigate algorithmic technologies in organizations and companies, could provide research and organizations with better understanding of the impact

technology can have on the people involved. This could also assist in making informed decisions and regulate how technology is used.

This thesis aims to contribute to the understanding about agency in the context of algorithms in working-life. This thesis approaches agency of algorithms as something constructed by its users and developers, and I set out to investigate what kind of constructs of agency are present in the discourse of 5 employees of an IT company, who has adapted an algorithm in their operations. I further set out to investigate what impact the algorithm has on the flow of agency, and how it has changed the work of the interviewees. As background, I will first discuss the history of technology at work in the second chapter, and concepts of agency in the third chapter. In the fourth chapter I will present and discuss my theoretical framework and methodological approach. The fifth chapter will focus on the data gathering process and stages of analysis, including elaboration on interviewees, context and ethical considerations. The sixth chapter focuses on the results of the analysis in two parts; firstly looking at the different constructs of agency, and secondly, the impacts of the algorithm on the work of the interviewees and the flow of agency in the company. I conclude the thesis with a discussion, in which I discuss my results in relation to previous research. Here I will also deliberate on the contributions to the field, potential for future research, and limitations of the thesis.

2. ALGORITHMS AT WORK

In the 1800s, 80% of workers in the United States were employed through farming, but due to developing technology, that percentage dropped to 40% by the 1900s, and to only 1.3% in 2018 (U.S. Department of Agriculture, 2020; Kaplan, 2015). Technology was able to take over a great amount of jobs from the human workforce without creating widespread unemployment, as people were relocated to other activities in the U.S. economy. This change however happened slowly, over the course of two centuries, as the labor market as a whole went through a lot of changes that allowed for the workforce to be located elsewhere. Today, technology is developing much faster,

and through new forms of automation brought to existence by algorithmic technologies, some worry that our labor market will not be able to keep up and people will not be able to gain the skills to adapt (Kaplan, 2015).

Applying technology to increase productivity is not a new phenomenon, but with the rapid development of technology we are seeing an increase in automation in the labor market, and algorithmic technologies are being applied in an ever growing amount of industries. It is no longer something only found in the form of a conveyor belt in a factory or a plow on a farm; algorithms are being developed to drive cars, assist law enforcement, help in recruitment and make a lot of other decisions which used to be done by human beings (e.g. Bongard, 2019; Brayne & Angéle, 2020). While a lot of the discussion about adapting algorithmic technologies has revolved around the concern of algorithms replacing the human workforce, a growing body of research and discussion has shifted focus towards dynamic interrelation, and how humans and technology cooperate or complement each other in performing different tasks (e.g. Autor, 2015; Bailey & Barley, 2019; Grønsund & Aanestad, 2020; Markus, 2017). Emerging perspectives argue that technology might replace some of the human workforce, but that new technologies will mostly lead to a partial automation, where algorithms might take over some specific tasks, leaving and even creating other tasks to human workers (Autor, 2015; Grønsund & Aanestad, 2020).

Some research has set out to investigate how human workers and algorithmic technology complement each other and how the relationship of human workers and this technology evolves (e.g. Grønsund & Aanestad, 2020; Shestakofsky, 2017). This research provides an alternative view to that of technology replacing the human workforce by demonstrating that algorithmic technology reshapes organizations and can lead to a complementary relationship between people and technology. Shestakofsky (2017) found two forms of human-algorithm complementaries, where humans support or stand in for the algorithm, as well as emotional labor to help end-users adapt to the system. Grønsund and Aanestad (2020) similarly found that different interplays between human and algorithm emerged as the technology was introduced. They demonstrated, for

example, that algorithms were both audited and altered by human workers, and thereby workers gained new tasks related to this work.

Although some research exists, it is scarce, limited and very little attention has been given to what happens to the work, the employees, self-efficacy, agency and other human processes when algorithmic technology is introduced into an organization. Furthermore, the research which has been done and published is mostly found in journals which do not have a social scientific perspective. As algorithmic technology takes over a job, or a part of a job from a human, and starts performing that job independently, one can call this technology autonomous. If this technology is autonomous, can it then be considered to have agency? Very little research has been devoted to this question and the consequences of algorithmic agency. What happens to the experiences of agency? And what happens to the agency of the human workers? These are questions not yet covered by research, but that could provide ways of understanding the changing nature of work and the dynamic relationship of people and technology. In order to investigate the effects of algorithms on agency, a necessary starting point is to first elaborate on the concept of agency and how it has evolved to include not only human actors, but also technology and algorithms.

3. THE CONCEPT OF AGENCY

The concept of agency has been discussed by scholars in various branches of the social sciences. All scholars do not agree on the definition of agency, nor even the extent to which agency exists. This discrepancy between different theorists however falls out of the scope of my thesis, which is why I will focus on defining human agency as a result of interaction between people and their environment. I will further focus on theories which frame agency as something relational and postmodern theories which expand the concept of agency to include a more diverse set of actors, including technology and algorithms.

3.1 Human agency

Simply put, to have agency, means to be able to intentionally influence one's own actions and life circumstances. To have agency thereby means to have a sense of self-efficacy; a belief that one's actions can lead to a desired result. To be able to act as an agent therefore requires the belief that one can, but also the tools to be able to realize goals and evaluate results. Hence, it is useful to discuss the properties of human agency in more detail (Bandura, 1997).

Bandura (1997) outlines four core properties of human agency; intentionality, forethought, self-reactiveness and self-reflectiveness. Intention is the first step towards actions and includes goals and ways of reaching those goals. Forethought describes the ability to visualize a future to guide and motivate behavior. Self-reactiveness refers to the ability to self-regulate and adjust one's behavior when needed. Self-reflectiveness allows people to examine their actions and their self-efficacy. So, according to Bandura it is these four properties that work together to form human agency. He however underlines that most human goals and actions often, if not always, involve other people, which means that absolute agency does not exist.

To state that individuals do not operate as absolute autonomous agents opens the discussion of what enables or assists individuals to enact their agency. Therefore we need to expand our understanding of agency from something an individual possesses to something that exists in the interaction of several individuals and their environments. Bandura (1986) states that *"human functioning is a product of a reciprocal interplay of intrapersonal, behavioral and environmental determinants"* (Bandura, 1987, as cited in Bandura, 2006: 165). In a similar vein, Campbell (2005) describes agency as *"communal, social, cooperative, and participatory and, simultaneously, constituted and constrained by the material and symbolic elements of context and culture."* (Campbell, 2005: 3). The key to understanding agency is thereby to consider the dynamic structures and networks of individuals as well as the material elements in their environments. In some contexts those material elements could be tools or technology, such as

algorithms.

3.2 Non-human Agency

The emergence of algorithms has challenged the notion of human agency, as the development of such technologies has opened the debate for what behavior constitutes as uniquely human. Algorithms are embedded in technology to do things, adapt to certain circumstances, and even make decisions, to some extent filling the properties outlined by Bandura. Yet they are constrained by their programming, which is done by human actors. Programmers provide the algorithms with structured data in order to perform the tasks the algorithm is assigned to do, but this data only provides a limited set of options for action, as all action is determined by the programming. So, how is agency to be interpreted in this situation? In order to understand agency in a context of algorithms it becomes crucial to see agency as something interactional, but also to expand on what we mean by "actors" (Johnson, 2018).

3.2.1 Actor Network Theory

Bruno Latour, the foreman of the Actor Network Theory, has been calling for an expansion of the terms 'agency' and 'actor', to include a broader network of entities; both human and non-human actors. Latour argues that non- human objects have not played a role in the discussion of agency due to the reigning definition of the social as well as the actors within it. In order to understand agency in an environment with technology, we have to problematize the so-called humanist paradigm, which puts the human individual at the center of agency. Therefore, objects gain agency only when action is not limited to "what 'intentional', 'meaningful' humans do[...]" (Latour, 2005: 71).

In his argument for the agency of objects, Latour states that action rarely consists of mere human-to-human or object-to-object connections, but that it *"will probably zigzag from one to the other"* (Latour, 2005: 75). Thereby, action and agency should be viewed as something enabled by a network of different kinds of entities, including objects. Furthermore he points to the discourse

used when describing functions of different objects: *"kettles 'boil' water, knives 'cut' meat, baskets 'hold' provision[...] Are these verbs designating action?* " (Latour, 2005:73). Similarly, when we talk about technology, we might say that our devices and applications are 'suggesting', 'showing' or 'telling' us various things. If we then accept the notion that the definition of actors and agencies must be expanded, we then have to consider how different actors permit, influence, shape, restrict or in some other way affect other agents and their actions. So, how do algorithms affect the agency of other actors embedded in the network they are situated in?

The Actor Network Theory does however not declare objects as actors who act 'instead' of human actors. When examining algorithms this definition needs to, in some cases, be adjusted as the purpose of such technologies is, to a great extent, explicitly act instead of human actors.

2.3.2 Agency of Algorithms

Since the emergence of the Actor Network Theory, many other postmodern theories of agency have expanded on the concept of agency in contexts of technology. These postmodern scholars emphasize both the importance of how we talk about technology, as well as the argument that agency does not rest within any given agent, but that it instead flows through a system of human and non-human actors (e.g. Johnson, 2018). Algorithmic systems are being assigned the abilities to "reason", "plan" and "learn", i.e. they are given agency and intent through discourse, but algorithms also need data, computer code and developers in order to be able to do those things, which means that their agency is affected by that of their creators (Zhu & Harrell, 2009; Johnson, 2018; Reyman, 2018).

Zhu and Harrell argue that the intentionality of AI and systems relating to the field is generally seen as a technical property of an AI or algorithm, but that it is in fact strongly bound to the narrations and interpretations of its human creators and users. Thereby they propose that system intentionality *"arises from a complex meaning-making network that incorporates software authors' discursive narration and users' hermeneutic interpretation of system intentionality..."*

(Zhu & Harrell, 2009: 3). The system's intentionality, or agency, can hence be found in the discourse of human actors who interpret the behavior of artificial intelligence and algorithms. This is also discussed by Hayles in the context of narratives of AI, who states that understanding the life-like properties assigned to AI requires *"looking not only at the scientific content of the programs but also at the stories told about and through them"* (Hayles, 1999: 224).

Zhu and Harrell give an example of the Roomba (autonomous robot vacuum cleaner). By looking at the machine, we do not know exactly what technology or systems steer its movement, but we can make sense and predict its behavior by *"formulating our interpretations of its beliefs and desires."* (Zhu & Harrell, 2009: 1). Hence, the Roomba is assigned agency through the users interpretations. In the same way, we assign agency to the algorithms we encounter, but understanding how agency comes to exist is not enough to understand how agency actually works. Unlike the Roomba, which merely takes over the mundane task of vacuuming, an algorithm adapted in an organization can have complex effects on its environment. Zhu and Harrel further demonstrate the use of their theory by analysing technical narrations of an AI system called Copycat. The material thereby consists of the program's source code and technical literature about it, and their case study is thereby limited to that of developers and people responsible for the technical literature for Copycat. In order to understand agency in complex organizational environments, one must not only look at how it is constructed by different actors (both developers and employees affected) in the context, but also zoom in on the structural dynamics and the flow of agency in the context of the organization (Johnson, 2018).

4. THEORETICAL FRAMEWORK AND METHODOLOGICAL APPROACH

As seen in the previous discussion and research about algorithms, agency does not only lie in what the algorithms are encoded to do, but also in the way we talk about them and how they are presented in our discourse. Thereby, how we talk about technology and agency is in a key role in constructing agency both for ourselves and that of other actors in our environment. My theoretical framework will thereby draw from Social Constructionism and Discursive Psychology. I will

analyse my data by using discourse analysis, in order to investigate different accounts of algorithmic agency, and understand what the algorithm does to the flow of agency in the organizational setting.

4.1 Social Constructionism

According to positivist approaches and empiricism, the aim of science and experiments have been to learn certain truths about the world, and gain knowledge about a given subject or phenomena; scientists set out to find objective knowledge and truth about phenomena in the reality we are situated in. These epistemological positions assume that one can learn about the world through observing it and that our perception forms what is real. Social constructionism however problematizes the notion of objective truth, and critizites knowledge, which is taken for granted. It calls upon us to be critical of the notion that scientists are able to see and explain the world objectively merely by looking at it, and that peoples' observations and assumptions are not without contextual and cultural influence. Furthermore, social constructionism is inherently anti-essentialistic, which means that the world and the people in it are not considered to consist of ready built-in elements, but that things come to existence through social processes (Burr, 2015: 2-3, 6-7).

Mainstream research aims to discover universal laws of how people function; they assume that they can find answers that are applicable to all people. Social constructionism however emphasizes the historical and cultural context, and that how the world is perceived is highly influenced by not only the perceivers background, but what time and cultural context they are situated in. As an example one could examine different languages and find words, which are hard to translate into any other language. One such example is the Japanese word *amae*, which describes a form of dependence, often between child and parent, but that has no equivalent word in English. The existence of the word is said to be a product of the social and cultural structures of the Japanese society, and forms an excellent example of how our realities are affected by our

environment(e.g. Niiya, Ellsworth & Yamaguchi, 2006). This shows that psychology and social psychology cannot find a universal 'human nature', and that attention must be paid to the historical and cultural context, as well as the social practices by which people create their social realities (Burr, 2015: 9-10).

As social constructionism sees knowledge as something constructed through everyday social interaction, language plays an important role in this process. Language is in fact viewed as the core means by which we construct everything around us. People are not seen to use language merely as a way of describing things, either internal or external, but that using language is a form of social action with consequences. By using language in interaction, people construct different accounts, or 'truths' about the social world, which is why social constructionism advocates for a focus on the processes happening in these interactions. Burr (2015) argues that social constructionism sees knowledge *" not as something that a person has or doesn't have, but as something that people create and enact together"* (p. 11-12).

Like for any other phenomenon, people have constructed various realities and notions about algorithms, what they can do, and what their future might hold. These notions, or imaginararies as some might call them, have had an immense impact on the field of data science and algorithms. It is thereby important to look beyond the technical properties of algorithmic technology, and analyze the discourse about algorithms in order to understand the impact of such technologies. In other words the focus should switch from what an algorithm actually *is* to how language is *constructing* what an algorithm is and is capable to do.

4.2 Discursive Psychology
The theoretical and methodological approach of this thesis draws from traditions of discourse analysis, which is the study of language and what people *do* with the use of their language. McKinlay & McVitte define discourse analysis as *"collection and analysis of verbal material, spoken or written, which emphasizes properties such as structure and variability and focuses on*

action." (2008: 10). Similarly, Potter & Wetherell (1987) define discourse as any form of spoken or written utterances and that the central element of discourse analysis is *"the focus on discourse itself: how it is organized and what it is doing."* (1987:49).

The strand of discourse analysis practiced by Wetherell and Potter is also known as discursive psychology, which shares many of the epistemologies of social constructionism. Discursive psychology sees social interaction, and especially discursive interaction as the core of any social phenomena (Billig, 1997). Augoustinos et al (2014) state that the starting point for Discursive Psychology is the discourse, or the use of language itself, and that this is *"constitutive - objects, events, identietie, social relations are constructed by the specific words and categories we use to talk about them."* (Augustinos et al, 2014: 55). Things and phenomena gain meaning through the discourse we employ about them; we construct the social reality we are situated in through the use of discourse with other people.

Potter and Wetherell (1987) outline six core principles of discourse. Firstly, language can be used to do a variety of things, and the use of language can have a variety of consequences. Secondly, they argue that language is both constructive and constructed, in the sense that it draws on a set of cultural resources (such as pre-existing words and social categories) to construct different versions of the world. Thirdly, the constructive nature of discourse results in the same events or phenomena being described, or constructed, in a variety of different ways. Thereby, fourthly, creating significant variation in accounts. As their fifth principle they argue that there is no unerring way to deal with, or scrutinize the variations in accounts constructed by people, which is why their sixth principle states that the core object of analysis should be the constructive and flexible ways language itself is employed (Potter & Wetherell, 1987: 35).

One central interest of discursive psychology is how different versions or accounts for things and events are produced. Discourse analysts underline that words are not merely a reflection of thoughts and experiences, but that these experiences and realities are produced *"through the ways*

in which people live their lives and through the discursive practices that make up these lives." (Wiggings, 2016: 5-6). Thereby, through their discursive practices people make sense of the world, and at the same time construct specific accounts or versions of the world and phenomena around them. What might pass as a person merely describing a phenomena is actually a person constructing and building one version or account of that phenomena, which can also be constructed very differently by someone else (Burr, 2015;Wiggings, 2016). As for any other phenomena, accounts of algorithmic agency also come to be through discourse about and around algorithms, as well as through how people interact with this kind of technology.

4.3 Approach to Agency and Research Questions

At the core of this thesis lies the construction of the capabilities and agency of the algorithm, as well what consequences this construction has on the interviewees' work and flow of agency in the company. I will investigate this by first, analysing what kind of accounts (or lack thereof) of algorithmic agency are present in the discourse of the interviewees, and secondly how they describe changes in their work after the algorithm has been put to use.

I set out to answer the following questions:

A: How is the agency (or lack thereof) of the algorithm constructed in the discourse of the interviewees?
B: What consequences do these constructs have on the interviewees' work and flow of agency in the company?

By the phrase flow of agency I refer to how agency is enabled by a network of both human and non-human actors (as discussed in Chapter 3.2.1), and how it can flow from different actors or entities in this network.

5. GATHERING OF DATA AND STRUCTURE OF ANALYSIS

Ast he purpose of my thesis is to investigate experiences in working with algorithms, I have conducted interviews with employees of a technology company who use and develop a route-optimization algorithm in their daily work.

5.1 Interviewees and context

The interviews were conducted at my own place of employment; an IT company with over a thousand employees and offices in more than 20 countries. The company provides a food-delivery platform that allows users to order food and either pick it up from the restaurants, or have it delivered to the location of their choosing by a courier. The employees of the company are divided into several teams, all responsible by a specific area of the company's product development or country operations. In 2016 the company started using an algorithm in order to increase efficiency in their operations, which changed the job of those working in the operations team.

The algorithm is a route-optimization algorithm, developed to find couriers and plan routes for incoming delivery orders. When a customer places an order with delivery, the algorithm will in other words calculate a delivery estimate based on available couriers, and then figure out which courier would be the best to deliver it based on time, distance and some other parameters that have been built into the system. Before the company adapted the algorithm, the assignment of orders to couriers was manual, and done by human workers in the operations team. Hence, the algorithm has been developed to take on a task, and automate a part of the job of a human worker. For further description on how the work was done before and how the algorithm was gradually adapted, see Appendix 1.

It is worth noting that as an employee of the company and a former member of the operations team, I have a lot of knowledge about the algorithm being studied. Information about how the algorithm technically works is readily available to all employees of the company through internal

knowledge sharing platforms, but not all employees have been affected in the same way as the operations team, where the content of the work itself has changed. While information about the technical properties of the algorithm are available to all employees, detailed information about the change and how things worked before the algorithm are not as widely known. In other words, most employees know *how* the algorithm works, but *what* it has done to the workflow of the people working in the operations team of the company is not as explicitly documented. This is however common knowledge of the senior staff (employees who have been in the team since 2016) in the operations team.

In order to gain the most relevant insight on how the algorithm has changed the work of employees and the flow of agency at the company I have chosen to interview people from the operations team in Finland, and the product team responsible for developing the algorithm. I have chosen the Finnish team, as it is an older market, and hence has employees who remember the time before the algorithm. The pool of interviewees consist of 4 people working in the operations team of the company and one member of the product team. The members of the operation team have all worked in roles that have to some extent involved the manual labor now handled by the algorithm, and the member of the product team has been involved in developing it. They have all worked for the company for a minimum of 3 years, and hence seen different stages of automation. Most of the participants have experienced the effect of the adapted algorithm from the start and all have closely followed its development and how it operates in their daily work. All interviewees have thereby been in close contact with the algorithm from different perspectives and form an excellent pool of interviewees to attempt to answer the research questions.

5.2 Interviewing and transcribing

An interview could loosely be defined as a conversation between two or more people. What sets an research interview apart from a traditional conversation is however the existence of a predetermined goal; it is a means to systematically gather information about a certain subject or

problem of interest to the researcher. In order to succeed at this, not only should the researcher study the subject at hand before the interview, but also make a conscious decision on how to systematically gain more information about it (e.g. Hirsjärvi & Hurme, 1988).

The aim of this thesis is to gather information about how agency is constructed and how the existence of algorithmic technology might change the work of the participants, and the flow of agency in this context. The phenomena is thereby dependent on the participants and their background, interpretations and experiences. In order to emphasize and bring forth these perspectives of the participants, I have chosen to conduct semi-structured focused interviews. Typical for this method is the focus on certain predetermined themes, but allowing the conversation to evolve depending on the personal context of the interviewee. (e.g. Hirsjärvi & Hurme, 1988). I therefore prepared some guiding themes and questions, but allowed the participants to explore the theme through the different topics they brought up and use their personal experiences as references.

I outlined themes and prepared guiding questions (see Appendix 2) to produce talk about the interviewees daily tasks and where the algorithm intersects with the human actors. These included questions about the content of the interviewees work, how they describe what the algorithm is and what it does, what their thoughts were on its development process, how it has changed their work and how it is visible in it.

Given my background at the company, I myself have a certain way of talking about the algorithm and how it works, which means I have been an active participant in constructing different notions of the algorithm during my 4 years at the company. For this reason I initialized all the interviewees by encouraging the participants to talk about the subject and verbalize their experiences in their own words. I found this important to avoid leading the interviewees or let my own experience and knowledge have a considerable impact on the talk that they produced. I however acknowledge that my role and history with the interviewees had an impact on how the

interviewees spoke about the subject. In any interview the speech is created through the interaction of people, and as an insider I might have gotten more information than a stranger would have. This has its advantages, as I can easily engage in a conversation about the subject, but I must be mindful not to let my knowledge lead the conversation more than necessary.

The interviewees were conducted over a period of 4 months, from December 2019 to March 2020. The interviews were conducted before or after the interviewees' shifts or working days. All interviews were transcribed by June of 2020 in accordance with the guidelines of Rantanen and Vesala (2007). As the interviews were conducted in Finnish, relevant excerpts were translated to English during the analysis.

5.3 Ethical considerations

I have to the best of my abilities aimed to conduct ethical research in all stages of my thesis. As my research involves interviews I have especially paid attention to the anonymity of the interviewees and emphasized the voluntary nature of participating in research.

Prior to approaching the interviewees I asked for the company's permission to interview its employees. All participants then volunteered to participate after being asked if they would be interested in being interviewed. As I reached out to the potential participants I also disclosed the purpose of my thesis and that I am interested in hearing their experiences of the algorithm. I suggested to the participants that the interviews could be held at the company office, but that another location of their choosing was also an option. All participants agreed to be interviewed at the office after office hours. Before booking the interviews I pointed out that someone might see me interviewing them at the office, and might know that I am working on my thesis. Thereby someone might be able to figure out that they are participating in my research, but that the content of the interviews are none the less strictly confidential. This did not raise concerns from the participants, and we proceeded to book the interviews. I made a calendar event in order to secure a room for the interviews, and deleted the event after the interviews were held.

At the beginning of every interview I further introduced the participants to my research questions and emphasized that this interview is entirely voluntary and that they can choose not to answer questions, and that we could end the interview at any time if they wanted to. I also asked the participants to sign a form of consent, but underlined that they have the right to withdraw this consent if they would want to at any time during, or after the interview. Before I turned on the recorders I asked if the participant was ready, and if it is okay to start recording. All interviews ran smoothly and participants said that they had an interesting and positive experience.

I am a researcher, but also a colleague and a friend. This puts me in an advantageous position when it comes to being able to examine and understand the subject, but also requires me to be mindful of the participants. I paid special attention to making sure the transcripts were anonymized and left out any discussion not related to the subject of this thesis, which sometimes arose during the interviews. As the participants were all aware of my knowledge of the algorithm and long history at the company, I underlined both before and during the interviews that I am interested in hearing their experiences in their own words, and that there are no wrong or right answers.

As an employee of the company I was not only bound by research ethics, but also the code of conduct of the company. As a result I paid special attention not to reveal any company confidential information both in my description of the company and the excerpts I used in my analysis. I have anonymized the company to the best of my abilities, but made sure to inform the company, that due to my involvement as an employee, this is not fully achievable, and that someone might be able to deduct the name of the company.

I recorded all interviews using two recorders. After the interviews I immediately transferred the recordings to my personal computer (deleting them from the recorders) and then to a password protected external harddrive, where I will store them until the thesis has been accepted. All

recordings will be deleted for good after this and printed transcripts will be shredded or otherwise discarded securely.

5.4 Stages of analysis

According to Rantanen and Vesala (2007) qualitative analysis progresses on two levels; first, the categorizing analysis, and secondly, the interpretative analysis. In the first stage, the analysis consists of coding, categorization and grouping of observations made from literal reading of the transcribed data.. Thereby, I focus the first stage of my analysis on what kind of constructs and accounts of agency are present in the discourse of the interviewees. The interpretative stage of the analysis in turn takes a step back, and views the findings of the first stage as a part of a broader context. The underlying tenet here is that one gains knowledge about the studied reality by interpreting the data through different perspectives on context. In the second stage I will thereby look at what kind of context these accounts are situated in, and what happens in the context as a result of the existence of these constructs and the algorithm itself.

I started my analysis by reading the material several times and highlighting instances or themes related to agency. Here I focused on the literal material and looked for instances describing action, how the algorithm was positioned in the discourse of the participants, what kind of pronouns were used, and agent-subject distinctions. I then started categorizing and sorting these instances into accounts of agency by finding similarities and variation in the participants' discourse. As a result I had mapped out patterns and themes that formed three different accounts of agency.

After I had identified different accounts of agency I moved to the second part of my analysis, where I set out to take into consideration what kind of broader context these accounts exist in and what happens in this context due to the existence of these constructs and the algorithm itself. In other words, I set out to analyse the consequences of the constructs on the interviewees work and the flow of agency in the company.

6. RESULTS

In this section I will present the result of the analysis by summarizing the findings from both stages of the analysis. I will start by presenting the accounts of agency found in the discourse of the interviewees, and then move on to looking at the flow of agency and what consequences the constructed accounts have on the interviewees work, and the flow of agency in the company.

6.1 Construction of algorithmic Agency

In the first part of my analysis I identified three core constructs of agency; the algorithm as an independent actor, restricted algorithmic agency and agency of the developers and company goals. In the first construct the algorithm is constructed as an independent actor, the second account constructs algorithm agency as something that exists, but is restricted by human-made rules, and the third account shows a lack of algorithmic agency, but instead the agency is constructed and assigned to the company and the developers in it. Although the analysis points to three distinctly separate constructs, they exist at the same time, not only in the shared context, but also in the discourse of the interviewees. Thereby, the same participant could construct several accounts in the same instances of discourse.

6.1.1 The algorithm as an independent actor

Almost all interviewees used discourse describing action when asked about how the algorithm works and how it is visible in the participants' work. All participants further constructed the algorithm as an independent actor in at least some instances in their discourse. Here, H2 describes the algorithm as something, which *does* things, as well as describes how the algorithm is able to perform tasks without human intervention:

> *M: Yeah. Is there anything else in addition to effectiveness that has been brought along?*
> *H2: Well. It's hard to say as I'm not always glued to the screen, looking at what it's doing,*
> *because nowadays I trust it. So uh: but there are these wow-moments where it has come*
> *up with how those three tasks, how those can be combined, and stuff like that. It's hard to*

say if I could have done that myself. Probably not. Because there would be too much

happening around me

H2 constructs the algorithm as an active individual agent through words of action, but also in comparison to the ability of a human actor to perform the same task. The interviewee further states that the algorithm is trusted to take care of its task, hence further framing it as an individual actor. The independence of the algorithm is further constructed in the next statement of H2, where the algorithm is constructed as an entity that goes unnoticed in the background, while it performs its tasks:

H2: [...]I think. I mean it is like ((short break)) it runs in the background and does its own

thing. I can't really think of how I would see it. It's just been cunningly hidden in there to

help me [laughs]

The agency of the algorithm is also constructed in relation to other actors and in describing the relationship between them:

M: Yeah. How do you see- or in what way does it affect the couriers?
H2: The decisions it makes. They affect how many tasks a certain courier gets, but I don't
know everything about our algorithm. Like if it favors bundles over something else. Like
effectiveness or something but ((short break)) it does have an effect

H2 constructs the algorithm as an entity, which is able to *make decisions* that changes its environment and how other actors can act within it. Similarly, H3 talks about the algorithm in a way, which constructs its agency through words of action (the algorithm *organizes* things), and its independence by situating it in the network of other actors, stating that it has tasks of its own.

H3: Uhh. Well it ((short break)) it like organizes the tasks, to uhh ((short break)) the couriers in the smartest way possible, so that the customers get their stuff fast- at the moment we don't really have to intervene anymore. Like uhm ((short break)) of course there are exceptions sometimes, where we need to manually create a task for it, so then you have to. But basically ((short break)) basically it runs completely on its own and, and distributes the tasks to the couriers((short break)) and so on.

When discussing the development and the period of adapting to the algorithm, the participants constructed it as an entity with agency, but that it could not yet work completely independently. Here H2 construct the algorithm by describing that the algorithm makes decisions, but further states that the things it does were unintelligible.

M: Why did you criticize it at first?
H2: Well it did these stupid calculations
M: [laughs]
H2: It did stupid decisions. I was better myself at the time-or at least thought I was.[laughs] That was the reason.

A similar discourse can also be found in the discourse of other interviewees, for example when discussing the problems of the algorithm with H3:

H3: it didn't happen with a snap of the fingers. Like I said before, there have been those things where its made very stupid routes and these- the problems that sometimes occur when the courier has to wait somewhere for no reason ((short break)) They have been a lot worse before.

The algorithm as an independent actor was an especially prominent construct in the discourse of those participants who work in the operations team, but all participants also constructed several, different accounts of agency in their discourse. The algorithm was constructed as an independent actor, but the participants also constructed other versions, which assigned agency to the algorithm at the same time as they acknowledged that it abides by a certain code, developed by its human creators.

> *M: So how would you describe how it works and what it does?*
> *H5: Yeah. It is like an algorithm that works automatically, so it's like it's built in there and kind of does all decisions instead of the support person. So it directs the orders and diff-different like, according to different settings decides what orders go to which courier and how many and what direction. Ehm (short break) but then there is of course the possibility that the support person does some manual changes if they have to, but primarily it steers it.*

Here H5 constructs the algorithm as an entity, which is embedded in the system to make decisions *instead* of the person working in support (the operations team). H5 also describes the algorithm as an entity which *directs* and *decides*, but yet acknowledges, that it does so based on some kind of settings, constructing it as something that is still steered by predetermined rules. This shows that not only do several constructs exist, but that they can exist at the same time, in the discourse of the same participants. I will further explore these different constructs in the following sections.

6.1.2 Restricted algorithmic agency

While many interviewees constructed independent algorithmic agency, many of them simultaneously acknowledged certain human-made restrictions on the algorithm. These restrictions are certain rules, or settings, which created a framework in which the algorithm was able to enact its agency. In other words, the algorithm is able to make decisions, but only within, or according to a certain set of rules, determined by the human developers, which in turn strive to

meet strategies of the company. Thereby, while interviewees did assign the algorithm agency, they also acknowledged that it operates based on and restricted by the agency of its developers. This construct became apparent through the exploration of several different themes, maybe the most prevalent being the discussion about if the algorithm makes mistakes.

The same interviewees who constructed the algorithm as an independent actor through pointing out its mistakes or nonsensical decisions, also at some point in their discourse acknowledged that they are developed by humans, and thereby it is in fact these humans who made the mistake.

> *M: Well, what do you think?*
> *H2: Well. Of course, in my opinion it has done a lot of mistakes [...] but I don't really know how the whole thing is built. So it's hard to say if it di- well, I think it has in some situations made the wrong solution ((short break)) but it abides by a certain code, so in that sense it hasn't made the wrong choice.*
> *M: Yeah*
> *H2: So I guess it's the coder who has made the wrong choice*

H2 constructs the algorithm as an entity by pointing out that it has made mistakes, but then questions the source of that mistake, as the algorithm follows a certain code. H2 thereby concludes that it might not be the algorithm itself who made the mistake, but the developer behind the code it has been given. A similar point is presented by H1:

> *M: Okay, so: If we forget about these human mistakes you mentioned for a while and think about other situations like this, like mistakes or errors of some kind (short break) so do you think that the algorithm makes errors?*
> *H1: Hmm ((6 s break)) well technically no. Because if there are mistakes in the algorithm, then it's the mistake of the creator and not the algorithm[...] and then uhm ((short break))*

it's not like advanced and civilized enough to know how to take everything into account.
In addition to taking into account the instructions it has been given.

Like H2, H1 constructs mistakes as something *in the algorithm*, and that the *creator* is
responsible for these. H1 however still uses language, which frames the algorithm as an entity that
takes into account instructions, or that can't take everything into account. This discourse
constructs the algorithm as an actor, but with action determined or steered by its code, i.e. its
human developers. The account for restricted algorithmic agency also became apparent when
discussing the development of the algorithm. H4 further constructs this relationship between
human and algorithmic agency as follows:

> *H4: [...] really the biggest part of the job throughout our history has been more about,*
> *like more about what is a good solution, and how we like* tell *that to the optimization. So*
> *not so much about when we know a good solution, then how do we get there.*

The interviewee refers to the *optimization*, describing an action, rather than an entity. The term
optimization is however sometimes exchanged with the algorithm (as it is a route-optimization
algorithm), whereby one could conclude that the optimization, or the algorithm is constructed as
an entity that the human developer *tells* something to do. One could then argue that the algorithm
is constructed as an independent entity in its environment, but one that its agency is still restricted
by what it is *told* to do by its human developers. Similarly, when talking more concretely about
what the algorithm does and how it functions, H4 states the following:

> *H4: [...] ultimately the algorithm only gets thi-it only gets like, here's*
> *the purchase, solve! [laughs]*
> *M: [laughs] yeah*
> *H4: so it doesn't like care if the drop-off is in like Turku or Helsinki. There are like these,*
> *many different layers around it. So everything then affects it.*

H4 constructs the algorithm as an entity, which receives something to solve. Here they construct a type of action between the algorithm and some other entity, by stating that it *gets* something; that it is given something, by some other entity. H4 further says that there are *layers*, referring to not only the capabilities and restrictions, but also businesslogic and strategies which dictate what kind of capabilities and restrictions are put in place.

H4 was especially focused on the different technical restrictions and rarely constructed the algorithm as an independent actor. Instead, the interviewee constructed the algorithm as a type of vessel to enact the agency of the developers, who in turn strive to meet the goals of the company. This will further be explored in the next section.

6.1.3 Agency of company and developers

When asked to explain how the algorithm works and what it does, H4 rarely said that the algorithm itself does something, but mostly used the pronouns *"we"* and *"you"* when describing action. Furthermore this was linked to broader goals of the company, further shifting agency away from the algorithm to the people developing it and the business strategy framework in which it is developed. H4 in other words rarely directly referred to the algorithm as an *it*, or an entity that does something, but instead often used pronouns *'we'* or *'you'*.

> *M: Yeah, so how would you describe how it works and what it does?*
> *H4: Hmm. Well probably the be-maybe the most common starting point is like for this kind of algorithm a cost-function is usually defined. So there is something that you either want to minimize or optimize. [...]So we sort of like focus most of our work on like (short pause) the cost-function is the same and we just try to get as close as possible to it. Like we have this problem so how do we find the solution that has the smallest possible cost.*

When asked about how the algorithm works, H4 starts out with talking about the most common starting point for this kind of algorithm, but quickly shifts to constructing the situation as a problem *we* or *you* have to solve. H4 further continues:

> *H4: [...] So okay, we know that we want to for example a small amount of latency and a small amount of distance, but how do we find the solution? Because there are (short pause) billions and billions of solutions. So you can't possibly go through them all, so you have to somehow search that universe, like effectively. And it's li-it's a big part of what is at the core of developing an algorithm*

Although I here initiate the conversation by constructing the algorithm as an *it* H4 very quickly shifts to talking about a type of collective *we* or *you* when asked to describe how the algorithm works. This collective seems to refer to the developers of the algorithm as well as the business strategies of the company. Here agency is in other words not assigned to the algorithm, but instead to human workers, whose task it is to *find the solutions*. When further discussing the development of the algorithm and future plans, H4 continues in a similar manner.

> *M:So what about the future. How li-or are there any plans for how to develop it? And if so then how?*
>
> *H4: Well right now one of our like bigger projects is sort of li-well one is that we now that we have to improve, like the algorithm itself. Like the ting that e:hm so when we know what is a good solution we need to improve the thing that tries to find them. And we know we can improve it quite a lot, so it's already in the short-term plans [...]and it's better simply because we have been able to develop an algorithm for this specific use-case, and not like a generalist-algo, which we have used so far. And then there's ((short break)) one of the big problems li- one problem in the optimization is that if the baseline is faulty, then the results are as well. So it's sort of like garbage in garbage out.*
>
> *M: Mm.*

> *H4: And o-like anything improved in what we give to the optimization we know will improve what comes out [...]*

In this instance, the construct of the algorithm as an entity is more present; *it* is something that needs to be improved. Effort and action to improve it is however something assigned to the human developers. H4 further constructs the algorithm as something dependent on the agency of the developers, by stating that the results are a product of what the collective *we* give to the algorithm. When later discussing quality of cost-functions and how to determine what is the best way to develop algorithms, or what are the best solutions, H4s constructs the agency of human actors explicitly.

> *H4: You like always end up in the loop that, that to be able to evaluate what costfunction is better than another one you have to have another costfunction [laughs]*
> *M: Yeah [laughs]*
> *H4: So it becomes this endless loop sort of. It's sort of like ((short break)) it's difficult. At the end of the day a human just has to make the decision that this is the thing that we are optimizing, and that's it. That's how it always goes at the end of the day. It has to!*

Here H4 states that ultimately, the decision of what is optimized, i.e. the activities of the algorithm, must be done by a human actor, and that is how it *always goes.* What the algorithm does is in other words the result of a human enacting their agency to decide what solutions are the best ones, and what cost-function to apply to reach those.

6.2 The flow of agency

The first part of the analysis shows that there are several agents, and that both human and algorithmic agency are constructed in the company. In order to further understand the dynamic

nature of these actors, it is important to look at how they interact, which is the focus of the second part of the analysis. Since the adaptation of the algorithm, the work of the interviewees has changed in several ways. Not only has the algorithm affected the flow of agency by enabling and restricting some things, but new patterns of agency have also emerged, where human and algorithmic agency cooperate to perform certain tasks. When examining the flow of agency in the company, the changes became especially clear in the discourse of the interviewees working in the operations team, which is logical, as the algorithm has taken over a task they used to do. Changes in the flow of agency, and especially new forms of agency were however present in all interviews.

6.2.1 The algorithm as an enabler

By exploring the interviewees work prior to the algorithm and what it is today, many described the algorithm as something which has allowed the company, and them as workers to do certain things that were not possible before. In other words, the algorithm acted as an enabler. This construct was especially prominent through discourse about company growth, and all interviewees saw the algorithm as a prerequisite for the company to be able to grow.

> H3: Hmmm. I wonder if the old system had any good sides [laughs]
>
> M: [laughs]
>
> H3: Well. It is fun to look back at it now but ehm: this is, I'd say that we have gone in a direction. And especially like, like the fact that we were two or three people needed at the office to run a fleet of 15 couriers. So now that we have a lot more we'd have to be like ((short break)) two hundred people here at the office to run this with the old system. That wouldn't be very efficient.
>
> M: Yeah
>
> H3: So this new system does bring opportunities for growth in a whole different way

Here H3 acknowledges that the company would not have been able to grow at the same speed if it wasn't for the algorithm, and that without the algorithm, operations would be less efficient. The

algorithm has hence enabled the agency of the company, the business strategies, or the goal of the entity or actor whose goal is for the company to grow. The human workers in the operation team see the algorithm as an advantage, and describe it as something making their job easier, but often referred to company growth when talking about what it has enabled. There were however also some other tasks that received more time as the workers did not need to take care of the task now assigned to the algorithm.

> *M: You said that it's sort of like a tool, so in what way do you mean?*
>
> *H2: If we think about the time without the algo, we moved everything ourselves, like assigned all the tasks to each courier separately and ((short break)) at some point we realized that when we grow this won't work. So it's a tool that makes my job easier.*
>
> *M: Yeah.*
>
> *H2: One part of my job was like removed, so I can focus on doing something else more effectively.*

Here H2 explicitly states that a part of their job was *removed* so that they can focus on something else. Also the word *'tool'* suggests that it is something the employees use in their work to make it easier, and allows them to do something else. One interviewee also said that the algorithm frees up time to focus on tasks related to communication with other people.

> *M:Yeah. Well ho- or in what way is it visible in your like day-to-day work?*
>
> *H3: The algorithm?*
>
> *M:Yeah*
>
> *H3: Well I think mostly it's like we don't like, like have to worry about how the tasks are organized, so really it- like you're able to focus on communicating with the couriers.*
>
> *M: Yeah*
>
> *H3: So essentially ((short break)) Well of course we nowadays have shift supervisors who look at the bigger picture, and keep an eye on that a little more, but what I do is sort of*

> *focused on the couriers. And if we get a message from a courier about some problem, then we check if there's something wrong.*

H3 says that because of the algorithm, they are able to focus on communicating with the couriers. They further say that they no longer have to *worry* about how the tasks are assigned. So in addition to enabling focus on other tasks, the algorithm seems to alleviate some sort of worry about the orders being assigned to the couriers. The algorithm as an enabler for communication was also present in the discourse of other interviewees.

> *M: Yeah. What about the routing (short break) you said that instead of thinking about the routing, which the algorithm now takes care of, you can focus on other things. So what are these other things, and why is it an advantage to be able to focus on them?*
>
> *H1: I mean (short break) there are advantages and disadvantages But with the current volumes it is of course mostly an advantage, like you don't have to do the manual work. What we can then do instead is answer these questions, where we are asked for help in some situations. Or some kind of advice. You can then focus on that, and we don't have to put as much resources into the routing, like counting in working hours.[...] The technology has been a considerable help, like in decreasing the amount fo working hours. Which in turn leads to less administrative work and less need for recruitment. Then you don't need to train and onboard people. And on top of that we can train people to a narrower role. So like more of this communication and like human and personal stuff. Or like working wi- together with people, instead of putting the [routing]puzzle together.*

H1 explains that as a result of company growth and current volumes the algorithm is an advantage as resources can be focused on something else, instead of the manual labor of assigning deliveries to couriers. They further suggest that as a result of the algorithm not as much recruitment and administrative work is needed, and that people are trained and onboarded into a role, which has less tasks. Thereby, the algorithm also enables the administration and management responsible for

recruiting and onboarding to focus on something else. They further state that the algorithm enables interpersonal work, instead of focusing on the manual assignment of orders.

The algorithm was often constructed not only as an enabler for company growth, but also a means for the employees of the company to handle growth. While a lot of the discourse focused on growth and managing it, there were also some other aspects that the algorithm had enabled. The most dominant discourse was however that of growth and efficiency.

When talking about what the algorithm has changed, many interviewees pointed out that it has both advantages and disadvantages. Coexisting with the things the algorithm has enabled, were also things, which the interviewees found as a disadvantage, or thought the algorithm has prevented them to do.

> *H5: Uhm. I think it's enabled many many things for our company. We could never operate this way in many countries and many markets if we didn't have the algorithm. But in my case I have done a lot of support work, uhm (short break) maybe no-well you could say that I've done more support without the algorithm. So li:ke, it ofcourse, it brings a lot of possibilities but also takes some options away. It like rules out a lot of things which you can't then do.*

Here H5 describes that the algorithm has enabled many things in the company, and that growth would not have been possible without it, but that it has still '*take[n] some options away'*. The algorithm has in other words acted as a restrictor to human agency. This will be further explored in the following section.

6.2.2 The algorithm as a restrictor

While the algorithm has enabled the interviews to focus on other tasks, and enabled the company to grow and scale, there were things that the interviewees said that they were not able to do anymore. This became especially apparent in the work of the operations team and what kind of action was available to them.

> *H5: [...] if the algorithm has already made the decision, then you can't necessarily get your foot in the door anymore. Sometimes you just have to accept that, okay, this is how it will go. Then it's sort of like, well, this is kind of how the algorithm works, so let's go with it.*

Here the interviewee explains a situation where a human actor might have to step in to fix a problem, but that it is not always possible and that sometimes they have to accept the decision the algorithm has made. Thereby the algorithm might prevent the human worker from doing something, although one might see a situation that would be reasonable to adjust somehow. H5 later talks about the manual work they have done before and says:

> *H5: [...]Then nowadays when a lot of things have been automated, so if you have this kind of situation you can't really do it anymore. Like according to the rules you can't do it the same way anymore. Then there might be like these guidelines, so this is how things are handled and it might be easier to just follow them.*

Here H5 talks about *rules* and *guidelines* which state that things should be done a certain way. These refer not only to the algorithm, but also guidelines or ways of operating that have come with it. These are in other words not something directly dictated by the algorithm, but imposed by managers as a result of adapting the new technology.

When interviewing the employees of the operations team who have been at the company for the longest, and thereby worked for a longer time without the algorithm, mentioned a sense of accomplishment that came from when the manual work was done successfully. They also said that this sense of accomplishment is no longer achievable, or comes from something else due to the algorithm taking care of these tasks.

> *M: Yeah. And ehm: is there something, like something it has made harder to do in your work?*
>
> *H3: Hmmm: we:ll I wouldn't say that ((short break)) of course it was really nice when we had the old system and you were like <u>really good</u> at it. Like you could sort of ((short break)) working the old system required a lot of <u>skill</u> to throw the tasks around as fast as possible. So now four years later I remember that it was fun and you cou-or it actually mattered if an experienced person or someone new was sitting there. Like the quality of work could even vary depending on it, and it was like nice to feel that you were good at it.*
>
> *M: Yeah!*
>
> *H3: So that is not really the same anymore. It's more about talking a-of course you can be more or less skilled at that too, but maybe ((short break)) there was something fun in tinkering with the tasks [...] Like if you just made an incredible triple-task for a courier it felt good!*
>
> *M: Exactly! [laughs]*
>
> *H3: [laughs] like now the machine does it for me. And you don't really get the same kick out of it*

Another interviewee also mentioned the sense of accomplishment and that it did not only come from the manual work, but also the teamwork and working with people, which is not the same as before.

M: Maybe we could talk about the tasks which the algorithm takes care of now. How were they handled before?

H5: Yeah, so a lot of them were handled like by ourselves. I can't immediately think of like specific things, but like generally we did a lot these different tasks with the team during a shift, which you don't have to do at all anymore. They are taken care of automatically. It wasn't really just like working what we used to do, but it was also like working with <u>people,</u> like spending time with <u>people.</u> [...] or if you like compare to how it is now, where like some kind of algorithm or machinery just takes care of it without asking any questions or without saying anything <u>out loud</u> or anything. So the human side used to maybe a bit more present. It sort of brought this ((short break)) or built this team spirit, and there was this different atmosphere. It was nice. Like you could see the result of your work, you could see it clearer. It was like visible to you all the time.

M: Mm. Yeah

H5: And then it of course brings you a sense of achievement. Because you could see what you were doing and you saw the outcome of it right away. Nowadays you don't get these feelings and stuff, or like you don't get them from the same things at least. Nowadays they maybe come from other things[...]

Here H5 describes the time before the algorithm, and what happened after it was adapted. Not only do they discuss the same sense of achievement, but also constructs it in relation to working with *people.* The algorithm is constructed as an entity which has taken over a task of the human worker, and now takes care of the task which used to involve human-to-human communication and teamwork quietly, without *saying anything.* This discourse also constitutes an interesting contradiction to the discourse of H1 in the previous section. Whereas H1 constructed the algorithm as an enabler for interpersonal work, here H5 constructs it as something that has restricted it.

6.2.3 Human-algorithm complementaries

In the interviews it became apparent that agency moved both through humans and the algorithm, and created new forms of agency. The algorithm does not only restrict and enable certain things, but the people working on or with the algorithm also restrict what it can do and might step in to change something that the algorithm has done. In this context action and the accomplishment of something is not the result of a single entity, like the algorithm or the human worker, but several entities working together. Hence, one could consider a sort of hybrid or collective agency, which is formed as the human and the algorithm works together to reach a goal.

New forms of agency, or new flows of agency became apparent for example when discussing the human-made restrictions and other things related to the development of the algorithm. When explaining these restrictions, one interviewee constructed the process as something communicative; the developers told the algorithm not to do certain things by setting different types of restrictions. When talking about how the algorithm is developed, and the different layers of settings and human-made restrictions around H4 described them as follows.

> *M: Do you have a concrete example to give? Or are you talking about these, ehm,*
> *capabilities o:r?*
> *H4: Well for example yeah. And they do directly affect the algorithm in the sense that it*
> *affects how like, it's like a way to tell it that these are like acceptable solutions, and these*
> *are not. So this courier can do these orders and such. So it like restricts what kind of*
> *solutions we can find, so in that sense also affects the core optimization as well.*

Capabilities are another word for certain restrictions, that e.g. might tell the algorithm not to assign a long distance delivery to a courier on a bicycle, but preferably a car. H4 later continues about different types of restrictions.

H4: So there are like, well two diffe-in our case two sort of different types. There's like either this kind of like hard-restrictions, so these clear things that it is completely clear that this can not be done. It is pretty straight forward in practice. So this courier and this order are not compatible, so don't make this kind of solution. And making these are very simple. It's this logic-code sort of. But then like ((short pause)) the harder part is this like this soft stuff. Sort of like these cost-function things, like they are these things ((short pause)) well, preferably don't do this. But then it's like, how preferably? [laughs]
M: [laughs]
H4: Like how bad is this? [laughs] And like you have t- it gets a lot harder. Because you have to be careful with for example saying that something is so bad that suddenly it does not care about anything else. The optimization. As long as it finds the ones where this really bad thing doesn't happen, then it's just fine.

Here H4 constructs the flow of agency as something starting from the human actor telling the algorithm what not to do, or what is not a preferred way to act. These forbidden solutions created by the developers then create a framework inside which the algorithm can act and make decisions. H4 further states that some restrictions are not as absolute as the other, which give the algorithm more options to act. Here the situation is also constructed as a two-way communication, where the algorithm then asks how bad it would be to do something that is not forbidden, but not preferred. H4 also says that the human setting these restrictions have to be careful not to set restrictions that are too strict, as it might lead to an undesirable result. Thereby the outcome is a combined effort; humans enact their agency by giving the algorithm instructions, and the algorithm enacts its agency within these boundaries. The decisions of the algorithm are then evaluated and restrictions are adjusted when needed by developers.

Later, when discussing how the algorithm has changed the work of people in the operations team H4 says the following:

M: So what about support? If we go back to how this affects people

H4: So support? Like how they are affected?

M: Mm. Or how its affects them or is visible in their work

H4: Feels like an interesting questions [laughs] you'd think that you'd sort of have like a better [laughs]

M: Mm yeah [laughs]

H4: E:hm. No but of course it affects them alot! Like the starting point where support sort of set off from is what has been optimized and what the system has done. So it's either what they start fixing or then ((short break)) like what they start looking into, like why something goes the way it does. Because the basis of this whole system is what the couriers do and in what order.

M: Mm.

H4: So its definitely a very essential thing. Especially if it does something clearly, like clearly wrong.

Although the algorithm is described as something dependent on the action of its human developers, here the algorithm takes another role in the flow of agency. In the context of operations, the starting point is the action of the system, or the algorithm. First, the algorithm makes a decision on what courier to assign the order to, and after that the human workers in the operations team might step in. This flow of agency between humans and algorithm became especially apparent in cases where people in the operations team had to step in after the algorithm had made a decision that the human workers deemed wrong or faulty.

H5: Yeah, uhm ((short break)) Well there are a lot of situations in operations. There are so many tasks and stuff. The algorithm makes the decision based on wha-what kind of settings has been developed, and when it makes a decision about some task, it only makes the decision based on those settings. But then at the same time in real life there might be

some unexpected tur-unexpected event that like changes the nature of the situation from what it was when the algorithm made the decision. So at this point it might be reasonable to make another solution. Like change the task or the situation somehow

H5 points out that the algorithm makes decisions and does something based on settings it has, acknowledging that it acts in accordance with how the human developers have developed it. H5 however states that in *real life* there might be a number of unexpected things happening, and suggests that the algorithm is unable to adapt to this. Thereby a human worker might have to step in to somehow change the situation. H1 similarly describes situations where a human might have to step in:

M: So it sort of runs in the background then?
H1: You mainly have to focus on the outlier ca-or problematic cases. And these are usually completely caused by some human factors, which the algorithm is not able to solve. So that's why we still have people doing this, and not just machine-to-human, but also human-to-human communication.

H1 states that situations where a human has to step in are usually due to *human factors* which the algorithm cannot solve. Here the interviewee does not only describe the realities, but also justifies the need for human workers and that a machine communicating to people is not enough; there needs to be communication between humans to solve some situations. When asked about details about how problematic cases are solved, H1 describes another complementary between human and algorithm:

M: Yeah. And what do you do in a situation like this?
H1: Well before what we did was ehm: we put someone there, like in the middle of the route to take over the delivery, and then we continued. Nowadays as the tools are a little

different, we usually just redo the whole order and let the algorithm decide who it is
assigned to
M: Yeah.
H1: So let it decide what is the best option

Here H4 describes a situation where a human worker steps in and redos the order. In practice this means that a human worker identifies the issue, and then chooses to fix it by creating the order again in the system. This action also requires contacting the human parties (couriers and vendor), but unlike before when the order was manually assigned to another courier, the human worker creates a new order for the algorithm to assign. Hence, the agency flows from algorithm to human and back to algorithm, unlike before, when a mistake led to the human taking over, overriding the decision made by the algorithm.

The analysis shows multiple flows of agency in the company. The algorithm acts as both a restrictor and enabler, but the adaptation of the technology has also led to new flows of agency, where agency flows from human to algorithm or vice versa. The results show some similar findings to previous research, but also provides the field with new insight on agency, from a social scientific perspective. I will further elaborate on this in my discussion.

7 DISCUSSION

In my thesis I set out to contribute to issues on agency and algorithms in peoples' working lives. I set out to do this through a discursive analysis on how algorithmic agency is constructed by people working with algorithms and what the existence of the algorithm does to the flow of agency in the participants' work. I have thereby not only aimed to contribute to the body of research and literature about the construction of agency, but also to the research focusing on what algorithms do to the organizational context they are embedded in.

Firstly, I wanted to investigate what kind of algorithmic agency (or lack thereof) is constructed in the discourse of people working closely with the algorithm. The analysis shows three core constructs of agency; the algorithm as an independent actor, restricted algorithmic agency and agency of developers and company. In the first construct, the algorithm is constructed as an entity, which enacts its agency independently, whereas in the second construct constructs the algorithm as an entity, but that its agency is to some extent restricted by human-made restrictions. The third construct on the other hand shifts away from the algorithm as an independent entity, and focuses on the agency of the developers and the company. In this third construct the actions of the algorithms are described in terms of developers working on problems and through their efforts finding the right solutions. Although the algorithm as an entity is also present in the third discourse, it is so to a much lesser extent than the first two constructs.

An interesting observation was that although constructs were inherently separate, they were also to some extent present in all of the interviewees discourse, sometimes existing in the same instance of speech. The same interviewee could, for example, construct the algorithm as an independent actor which does mistakes (assigning it agency), but also acknowledge that the algorithm acts based on certain settings or human made restrictions, and that ultimately the developer is at fault (assigning the developer agency). Another interesting find is that the accounts varied between the members of the operations team and the member of the product team, which would suggest that agency is perceived differently depending on the role and the types of interaction the person has with the algorithm.

In the second part of my analysis, I took a step back to look at agency as a part of the broader context to see what the algorithm does to the context it is embedded in. There is a lot of discussion about how algorithms will change the way people work, and some even fear it will take over the jobs of humans. The analysis shows that the algorithm in fact has changed the way the interviewees work, but that it is not just a matter of taking over a job from a human worker. Instead, while the algorithm might act as a restrictor to human agency, it also enables human

agency and creates new flows of agency, by creating new algorithm-human complementaries. The interviewees describe how the algorithm has enabled them to focus on other tasks in their work, and how it has enabled, and has even been a prerequisite for the growth of the company. At the same time the algorithm has also restricted the agency of the interviewees; by taking over a part of the work from the human workers not only restricts the people from doing that work, but also restricts them from the sense of accomplishment and fun the work brought to them. What the algorithm has done to the flow of agency is however not just a matter of enabling and restricting agency, but it has also created new forms of agency, which is a sum of the actors in the context. The results support the findings of previous research, which has also found human-algorithm complementaries, but also provide more insight on how algorithms might restrict human agency, and provide an employee-centered approach to the matter of agency.

With all research comes the question of generalizability, which is an especially important conversation for qualitative research results. The discourse in this thesis is produced in a very specific context, and hence represents a certain, specific type of interaction. This raises the question of ecological validity, i.e. the extent to which the results can be generalized beyond the research context. Some claim that results of discursive research lack this validity, and hence cannot be generalized to any other form of interaction (e.g. Potter & Hepburn 2005). Niska, Olakivi and Vesala (2018) however suggest that in any one interaction, one can find things, which are of interest in themselves. They further suggest that it is possible to make generalizations beyond the context, but that this has some requirements. One of these requirements is the formulation of the research questions, which allow exploring phenomena, for example, through focusing on resources, functions and practices of speech. They further state that if discourse exists and is understandable in one context, it is most likely also possible and applicable in another context. Hence, it is not credible to assume that similar constructs of agency could not be found in another context. Generalizability is not a central aim of qualitative research, but based on this the results can be applicable outside of the interview context.

7.1 Discussion about accounts of agency

In the discourse of the interviewees, the results found three different constructs of algorithmic agency. In the constructs one could argue that at least two of Bandura's (1997) four properties could be found, namely intentionality and self-reactiveness. The interviewees describe the algorithm as having an intention (to e.g. find solutions or make the smartest decision) and ability to self-reactiveness (by evaluating the situation, and possibly changing the made decision). The constructs however also point to limitations of the algorithm and how both human and algorithm work together to reach goals, hence showing that neither human or algorithm has absolute agency in the context. Trying to understand the results in terms of Bandura's core properties is however not enough, and the phenomena needs further exploration.

The results support previous discussion about algorithmic agency (e.g. Johnsson, 2018; Reyman, 2018), by showing that agency is constructed in the discourse of the people in the context. The three constructs were to some extent present in the discourse of all employees, but the last one however mostly present in one of the interviewees. One explanation for this variation could be the role and background of the interviewees. One could assume that a developer has a more technical way of speaking about a software program, than someone who is not educated, or by other means has extensive knowledge about algorithms. Similarly, one could also assume, that someone working closely with the developed and applied algorithm, and whose task has been outsourced to it, might perceive it differently, and more like an agent. So when the developer might focus on their work, i.e. what technical and mathematical action goes into developing an algorithm, the members of the operations team rely on their interpretations and resources available in their personal context to describe what the algorithm does.

Zhu & Harrell (2009) also make a distinction between the *'software author's discursive narrations'* and *'users' hermeneutic interpretation of system intentionality'*. The results of this thesis shows how the agency of the algorithm is, indeed constructed in the discourse of the

software authors (developers) and the users. The term *user* is not explicitly defined by Zhu and Harrell, but the members of the operations team could in a sense be interpreted as users, as they are the employees who work closest to the algorithm, and to whom the algorithm is constructed as a type of tool in their work. The results suggest that the distinction between developers and users may be relevant, as it could account for some variation in the accounts constructed by the interviewees. It is further worth noting that Zhu and Harrell focus on technical narrations, i.e. the software's source code and technical literature about the software. In their results they find several ways in which the authors of these construct intentionality, or agency to the software. The results of this thesis support the findings of the case study, but also contribute with a more extensive understanding of the discourse of both software users and an author by examining both the discourse of a developer, and members of the operations team. Furthermore, discourse is produced in an interview at the interviewees' place of work, which might constitute a more natural setting, and thereby get a more accurate account for algorithmic agency in the participants' work, compared to discourse in source code or other technical narrations.

The selected participants also make up a relevant group for the research questions, as they are the people either developing, or most affected by the algorithm. This is not only due to their positions, but also time at the company, which have allowed them to experience the time before the current algorithm and different stages of automation. As the algorithm has been developed, it has become more invisible and seamlessly integrated over time, and one might not for this reason find the same results by interviewing newer employees. This raises an interesting question about generalisability, as the experiences of the selected interviewees are most likely quite different from those who have just started at the company. The experiences of the selected interviewees is however the most relevant for this thesis, as they have first-hand experiences of the adaptation of the algorithm, and most importantly, have done the job the algorithm now does.

In conclusion, the results of the first part of the analysis show three different constructs of agency, which corroborates to previous discussion and research about algorithmic agency. The results

further illustrate the multifaceted nature of the construction of algorithmic agency; showing that agency is constructed in multiple ways, depending on the personal context of the constructors. In the next sections, I will further explore the consequences of these constructs on the work of the interviewees and the flow of agency in the company.

7.2 Discussion about the flow of agency

As suggested by Latour (2005) in his actor-network theory, agency is a sum of the action of entities (both human and non-human) situated in a given context. This also becomes evident in the results of this thesis, which shows how the algorithm takes part and intervenes in different processes in the context, but how the human workers also intervene with the development and actions of the algorithm. Agency therefore moves from one actor to the other, sometimes going back and forth in order to reach a goal, or to put in Latours's words, it *"zig-zags from one to the other."* (Latour, 2005: 75). Although Latour's actor-network theory precedes research on algorithms, it still seems to have some accuracy in this context, especially given that the algorithm has not completely replaced the human workforce.

The results show that while the algorithm might restrict the agency of the employees, it also acts as an enabler for some action, as well as creates new human-algorithm complementaries. These findings support the results of the studies made by Grønsund & Aanestad (2020) and Shestakofsky (2017) by showing that adaptation of algorithmic technologies might remove some task from the human workers, but also enables focus on other tasks, as well as creates new tasks the employees can or have to take care of. So while the algorithm might enable workers to focus on something else, they might also gain more tasks due to the algorithm.

The tasks which the algorithm has enabled more time to focus on, and the new tasks created as a result of the algorithm are very similar to that of the nonroutine tasks and emotional labor found by Shestakofsky (2017). As the employees do not have to put time on the routing and assigning of

orders, they can focus on interpersonal work and troubleshooting; talking to people and solving problems, which sometimes might be due to the algorithm. In regards to interpersonal work the results however found a contradiction between two of the interviewees. While all interviewees of the operations team constructed the algorithm as an enabler to focus on tasks including answering messages, two of the interviewees explicitly discussed interpersonal, human-to-human work; one stating that the algorithm has enabled it and the other, that it had restricted it (H1 in chapter 6.2.1 and H5 in chapter 6.2.2). This could possibly be explained by years working at the company (one of the interviewees being an employee long before the algorithm, and the other joining around the time of the first stage of automation), but also illustrates how the same events can be constructed in different ways, depending on the person perceiving it.

To conclude, the results illustrate how interviewees construct complex flows of agency as a consequence of the algorithm. As the research on agency and algorithms in a work setting is very scarce, it is hard to further discuss the findings in relation to earlier studies. By drawing from the discourse of the employees, this thesis however further provides contribution to the understanding of agency and algorithmic technology in a work context. Most discussion and studies related to algorithms at work, have taken a performance-centric approach, but this thesis contributes by taking a social scientific perspective on algorithms at work. I will discuss this further in the next section.

7.3 Relevance of thesis in the field of algorithms, agency and work
The background research for this thesis points at a clear gap in the understanding of algorithmic agency and what consequences the constructs might have on the work of people and the flow of agency in a work setting. It is further important to note the gap is especially critical for its lack of research from a social scientific perspective.The results of this thesis contribute to understanding of agency and capabilities of algorithmic technology, and what impact they may have on working life. While public discussion on the question of agency and algorithmic

technology is often divided into utopias and dystopias, the results of this thesis contributes to a realistic perspective on algorithms and agency in working life.

While research and discussion about how algorithmic agency is constructed, and what consequences algorithms might have for the organizational context they are embedded in exist, there is a lack of research combining these two. This thesis thereby contributes to understanding not only accounts of agency, but also their consequences on the flow of agency in a company that is adapting algorithmic technology. Furthermore, the thesis takes a social constructionist perspective, focusing on how employees construct the phenomena, which is an approach not yet extensively explored in research.

The results of the first part of the analysis contribute to the assumption that algorithmic agency is constructed in the discourse of people (e.g. Johnson, 2018;Reyman, 2018;Zhu & Harrell, 2009). Like the case study by Zhu and Harrel (2009), this thesis focuses on the discourse of people working on or with algorithmic technology, but goes further by including a more diverse set of actors (both developers and users) and shows how accounts of agency might vary depending on the role of the interviewee. The research is also done by interviewing the employees, which arguably brings research closer to the dynamic context than technical literature and software source code is able to. This shows that investigating the phenomena only through the discourse of developers or experts writing code or manuals is not enough, but to understand the phenomena, one must include other actors, who are affected by these technologies. This thesis further considers the consequences of these accounts, which were explored in the second part of the analysis.

The results of the second part of the analysis have similar findings as the observational research done by Grønsund and Aanestad (2020) and Shestakofsky (2017); the results show that instead of replacing the human workforce and solely restricting human agency, human-algorithm complementaries are likely to arise. This thesis however takes a different approach by

investigating the phenomenon through the discourse of the employees, and focuses on how they construct the agency and consequences of adapting algorithmic technology. Grønsund and Aanestad (2020) and Shestakofsky (2017) provide precious insight to help understand algorithms at work, but lack this perspective of agency.

While mainstream discussion is focused on the efficiency of algorithmic technology, the purpose of this thesis was to explore the phenomena through the discourse of the employees; not taking a stance on what practices makes an algorithm effective or how people and technology can work together to achieve efficiency, but how agency is constructed in this context. This is important to explore, as it could help understand the dynamic context from the perspective of the people involved in the changing environment. Another important finding is that of variability in accounts, which calls for more research on the subject, as additional accounts of agency and flows of agency are likely to arise in other contexts with other types of algorithms, or other employees.

The results and discussion of this thesis provides ideas for further research about agency and algorithms in the context of work. Research could, for example, be done in other companies with similar algorithms, or by interviewing other actors in the same context. This thesis has explored how algorithmic agency is constructed by employees who have experienced the stages of automation, and thereby can compare how the algorithm has changed their work. The result might however be very different if one would interview employees who have only recently been employed, and have no point of comparison. This thesis also analysed the discourse of a very specific set of people within the company, but it could also be valuable to explore the research questions by interviewing other groups of actors. One such group could be the couriers, who as a result of the algorithm are assigned tasks by the algorithm, instead of human workers in the operations team. To the couriers, the algorithm takes a form of managerial role, which is a phenomena not yet explored by research. Furthermore it could also be valuable to add to this research by conducting observational studies, or interviewing the employees while they work. Although the interviews of this thesis were conducted at the workplace (before or after the

interviewees shifts or workdays), and thereby in a relevant context, other interesting findings might emerge while observing the employees working.

After the interviews were conducted the company has further considered ways to apply algorithms in their operations, for example by applying an algorithm that helps customer and partner support prioritize incoming messages, or helps to prioritize which problem to troubleshoot first. A similar study to this thesis could also be done to investigate the effects of this.

7.4 Limitations

The purpose of this thesis was to gain insight on the construction of algorithmic agency and investigate what consequences these constructs have on the work of people and the flow of agency in the context it is embedded in. The results have achieved this purpose and contributed to gaps in research with a strong employee perspective and examined the subject through a social psychology viewpoint. Like any research, this thesis does however have its limitations.

The accounts presented in the interview data show that agency is a multifaceted subject, and suggests that accounts of algorithmic agency is highly dependent on the personal context of the interviewee. An important consideration discussed by Niska, Olakivi and Vesala (2018) are the different positions people take, or are given in the context of the interview. Participants were recruited specifically because they have been working at the company in certain roles, for a certain amount of time. Either before or in the interviews I had somehow implied that they had been specifically chosen for this reason, which might lead to them producing talk from the position that they have been offered through the inclusion criteria of the research. This issue is also discussed by Potter and Hepburn (2005) in terms of footing, and how it might affect the speech of the interviewees. The position or footing might for example limit accounts or lead the interviewees to discuss the algorithm from a certain perspective. As employees of the company they might for example aim to stay loyal, and talk about phenomena and events in a positive light. Here my role as a coworker and a friend might have been an advantage, but I should not

overestimate the impact of this. The results show a relatively positive perception of the algorithm, and most employees have over time come to see the benefits of the algorithm. There were however some instances of negative experiences present in some interviewees discourse. This was however not directly related to the matter of agency and algorithms and thereby not included in this thesis. If the interviews would have been conducted right after the first stages of automation (during the time in which the algorithm did not work as seamlessly), the perceptions might have been more negative, or the interviewees might have discussed more issues.

Niska et al. (2018) discuss the limitations of research interviews, which are often associated with essentialism, which sees interviews as a means of gaining objective knowledge of the inner psychological functions of people. Despite researchers taking a discursive approach, Potter and Hepburn (2005) state that the essentialistic viewpoints often permeate the research. In this thesis the essentialist view sometimes was present in follow-up questions in the interviews (e.g. discussing *feelings* of accomplishment), but I aimed to make no interpretation about inner psychological functions of the interviewees in my analysis. As the interviews were semi-structured focused interviews, some themes about psychological states might have come up, but the methodological approach to my analysis has been rooted in social constructionism and discursive psychology.

Potter and Hepburn (2005) state that researchers can both explicitly and inexplicitly be promoting a certain agenda or certain categories, defined by the discipline and the research questions at hand. In the interview, I aimed to give the interviewees as much space and freedom as possible to explore the subjects and themes. It is however important to remember that the speech, and the constructs of agency in it, is produced in the context of the interview and is dependent on all actors within it. Although the interview was planned to be semi-structured, the chosen themes still steered the conversation in predetermined ways, and other questions or themes could have led to other results. For the purpose of answering the research questions I was, however, compelled to steer the conversation towards the algorithm by asking questions related to how it works and how

it has changed the job of the interviewees. My questions might thereby have steered the interviewees to produce talk in a very different way than if I had, for example, only asked them to describe their work. Previous research and discussion however find similar accounts for agency, which would suggest that the results of this thesis are not exceptional.

As previously discussed, this qualitative study does not aim to broadly generalize, but based on previous studies and methodology, one could argue that the findings are not unique for this context. The interview context and the interviewee selection criteria might however be a limitation in understanding the construction of agency and its consequences in the employees everyday work, or how the dynamics might be constructed by other employees. Further research would thereby be important to understand, for example how agency is (or is not) constructed by new employees who have not experienced the development period. Including observational research to investigate how the studied phenomena is present in the daily work (during a work shift) could also provide further insight into the subject.

To conclude, the thesis supports previous research and discussion by showing how agency is constructed and what consequences these constructs have on the interviewees work and the flow of agency in this context. The thesis further provides new and interesting perspectives, by especially focusing on the discourse of those closest to the algorithm, as well as showing that algorithmic agency and its consequences are constructed differently by different people. This thesis thereby contributes with a contemporary, employee-centric perspective on agency and adapting algorithmic technologies in the context of work, through exploring the phenomena with methodologies and theories rooted in the social sciences.

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Appendix I. Stages of Automation

The algorithm has been gradually developed and integrated into the company system. Before the company started using their own algorithm and software they applied other means of automation to make their operations more effective. The process can roughly be divided into 5 phases:

1. Orders were moved manually by human workers in the product development team into an third-party software used by the company

    1.1.   Human workers in the operations team assigned the orders to couriers

2. Orders were automatically sent to the third-party software

    2.1.   Human workers in the operations team assigned the orders to couriers

3. Orders were manually sent and assigned to a courier in the third-party software

    3.1.   Human workers in the operations team often had to reassign the orders as the automation did not always assign the orders optimally

4. Orders were manually sent and assigned to a courier, and in some cases automatically reassigned in the third-party software

    4.1.   Human workers in the operations team stepped in to reassign orders when needed

5. Company started using their own algorithm and software to assign and reassign orders to couriers (late 2016)

    5.1.   Human workers in the operations team still stepped in when needed, but the goal was to reduce this to a minimum

This process was also explained by one of the interviewees as follows:

M: So what about the development of the optimization? Where did we start? Or why was it developed and how was it developed?

H4: Well it started from this, we had this system called Software X [laughs]

M: Rip

H4: Yes! [laughs] So in the beginning it was like, we just copied, like manually with copy paste the orders from our system into a separate browser tab [laughs] it was like completely done by a human of course, like we didn't have any integrations or anything, so e:hm ((short break)) All the like optimization and such that happened, or overall that we decided which courier gets what order, like a human being made those decisions. And this ran like this for quite some time, but then we started realizing that it does not make any sense, like a human can't possibly handle like the scale of things. Like the number of orders and the number of different options of how this could be solved. So then pretty soon we had to somehow automate, which we started like gradually doing. So the first step was that instead of copy-pasteing, we like send the order to Software X automatically. Then at some point we automatically put them into Software X and decided which courier it goes to. So we sort of like slowly but surely started building this onto Software X and at some point also started updating the ongoing orders. So we didn't just pick the courier when the order comes in, but we kept updating it, like okay this will go to this courier instead of the first one, in this order ant not the other way.

M: So this still happened in Software X?

H4: Yeah. But it didn't last long ((short break)) we realized that this was practically not possible to do with a n external service[laughs]

M: Yup [laughs]

H4 further discusses some technical details of the previously used third-party software, after which they continued:

H4: [...] So it quickly became clear that we have to do this in our own system. Like get rid of these external providers completely and ((short break)) and at the same time li-pretty much at the same time we started solving like the whole problem, instead of doing just the simple tasks of only deciding which courier and then leaving it there sort of. So like in every optimization we can change the order or bundle orders and change the courier and everything. And then it was around ((short break)) 2016? O:r 17? ((short break)) I think it was like fall of 2016 [laughs] when whe changed to running the whole thing in our own system. And the change was pretty tricky, because you had to like suddenly go from humans doing it and move to like all this is taken care of by the system, just let it be! [laughs]

Appendix II. Structure of interview and supporting questions

1.   Consent form and introduction to what is of interest to my research

2.   Background of interviewee

        i.   *Let's first talk about you. How long have you been working here and what kind of work do you do?*

3.   Algorithm

        i.   *So about this algorithm. How does it work and how is it visible in your work?*

       ii.   *Has it changed your job? How?*

      iii.   *Is it visible in someone else's work? How?*

      iv.   *Does it make mistakes / what happens when it makes a mistake?*

4.   The time before the algorithm and the transition

        i.   *What was your work like before the algorithm?*

       ii.   *Why do you think the algorithm has been adapted?*

      iii.   *How has the algorithm been developed? Have you been involved in this?*

5.   Asking if there is anything the participant would like to add or ask

        i.   *Something to add or ask about what we talked about, or something else?*

6.   Reminder of confidentiality and consent and urge participant to be in contact with any questions