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Do Algorithms dream of fair decisions?

How publics enact algorithmic decision-making in the public employment sector

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1. Introduction – Computers that dream

I can not recall the exact year, it must have been between 2014 and 2016, I read an article which excited me. “We taught this computer how to dream” or something like that. I can not find the article anymore. After booting up the web page on which the article was published, and waiting several minutes until everything was loaded, I saw a weird amalgamation of different objects, different colours, thoroughly changing. Always when I thought I could discover a distinct object, it changed itself again. The only thing I could make out, or at least thought so, were dogs. Many different dogs, but mostly from the breed of Shiba-Inu.

What I saw then and there only became clear after I did some research. This program was fed with many thousand pictures from the internet. Chosen randomly. These pictures then were processed and ended up how I saw them on my desktop. Apparently, there were so many different pictures of dogs in the training data, that the output, more often than not, showed dogs, because it thought this was the most important kind of picture to show.

It fascinated me to learn more about this thing, also referred to as AI, or Artificial Intelligence. Before that, AI was something that looked like a robotic humanoid in movies. But now, it happened on the computer. Right in front of me. I marvelled at how far technology had gotten, but also was fascinated and wanted to understand the processes of in- and output of this dreaming computer more. The way it showed these pictures, this diffuse mess with dogs in it, was more akin to a child trying to learn and understand the world surrounding it. Because of that, my emotions towards this *thing* were positive. I thought it was cute.

Many years later, my interest in this topic did not ebb down. However, I started to focus on a more easy way to understand these processes than AI: Algorithms. While more often than not, both terms are used interchangeably, however there is some form of distinction between the two. Nowadays, the word algorithm has become an amalgamation of many different *things* and *operations*. As with the dreaming neural net many years ago, I still wonder which inputs on my Spotify lead to different outputs, such as the auto-generated *Discover Weekly* playlist. Or what led to this new, weird rabbithole I find myself in while scrolling through Instagram Reels. It is fun to wonder and question my own behaviour and how it affects the output of these curation algorithms.

On the other side, however, there are algorithms that are used without the consent of the people whose data it uses. Algorithms, which have severe consequences on the lives and livelihoods of different people. In 2016, the Austrian public employment service AMS announced the integration of such a system in their work. In its simplest form, *the* algorithm should help in deciding which job-seekers need more help than others. After a brief test-run, the system was discontinued because of public criticism, questioning whether the system might continue prevalent biases or even discriminate against already marginalised groups. The question about such a system then, is not a guessing game of which inputs lead to which outputs, but rather, which consequences such a system may have on the public it affects, and what can be done against them. Such questions, however, can only be answered if the system, its functions, and its actors are properly understood. This will be the subject of this thesis.

The reason for choosing such a topic is my interest in automatisisation processes as a whole and a firm belief that, if done right, these systems can offer great help and advances in societal sectors. However, as an STS student the question “How could things be otherwise” is firmly locked into my head. So, rather than using a case where the automatisisation of processes helped and achieved something good, it is important to analyse a more problematic case study to see the flaws in such systems, and think about how they can be changed, or ask if it is even necessary to use such a technology in these sectors. Especially here, it is far more important to ask how things could be otherwise and thus, do research on it.

2. State of the Art

Algorithms, decision, and making are three words with strong associations and meanings in themselves. Especially for research in STS. Thus, it is necessary to split these words at first, to see what they mean, what they entail, and how they are used in research. This state-of-the-art will combine a descriptive approach to these terms, first showing how they are understood and then presenting existing research on them. This chapter is more theoretically oriented rather than going too much in depth into the results of contemporary research on these topics. The reason for doing this is that understanding algorithms through what they are, how they function, and where they are used, is necessary to grasp an otherwise often hollow term better. As will be shown, algorithms are hard to grasp as concepts and *things* but are also multiple. Not one is like the other. Thus, a theoretical framework in grasping them is an important step in analysing them.

After each term in the algorithm-decision-making trichotomy is presented, they will be combined again, and the real state-of-the-art on algorithmic decision-making will be presented. The first step to achieve this analysis is to look at how the term *algorithm* is defined and how research struggles to understand it. Afterwards, the discussion will move to the term *decision*. The important points here will be to ask what the terms relation is to classification systems and how real-world profiling systems are an important part of researching algorithmic decision-making systems. Then, the focus will shift, and *making*, as a term will be analysed, to see how power and politics will be understood and used throughout the thesis. In the end, all the knowledge on these terms will be merged to take a closer look at the research done in this field as well as the gap(s) that lie within it. While most of the concepts used in the state-of-the-art are an important groundwork for the empirical analysis of this thesis, some concepts will be elaborated more thoroughly in the analysis. The reason for this split is that some concepts only became relevant through the empirical material gathered, while what is presented in this chapter was used as the groundwork for the data collection.

With this introduction to this chapter out of the way, it is time to start with the term that will both open and close the state-of-the-art: Algorithm.

2.1. Algorithm - Unpacking the Black Box of Critical Algorithm Studies

Studying algorithms is a vast interdisciplinary field of research, often called critical algorithm studies, in which STS is but one of many different scientific disciplines (e.g. computer science, mathematics, and economics (Seaver, 2019)) that take part in analysing the technology.

While it is hard to entangle interdisciplinary research and pick out one academic field, trying to isolate it from the others, I will of course try to focus on STS scholars and their research on algorithms. However, it is important to note that due to this vast interdisciplinary spectrum of critical algorithms studies, the field lives more often than not on the boundaries between different academic fields. Nonetheless, STS offers an important entry point to algorithmic systems, especially since its focus on “the diverse practices of making, using, and maintaining software.” (DiSalvo, 2019, p. 365).

The following section will focus on a single, but hard-to-answer question: What is an algorithm, or, how to define it? The necessity for this question is not only to give a starting point on the main topic for this thesis, but it should also point at a distinct notion of the term itself and how research deals with it: uncertainty due to multiplicity.

2.1.1 Algorithms are multiple

In researching algorithms in STS, it is important to understand them as multiple (Bucher, 2018; Kitchin, 2017). This does not only refer to the many ways algorithms are used and the many forms they come in, like machine learning algorithms (Mackenzie, 2017), market manipulating algorithms (Callon & Muniesa, 2005; Arnoldi, 2016; MacKenzie, 2019; Hatch et al., 2021), surveillance algorithms (Roberts & Elbe, 2017), social media algorithms (Bucher, 2018), but it also means that they are part of larger sociotechnical networks.

Especially through the lens of Actor-Network-Theory, this becomes more clear. It offers the sensibility to analyse human as well as non-human actors and their relations (Venturini, 2010). This enables algorithms to be seen as technology which is embedded in a larger network, not only consisting of the mere technology, but also of actors working on that specific system, actors who use the system, and the publics that are affected by it. They are, as in a STS understanding of technology, a heterogenic assemblage of different things and meanings (Plesner & Horst, 2013). Algorithms are social constructions. Due to this, it is easier to understand them as either data assemblages (Kitchin, 2014; Kitchin & Lauriault, 2014) or, as will be the case for this thesis, as algorithmic systems (Gillespie, 2014; Seaver, 2019). Both these terms should entail one thing: algorithms are not an isolated technology. They are a collection of different socio-technical systems whose purpose is to produce data (i.e. data assemblages), and are part of a larger network which makes them algorithmic systems.

Even though throughout this thesis, the term algorithmic system will be used as often as possible, sometimes the singular form will be used nonetheless. This choice was made because often it is simpler in the formulation when referring to *a* specific algorithm, giving a better way to structure the words and makes the sentences less messy. Each time this will happen, either *the* or *an* will be put into italics, so that there will be no confusion.

Understanding algorithmic systems as multiple, sociotechnical systems also leads to understanding them as mutually constitutive of various

“systems of thought, forms of knowledge, finance, political economies, governmentalities and legalities, materialities and infrastructures, practices, organisations and institutions, subjectivities and communities, places, and marketplaces” (Kitchin, 2014, p. 20).

For researching them, this means that it is always important to unearth and analyse the networks they function in and the wider sociotechnical implications of these assemblages. Understanding algorithmic systems as a part of larger sociotechnical networks also shows, that “algorithms in the wild are not simple objects” (Seaver, 2019, p. 417).

2.1.2 Algorithms are hard to define

While the literature on the technology is vast, scholars often try to tip-toe around a clear definition. In their simplest definition, algorithms work through a procedure of in- and outputs. While this description may be enough going forward, it is important to highlight that this simple definition does not entail the rather messy nature of these systems. However, for this research, I will combine four distinct definitions. The first is a technical definition of these systems, coming from an often-cited computer science introductory book by Cormen et al. (2009). Here, they claim that

“[i]nformally, an **algorithm** is any well-defined computational procedure that takes some value, or set of values, as **input** and produces some value, or set of values, as **output**. An algorithm is thus a sequence of computational steps that transform the input into the output.” (Cormen et al., 2009, p. 5)

Later, they add to this description that “we should consider algorithms, like computer hardware, as a technology” (Cormen et al., 2009, p. 13) and “[a]lgorithms are at the core of most technologies used in contemporary computers.” (p. 14).

Adding to this technical description, it is important to give the definition an STS spin. A suitable definition in sociological terms is given by Callon & Muniesa (2005), in it, they state that

“[a]n algorithm can be analysed as a logical program. As a program, it implies the existence of several solutions that can be attained by following a concrete set of instructions contingent on a specific situation and/or task. [...] It matches the description of the multiplicity and materiality of complex but ordered operations through which singular demands and supplies run.” (p. 1243)

This definition can be seen as bridging the more technical understanding by Cormen et al. (2009) towards a notion of how a sociologist, or even an STS student, can see and understand these systems. Going further with understanding these programs, Gillespie (2014) gives a short, but good addition, as:

“[a]lgorithms need not be software: in the broadest sense, they are encoded procedures for transforming input data into a desired output, based on specified calculations. The procedures name both a problem and the steps by which it should be solved.” (p. 167).

This definition closely resembles that of Diakopoulos (2014) who states that: “An algorithm can be defined as a series of steps undertaken in order to solve a particular problem or accomplish a defined outcome. Algorithms can be carried out by people, by nature, or by machines.” (p. 3)

While these definitions do not differ much from Cormen et al. (2009), they open up the term algorithm, since these systems do not need to be softwares in the first place. Although it may contradict the other definitions, it is nevertheless interesting, as it allows for better understanding of data assemblages in socio-technical networks. Algorithms do not need to be technology or software in the first place. They are a form of translation processes. This also leads to Seaver (2019), who helps to tame the term after it suddenly escaped from the cage that was technology. First, algorithmic systems either require or produce a certain formalisation of otherwise informal data points. Second, algorithmic systems are obscure and opaque. Either because of their inner complexity or because their inner work is veiled through interventions from their producers.

With these four definitions, one problem of researching algorithms shimmers through: they are opaque, or rather, blacked box systems. Due to this, it is important to understand how research, especially in STS, could grasp them.

2.1.3 Algorithms are hard to grasp

In analysing algorithmic systems, one has to acknowledge that “[t]hey are ontogenetic in nature (always in a state of becoming), teased into being: edited, revised, deleted and restarted, shared with others, passing through multiple iterations stretched out over time and space” (Kitchin, 2017, p. 18). Algorithmic systems are not static entities, they are ever-changing. The temporality of these systems also makes it hard to speak of *discoveries* in research, as they might be only temporal (Seaver, 2019). As an example, one can look at the algorithmic systems behind social media platforms, which change routinely because of a mixture of user inputs, outside data, or an ongoing change of the code in the back end (Bucher, 2018).

This problem does not only affect the supposed external researcher, but also affects engineers and people working on these systems. Here again, a certain multiplicity can be found. Especially, because often these systems are made collaboratively between different authors, approaches and goals in creating them may differ (Seaver, 2019). Due to their networked manner, it becomes harder for researchers to understand their intricacies.

But if that is so, how can one research them? The first step of STS scholars would be to go through their toolkit of suitable concepts where they would find *black boxes* as a suitable way of shifting this uncertainty, negating the inside and looking at what happens on the outside. While the concept of the black box has become an important point of contention in STS since Latour’s (1987) “Opening Pandora’s Black Box”, research in critical algorithm studies has moved further away from this concept. One reason for that may be that the concept often just “conceals its own limitations as an epistemic device” (Bucher, 2018, p.

47). In researching algorithmic systems, STS is not concerned with their inner workings, but rather with “meanings and implication that these systems may have” (Bucher, 2018, p. 29).

Researchers should not use the black box as a reason for their curiosity, but rather accept that these boxes are there and are meant to stay (closed). Especially, since understanding algorithms as part of larger socio-technical data assemblages, also multiplies the black boxes. As shown, these black boxes are not static. They change themselves or are changed by different people throughout time.

Because of these black boxes, opacity, and complexity, are an integral part of what the term *algorithm* entails. The question then should not be what happens on the inside, or what *are* algorithmic systems, but rather: what do they do and what effects do they have?

2.2 Decision - Classification:

AlgorithmWatch is a Berlin-based NGO with its main focus being critically reporting and researching the usage of algorithmic systems in the public. Since 2019, they have published “Automating Society”, a report specifically focused on the usage of ADMS¹ in the European Union.

The 2020 issue opens with a discussion by Fabio Chiusi (2021) on the usage and perception of ADMS in Europe. These systems are used in many different industries, in both the private, and public sectors. ADMS have become an important part of our modern society. But what are ADMS? Here also, one faces the problem of a certain multiplicity. This chapter, therefore, tries to show what these systems are, how they function, and then, through an example, what their impact is.

2.2.1 What are decision-making algorithms?

In their simplest definition, ADMS are specifically “designed to affect people’s choices” (Kotliar, 2021, p. 347). One can encounter these systems in everyday life. Like using music or TV streaming services and their recommendation systems (Siles et al., 2020), or through a simple Google search (Bucher, 2018). Affecting people’s choices in mundane tasks through everyday usage of technology is where ADMS can be encountered daily. This also leads to researchers speaking about so-called *domestic algorithms* (Gillespie, 2014). They are not only literally placed inside the homes of their users, but are also integrated into their daily routines, with users adding additional meanings to them and thus transforming them (Gillespie, 2014). Even though they might be mundane by now, the task of analysing them still raises challenges. They “are often ‘hidden’ from observational research approaches because they are enacted and experienced by people when they are alone, and especially at moments that they are unlikely to share with researchers“ (Hyorth, Pink & Horst, 2018, p. 1213)

Research done on domestic algorithms often incorporates facets on how they are shaped and understood by their users (Siles et al., 2020; Bucher, 2018), with a strong emphasis on personal experiences.

However, this form of ADMS is but one of many. A well-known one, for sure, but the technology can be found in other sectors as well. They are used in law enforcement (Mayson, 2019), by tax companies

¹ Algorithmic Decision Making Systems

(J. Kučić, 2019), or for profiling job-seekers in public employment institutes (Desiere, et al., 2019; Wijnhoven & Havinga, 2014; Alhutter et al., 2020a; Alhutter et al., 2020b).

Through “processing huge amounts of data, supporting people in decision-making processes, and providing tailored applications“ (Chiusi, 2021, p. 6) they could be used to make things simpler. And while that is true from a practical point of view, making things simpler often does not mean making them better as can be seen through the specific example of profiling systems.

2.2.2 Profiling systems in the public sector

Profiling systems can be found in many different countries (Chiusi, 2021; Desiere et al., 2019), and are already used by many different public employment services (Desiere et al., 2019; Barnes et al., 2015).

The use of profiling in public employment services started between 1996 and 1998 in a few countries, such as the UK, the US, Canada and Australia (Desiere et al., 2019; Wijnhoven & Havinga, 2014). These first profiling tools had the task of identifying job-seekers at risk of long-term unemployment, thus helping those in need through a more direct approach. Over the years, the use of such tools spread to many different countries, and are by now, a widely-used tool in public employment systems.

Why such tools are used in the first place, is easy to answer. They help to improve cost-efficiency in public employment services. Using automated profiling made it easier to streamline the often, time- and cost-consuming process of doing the profiling through case-workers. It made it possible to quickly highlight job-seekers needing more counselling than others. The job-seekers in greater need of counselling often have less *employability* than others. The term *employability* refers to certain characteristics, - such as “career identity, personal adaptability, and social and human capital” (Fugate et al., 2004, p. 16) - a job-seeker should bring with them to find a job quickly. If these *employability* factors are met, job-seekers have a higher chance of quickly finding employment, yet it does not automatically ensure this (Fugate et al., 2004). These factors are also the reason for the need for profiling systems. It would be a waste of funding if the employment services focused their resources on job-seekers, who might easily find work for themselves. The focus on good profiling, thus, is to identify job-seekers who have a greater need for assistance in finding employment, redirecting the resources to these people. It also helps the employment service to better identify the needs and risks of certain job-seekers, making it possible to give them a more refined and individualised approach, such as recommending them certain workshops or courses.

2.2.3 The different types of profiling systems

How this would look can be found when analysing the process of the Dutch public employment services ‘Work Profiler’ (Wijnhoven & Havinga, 2014). In the first three months of unemployment, a client answers a set of 20 questions through a questionnaire. These questions are structured to evaluate certain soft² and hard³ factors which are complimentary for reentering the job, i.e. *employability*. The result of the questionnaire is used for two different evaluations. First, the chance for the client to resume work in one

² i.e. work ability, job search behaviour (Wijnhoven & Havinga, 2014)

³ i.e. age, last employment, language efficiency (Wijnhoven & Havinga, 2014)

year. Second, which hard and soft factors need improving to heighten the chance of reentering work within less than 12 months. These results are used by the case-worker to evaluate whether the client needs a more in-depth, face-to-face conversation or whether the digital process is sufficient.

The Dutch example shows a hybrid algorithmic profiling, both rule-based and statistical. Desiere et al. (2019) identify three different types of profiling: “rule-based profiling, case-worker-based profiling and statistical profiling.” (p. 8)

As can be seen partly in the Dutch example, rule-based profiling focuses on using (online) questionnaires and a point-based system to allocate job-seekers. However, instead of focusing on the individual job-seeker, like in the Netherlands, traditional rule-based profiling focuses more on allocating job-seekers into specific groups, rather than finding individual solutions. As used before the implementation of automation in the profiling process, case-worker-based profiling relied on the case-workers' judgement in public employment institutes and their decision on who needed the most help. The last entry described by Desiere et al. (2019) is that of statistical profiling. Here, a statistical model is used to predict the disadvantages that may inhibit a job-seeker's entry into the labour market. Compared to rule-based systems and their focus on sorting job-seekers into groups, the statistical model helps to target the individual job-seeker, thus tailoring the outcome of the statistical progression to the specific needs of the job-seeker.

By now, statistical profiling is the most used system in the public employment sector (Desiere et al., 2019). As the Dutch example shows, most services also use either questionnaires, to get data for the statistical models or rely on case-workers to interpret and judge the data of the statistical calculation. This means that all three profiling methods presented are now most often intertwined when used in public employment services today. Even though in some countries, the use of results derived from statistical profiling can be used voluntarily by case-workers, there are still concerns about the reliability and influence the results of such tools have. Even though statistical profiling is often understood as the best and most cost-efficient way of shaping services and recommendations to the job-seeker's individual needs, the automatisisation of these processes often comes with the danger of misinterpreting the data. As Desiere et al. (2019) show, the accuracy of these systems is between 60% - 80%. Accuracy, in this case, means how precise both the models and data are. To better understand these concerns, and make more sense of the accuracy prediction, it is necessary to take a look at how these statistical models work.

2.2.4 Statistical Models in profiling systems

As mentioned, the goal of statistical profiling tools is to predict the probability of the individual long-term unemployment of job-seekers. For this, they use different data (e.g. from interviews, questionnaires and/or administrative records) to rank job-seekers if they are either at low risk or at high risk of long term unemployed. For this process, a rich set of data is needed. This means that *the* algorithm behind the models needs to be regularly updated, to be up to date with the newest developments in the job market. A rich data set of job-seekers too needs to be provided, to feed the statistical model. Both these factors are important for the accuracy of the prediction.

But this also leads to problems in such systems. Translating humans into data, and thus making predictions on their future, hinges on rich data sets. Thus, the first question to ask is, where the data comes from. In public employment systems, there are many different methods of acquiring data. As the Dutch example shows, questionnaires help to acquire data on hard and soft factors relating to the job-seekers' probability of entering the labour market. Other means to acquire such data are using administrative data held by the employment services regarding their clients, or interviews, or more elaborate methods such as *click* data (Desiere et al., 2019). Wherever the data comes from, the question arises whether they are accurate enough to make predictions on *employability*. Studies have shown that statistical methods used in profiling have a higher likelihood of correctly identifying job seekers who are at risk of long-term unemployment, compared to case-workers (Arni & Schiprowski, 2015). However, looking more closely into the data, and considering the susceptibility to errors of both methods (i.e. statistical and case-worker based) there is but little difference between the evaluation of case-workers and that of statistical methods. A problem with the data usage in algorithmic systems is the assumption that data can be detached from subjective (one could say human) judgement. However, in truth, data “are situated, contingent, relational, and framed and are used contextually to try and achieve certain aims and goals” (Kitchin & Lauriault, 2014, p. 6). This means that data can not be completely free of value and thus, just like human decisions, are prone to errors (Diakopoulos, 2014) in the classification process. The question of data usage in the case of profiling systems is also, which data is used and labelled to be *positive* (Mayson, 2019) which is a deliberate process in programming the systems.

Being wrongly classified can have a huge impact on many people. If a job-seeker at high risk of long-term unemployment gets wrongly classified as low-risk, they might not get the help they need. Or at least not as quickly as necessary.

2.2.5 Automatised classification processes and their impact

As can be seen in the case of statistical profiling in public employment services, the classification, or the ranking of the job-seekers' *employability*, is at first not a computer-generated one. In its simplest form, it examines an individual's difficulty in finding suitable work. However, with translating this difficulty in to data, this decision-making comes with the risk of looking at correlations and patterns between people, which might not be there in the first place (Williams et al., 2018, p. 83). In finding matches between one of several groups, ADMS work as association algorithms (Diakopoulos, 2014). They try to link several people together according to similar data. This is possible because the data is standardised enough to facilitate the search for statistical twins. This often could lead to so-called “statistical discrimination” (Desiere et al., 2019, p. 24). What this means is, that while the approach of statistical profiling might seem like an individualised approach, the evaluation often leads to assigning certain group characteristics to the individual. An example of this is, that migrants are often classified as *high-risk* job-seekers, even though their employability could be higher than non-immigrants (Desiere et al., 2019). This problem of statistical discrimination does not only concern immigrant job-seekers but also people belonging to other vulnerable groups in the job market (i.e. disabled people or women) (Desiere et al., 2019).

Another problem that arises in the data usage of profiling systems is that through measuring *employability* and acting on that, these systems in the end are a predictive technology (Mayson, 2019). They use historical data and assume that the future may see a repeat of these patterns. The problem behind such an assumption is first, that it assumes a linear progression of time where what happened in the past will, without intervention, happen in the future. Such an assumption is problematic, especially in the employment market, as it is often exposed to different fluctuations (e.g. financial crises, and changes in working sectors). The problem thus is, that “[to] predict the future under status quo conditions is simply to project history forward.” (Mayson, 2019, p. 2224).

Overall, one of the main problems about statistical profiling systems can be traced back to the concept of classifications. As Bowker and Star (2000) write, “[a] classification is a spatial, temporal, or Spatio-temporal segmentation of the world” (p. 10). These segmentations are a form of “juncture of social organization, moral order, and layers of technical integration” (Bowker & Star, 2000, p. 33). For a classification to function it needs to work with certain classificatory principles (i.e. ordering), there has to be mutual exclusivity (i.e. one can not be another) and the system should be complete (i.e. it covers everything there is to cover) (Bowker & Star, 2000). It has to be noted, however, that these three principles of classification are only present in an idealised version of these systems.

Categorisation in such systems as statistical public employment profiling also leads to the understanding that “each category valorizes some point of view and silences another.” (Bowke, & Star, 2000, p. 5). This is especially problematic, as statistical profiling systems can be seen as a classification system, embedded in larger, socio-technical infrastructures. The problem hereby stems from the nature of infrastructures. These are an accumulation of different heterogeneous things. An infrastructure “holds values, permits certain kinds of human and nonhuman relations while blocking others, and shapes the very ways in which we think about the world.” (Slota & Bowker, 2017, p. 530). They often can only be made visible if they break down. Otherwise, they are invisible. This then means, that the visibility of infrastructures is bound to a certain temporality (i.e. when they break down), which leads Slota and Bowker (2017) to state: “the question is not whether a given thing is [...] an infrastructure but when it is an infrastructure” (p. 531). This temporality of their visibility then leads to a problem in both research and changeability, as infrastructures are embedded systems in both a technical and social sense. If they are embedded, and thus invisible, it is hard to change or readjust these infrastructures. As with algorithmic systems, classification systems are part of a larger, sociotechnical network, which needs to function with and for these parameters.

2.2.6 Are Profiling Tools algorithmic?

After what may seem like a long detour, one has to ask: are profiling tools algorithms? And if so, are they decision-making algorithms?

First, do profiling systems use values or data as input, to produce other values, or data as output? The answer is a certain yes. This means that profiling tools are algorithmic in nature. The next question would be whether they are designed to affect people's choices. This one is harder to answer and one needs to take a look back at the recent discussion on the ramifications of profiling tools in the public sector. While they are often used to help public employment workers, recent studies have shown that one could also see that the output could affect their choices (Kotliar, 2021). So, profiling tools, in the definitions given until now, can be seen as ADMS.

2.3 Making - Power and politics:

A large body of academic work on algorithmic systems focuses on the form of power such tools encapsulate (Dobbe et al., 2018; Diakopoulos, 2014; Obermeyer et al., 2019; Bucher, 2018). While research moves away from the use of the concept of black boxes to grasp the inner workings of algorithmic systems, and asks if it needs to understand them, black boxing often is connected to a specific uncertainty about and opacity of such systems. Uncertainty and opacity are important words for further researching algorithmic systems. Through these words, a completely new direction in STS research on algorithmic systems opens itself up.

2.3.1 Uncertainty and Opacity

Pasquale (2016) uses the metaphor of the "one-way mirror" (p. 9) to argue that the opacity of algorithmic systems can be seen as a power asymmetry that is inherent in the usage of such systems. The people behind these systems use data from the outside, like public administration data, to evaluate, improve, or change their systems accordingly, without the users being aware. Exercising power creates objects of knowledge, and knowledge produces power (Townley, 1993). Through this elliptical understanding of power/knowledge, it is therefore important to understand both as co-produced. Profiling systems as objects of knowledge thus is integral in understanding the mobilisation of power.

Statistical profiling tools translate the outside data according to their model. And even though their outcome might have an accuracy between 60% - 80%, the result might still seem unfair for some of the job-seekers because they do not have insights into the evaluation process. The problem here lies in the power asymmetry of the one-way mirror. Opacity allows people who are part of the evaluation process (i.e. people working on and with the algorithm) to benefit from the private pieces of information given by the job-seekers, while the job-seekers are only shown the results, while being completely clueless of the process (Zarsky, 2015).

Is the answer to this power asymmetry then, to make the systems and their process more transparent? As some authors (Diakopoulos, 2014; Seaver, 2019; Reddy et al., 2019; Zarsky, 2015) show, the answer is not as straightforward as one might suspect. It is true that making the processes behind

statistical tools and algorithmic decision-making visible would lead people to better understand the processes behind them. One should not forget that these systems function in larger sociotechnical networks. Algorithmic systems themselves are embedded in larger normativities, and opening the black box of these systems would therefore not help to fully understand the processes they function in (Reddy et al., 2019). In the end, these systems too are infrastructures, which are only made visible, when they break down.

2.3.2 Power and Politics

Searching for agency and accountability within technical systems themselves, does not lead far in research on algorithmic systems. However, what has to be understood before spiralling down the rabbit hole of algorithms, power, and politics, is that agency is still enacted through the output of the systems. Lupton (2019) proposes that “[a]ll matter has an agential capacity to affect and be affected“ (p. 2002).

Power, here and throughout this thesis will be understood in a Foucauldian sense. It is not a singular thing, but rather various forms of relations (Townley, 1993). In the case of algorithmic systems, these relations help “to produce certain forms of acting and knowing, ultimately pointing to the need for examining power through the kinds of encounters and orientations algorithmic systems seem to be generative of“ (Bucher, 2018, p. 3). Power is understood as being relational and becomes evident when it is used (Townley, 1993). Because of this, power is associated “with practices, techniques and procedures. Power is employed at all levels, and through many dimensions.” (Townley, 1993, p. 520). In the thesis, it is therefore important to understand *how* power is enacted. In the case of decision-making algorithms, power can be seen through processes of “*prioritization, classification, association, and filtering*” (Diakopoulos, 2014, p. 3). For statistical profiling algorithms, prioritisation, classification and association are specifically relevant. Prioritising will highlight things at the cost of others. Classification in algorithms first need to be set into predefined categories, which are in essence human-made which can be imbued with human biases (intentionally or unintentionally). In all these forms, algorithmic systems are enacting power in one way or another. These practices make them technologies of politics, or as Diakopoulos (2014) calls them “the new power brokers in society” (p. 2) due to their influential decision-making capabilities using a diverse and big set of data. Politics, in this case, is understood as a practice of world-making (Bucher, 2018) which then comes close to Winners’ (1980) view of technologies as world-ordering devices.

World-ordering devices order and arrange the world they are functioning in, and in the process make and shape the world around them. They “do not merely *have* power and politics; they are fundamentally productive of new ways of ordering the world.“ (Bucher, 2018, p. 20). They are imbued with definite values, ideologies and assumptions about the world they are acting in. Their intrinsic function of “ranking, classifying, sorting, predicting, and processing data [...] help to make the world appear in certain ways rather than others“ (Bucher, 2018, p. 3). In a sense, they are a constructivist technology.

While at first the usage of the conceptual black box was dismissed, one can come back again and use another term which can be found in Latours (1987) “Science in Action”, that being the inscription device. The term refers to an instrument, which generates scientific texts. Understanding algorithmic

systems as devices of in- and outputs then also means that they are inscription devices. In this context however, inscription too refers to the specific way the output is following a certain script, which got translated from a distinct source, oftentimes the authors of these scripts (Johnson/Latour, 1988). Using this, we can link together both power and algorithms and see them as inscription devices “of certain ideologies or particular ways of world-making” (Bucher, 2018, p. 30). These systems are not a locus of power, but rather, they are used to bring certain realities into being.

And again, this should not mean that accountability and agency have to be searched inside of them. Rather, the previous discussion about them as sociotechnical systems, classification systems and infrastructures, should have shown that they are embedded and a product of larger networks. While it might be easy for research purposes to exclude these networks in analysis, it is still important to keep this fact in mind. Algorithms are world-making machines. However, the means through which they make the world are outside of them. Thus, research should shift “attention away from questions of *where* agency is located to questions of *when* agency is mobilized and on whose behalf” (Bucher, 2018, p. 55).

2.3.3 Allocating power

But power and algorithms have a mutual relationship. At the same time, algorithmic systems might enact power, power is also allocated to them through the claims made about them. These systems often are connected to a larger promise. A promise that paints them as an objective and neutral technology. In the end, these systems only work with the data they get, so how could they be biased? Often, the claims about such technologies are that “[w]hatever choices are made are presented both as distant from the intervention of human hands, and as submerged inside of the cold workings of the machine” (Gillespie, 2014, p. 181). By now, it should have become clear that these assumptions are not completely correct. And to track back. These claims also show how the initial discussion about the accountability of algorithmic systems at the start of this chapter came into being. Assuming that algorithmic systems are a neutral technology quickly leads to pointing directly at them and blaming them if anything goes wrong, or at least, is perceived as *wrong*. This can also be understood through the concept of accountabilia (Ziewitz, 2011). This means that algorithmic systems oftentimes are used as “objects mobilized to enact relations of accountability” (Ziewitz, 2011, p. 7). This then means that the accountability of actors, in the network of algorithmic systems, gets shifted onto the technical objects. This process can be seen through the following example.

In the past, Amazon faced huge criticism, after it was revealed that its computer models which were used to identify valid candidates for jobs, would mostly recommend male applicants (Ajunwa, 2020). One reason behind that could have been, that the system was trained in majority by giving it the resumés of male workers, thus seeing male resumés as the norm, and downgrading women's. While this problem, also called the *bias in, bias out* problem (Mayson, 2019), is a specific example of a machine learning algorithm given the wrong data sets to learn, it still can be translated to the *simpler* kind of ADMS. What one can see here is that while, at first glance, accountability for the mistake could be given to the algorithmic system, it was the data set, chosen by humans, which led to the biased output of the machine. This example should show the need for analysing algorithmic systems under the sociological scope. If done, it could help unmask the

promise of cold and mechanical objectivity, as well as allowing for a better allocation of power. At the same time, thus, it is also important to analyse the promises made about these systems, to better understand how their imaginaries are generated. Analysing these systems sociologically shows that there are socio-technical choices which lie on the outside of these systems. However, these choices are not isolated, as the systems still, in some way, guide or assist in the choice-making process. A useful term in this regard comes from Bennet (2010) , who uses *agentic swarm* to describe the network where power is mobilised by both human and nonhuman actors.

The question then is, how can one theorise and analyse these systems through the understanding one has gained at this point? As Diakopoulos (2014) mentions: “What we generally lack as a public is clarity about how algorithms exercise their power over us.” (p. 2)

2.4 Algorithmic Decision-Making: Theorising Algorithmic Systems in Research

Understanding algorithms in research is an ambitious task. Not only, because there is not *one* algorithm, but also because of their intertwinement with other actors. The question then is, how to make sense of all these different directions that researching algorithmic systems entails? Until now, the State-of-the-Art was more focused on a theoretical discussion on what algorithmic systems *are*, how they function, and in which ways they are related to power. The following discussion then will focus on how researchers can theorise these systems, and which strand of theoretical thinking this thesis will follow.

The question of how to theorise algorithmic systems in research is vast, as can be seen in various papers, proposing many different strategies and methods for this task. As Nick Seaver (2019) writes “[algorithms] are social constructions that we, as outsiders and critics, contribute to“ (p. 413). Then, at first, the task is to understand algorithmic systems through the contribution of researchers, understanding them too as part of the assemblages they write about (Lupton, 2019) before stringing together usable approaches to proceed.

Lee & Björklund Larsen (2019) offer valuable insight into how to theorise algorithmic systems. While they point to looking “under the hood” (Lee & Björklund Larsen, 2019, p. 2) of algorithmic systems and thus understand the politics that are embedded in those systems, they critique this approach, as it pulls the focus from the social side of algorithms. Their most promising proposition is to analyse the so-called “mobile mechanics” (Lee & Björklund Larsen, 2019, p. 4) of algorithmic systems. This means that the focus should lie on understanding how both social scientists, as well as the people working with algorithms, relate to these systems. However, through such an approach one important group is left out: the people that are affected by these algorithmic systems. This becomes even more apparent when one looks at ADMS. As seen throughout the last two chapters, using ADMS can have consequences, be it either through wrong classifications, or by influencing those working on them. While power is an often brought up topic in this relationship, the consequences of this power often go unnoticed.

This criticism is not new at all. An often-cited paper in critical algorithm studies by Gillespie (2014) already pointed out, that both a focus on the “promise of algorithmic objectivity” (p. 168) as well as the “production of calculated publics” (p. 168) needs to be addressed while researching algorithmic systems.

Especially if one fully wants to integrate the topic of power and politics without omitting the social side. Being attentive to the promise of algorithmic objectivity, in this case, means that research has to be attentive to how claims made on the supposed *objective* technological nature influence how these systems are perceived. As already discussed, these claims are important to cultivate power in the first place. If a case-worker in public employment completely believes in the objectivity and accuracy of the profiling tool, they might not overrule its decision easily. This concept also entails a specific focus on both the promises made about these systems towards publics, as well as being attentive to how controversies around them start and are settled.

While I will later examine the concepts of promises and expectations more thoroughly in the empirical chapter, it is important to understand how the promise of algorithmic objectivity is strongly interlinked with expectations and promises, and how this then might lead to controversies, if not fulfilled.

Expectations are “statements about the future that circulate; they contain a script, that is, a description of the future situation and a concomitant distribution of roles for selves, others and technologies” (van Lente & Bakker, 2010, p. 694). These statements about the future have a performative character in the present (Horst et al., 2017). They can bring attention towards a future goal post into the past (Borup et al., 2006; van Lente & Rip, 1998) and can be used in the present to justify action (Plesner & Horst, 2013). They are acting according to a certain script, which can lead to actors reacting towards it.

Promises, on the other hand, can be understood as “positive expectation” (van Lente & Bakker, 2010, p. 694). As Joly (2010) states, two main ingredients are necessary to make a promise: a connection with a problem that needs to be solved, and credibility. Promises have to be shared and accepted by the publics they are addressed towards, otherwise, they could lose momentum (Joly & Renard, 2021). In the case of algorithmic systems, expectations then may perform the promise of algorithmic subjectivity. However, if these inflated promises are measured towards reality, for example when information gets released which questions the promise of algorithmic subjectivity (e.g. flawed or discriminatory results of algorithmic decision-making), it could lead to controversies.

Controversies, in these cases, are often started when the infrastructure of these systems breaks down. Likewise, controversies often lead to the infrastructure breaking down. If broken down, however, they become visible for a short amount of time. It also helps to shed light on an opposing side of the debate and thus have the possibility to see and understand the affected publics. This also leads to Gillespie’s (2014) second concept, “production of calculated publics” (p. 168). It means that research, especially on ADMS, has to be attentive to how they categorise people through various sets of values, and how those categorisations are simultaneously reflected back onto the publics. While most of the research on ADMS focuses on the first part of this concept, the categorisation aspect of the systems often gets left out. Which results in an omission of necessary social components in research.

Seldom has research examined how the affected publics felt about the implementation of such systems. Especially ADMS in public institutions, such as the public employment service, is a vast blindspot in research. It seems like most papers on such topics try to focus on the ‘domestic’ side of algorithms (i.e. social media, streaming, or search engine algorithms). Research in this sector can inspire and help to take

their methods and knowledge and use it in other ways. In these researches, a focus oftentimes lies on how people *see* (Siles et al., 2020) and *conceptualise* (Bucher, 2018) algorithmic systems. Because of the proximity users have to the algorithmic devices, there is either some sort of curiosity in how they function, or a sense of monitoring. These results, however, are dependent on how *close* they feel to their algorithmic system, or how *dangerous* they perceive the technology to be. Through interviews or focus groups, it can be seen that each person has their own algorithmic story to tell, meaning how and when they interacted with such systems, and how it made them question its functions.

Focusing on the implementation of such research can be seen by an example. Research on *the* Spotify algorithm done by Siles et al. (2020) offers a new and interesting way of understanding algorithmic systems through publics. The research analysed folk theories in Costa Rica about data assemblages used by the music streaming service *Spotify*. The research showcased one strength of focusing on how people affected by algorithmic decisions can give valid pieces of information on their perception of these systems. It showed that experiencing data assemblages behind algorithmic systems hinges on the cultural backgrounds of their users. It also gave an insight into how users made sense of the workings of such systems and how certain knowledge on these systems is co-produced through various other forms of technology and social issues, such as data collection processes. An approach like that also tackles the foremost mentioned power asymmetries, as it gives a way of gathering information on the systems, and ‘knowing’ them through the other side of the formally *one-sided mirror*.

While this study is an interesting example of people affected by algorithmic decision-making, the question still arises as to why research seldom sheds light on those affected. As the State-of-the-Art showed until now, at least the theoretical side of it, is how researchers try to define and make sense of algorithmic systems. While this is a predominant theme in research of algorithmic systems, there are still questions on how to approach them. For this thesis, the literature used mostly engaged with different ways researchers make sense of algorithmic systems and I tried to highlight a streamlined version of these different approaches and results. While more case-based research, as can be seen in Bucher (2018) or Siles et al. (2020) offer new ways of understanding these systems through their users and how they engage with them, there still is a certain blackspot which can be filled through the introduction of a new, but seldom used concept: *usees*.

2.4.1 Introducing Usees

Oftentimes, the subject which is analysed is that of the user. Until now, the thesis sometimes mentioned *affected publics*. This term, while correct, is relatively hollow. In the broadest sense, they are people which are tangentially affected by the consequences of the output of algorithmic systems. For this thesis however, this still would not be specific enough, as the influence of algorithms is, as already discussed, ubiquitous. If algorithms are seen to, at least to some degree, enact power, then the publics they affect, have to be highlighted more through their oftentimes prevalent passivity. To circumvent this problem and highlight a specific set of *affected publics*, a proposed term by Baumer (2015) will be used in this thesis: *Usees*.

Often research on computational systems faced the problem of pinpointing a certain group which lies between users (i.e. people directly connected to the interface of such systems) and non-users (i.e. people completely outside and not affected by these systems). A *usee*, however, is a person, which is not directly connected by these interfaces but still affected by them. Job-seekers in connection to public employment services for example fall into this specific group. They do not directly use the profiling tools - here, the case-workers are the users - but are directly affected by the decisions of said systems.

For a better distinction, Baumer (2015) offers three characteristics of a *usee*. First, they are “explicitly targeted by a technological system” (p. 3297). Thus, information on the individual is needed as leverage to represent and target said individual. As can be seen in profiling tools, this is a necessary part of them, as they try to single out the individual through data gained on them.

The second characteristic is that *usees* have little to no awareness that they are targeted by such systems. As can be seen in public employment services, most job-seekers are not in direct relation to the profiling tools used, but rather are mostly connected to the human case-workers. For them, the systems thus mostly operate invisibly.

The third, and last, characteristic is that the *usees*’ data is used by systems without the individual having consented to it, or not having enough knowledge of them, to fully consent. As can be seen in many controversies surrounding profiling tools, much of the data that is used to produce an *employability* ranking comes from administrative data. Even though some services also integrate questionnaires and personal interviews with their job-seeker clients, the problem of what is done with the data and how it gets translated statistically is still surrounded by uncertainty from the job-seeker’s perspective.

The concept, thus, is also important to draw attention to the power dynamics that the use of such a system creates. It gives a vocabulary to highlight those affected by the use of computational systems and can give them a voice.

As Baumer (2015) puts it, the term *usee* is used “to help account for a current blind spot in our reasoning about interactions between humans and computers” (Baumer, 2015, p. 3297). It also answers the question of how to define, or categorise, *the* social or *the* public in times of the digital age (Sujon & Dyer, 2020). Filling this blindspot is both a necessary task of this thesis, as well as for research on algorithmic systems as a whole.

The way this thesis will go forward then, is to analyse algorithmic systems through their social side, thus, giving research a science communication spin.

2.5 Holding algorithms accountable - Research Gaps, uncertainty and what to do

“A major obstacle to holding algorithms accountable, [...] is to know them in the first place.”

(Bucher, 2018, p. 41)

As previously shown, holding algorithms accountable might be an impossible venture. Perhaps they can not be held accountable, or maybe they do not have to be held accountable. If looking at the quote above, the task of knowing them might also seem to be out of the question. So, where should this thesis lead to? For this question to be answered, it is time to string together all that has been said so far, all the loose ends that might have been left tangling, and think about concepts which might improve current research on algorithmic systems.

The goal for this state-of-the-art section was to show the most important sides of algorithmic research and pinpoint several concepts, which are used to understand them theoretically. However, by now it should have become clear that there are many instances, where research could go further and try to give a more in-depth analysis. As was shown, research on algorithmic systems as a whole, is riddled with uncertainties. And while this may be a result of the analysed object being hard to grasp - and I would even claim uncertainty is part of the nature of algorithmic systems - there are many ways to work with these uncertainties, rather than against them.

For one, researchers must come to terms with the near impossibility of understanding such systems. For this, *unknowing* algorithms (Bucher, 2018) is a start. It offers the possibility of understanding assumptions about these systems, not through a technical deterministic lens, but rather through the social nets they are embedded in. It also helps to shift research interest from what I would call the production side of algorithmic systems (i.e. programmers, or people working on and with them), or the outside (i.e. researchers) onto the affected side (i.e. *usees*). This shift is necessary to at least understand the term accountability in algorithmic research. While research on ‘domestic’ algorithms from this side is vast (e.g. Bucher, 2018; Siles et al., 2020; Gillespie, 2014), the effect and knowledge of other ADMS in other sectors are scarce. The social aspect and the impact of these systems on certain publics is left out. This is a problem in itself, as “in attempting to say something of substance about the way algorithms are shifting public discourse, we must firmly resist putting the technology in the explanatory driver’s seat” (Gillespie, 2014, p. 169). For this, a shift to *the* social is necessary. Coming back to the foremost mentioned report by *AlgorithmWatch*, and the discussion on profiling tools in public employment service, it is useful to think about how such a shift and *unknowing* algorithms might help research in this sector. What the report by *AlgorithmWatch* claims, is that there is a lack of public debate around the use of ADMS. It is argued that a public consciousness about the underlying systems behind ADMS has to be formed first, in order to later generate a basis to participate in public discussions surrounding problems that come with the systems. While not directly referring to such, this can be understood as an open call towards understanding and researching the imaginaries people engage with on the topic of ADMS. While such a claim of course sounds a bit hyperbolic and hinges a bit too much on a deficit understanding of science and society, where society

is seen as non-knowledgeable and in need to passively adapt knowledge from scientists, it still gives a sense of where attention is needed.

As the example on profiling tools showed, this topic is not new for STS research and while it can already pinpoint some problems and aspects behind statistical profiling, there is nearly no focus on the affected publics. An interesting fact in itself, as can be seen by understanding this technology in use as a classification system, is that this one-sided research approach does still create this power asymmetry which was spoken about previously. Research, in this case, creates its own claims and knowledge on the system, leaving out any way to incorporate these facts into a wider discourse on the topic. Examining claims about algorithms - in this case, ADMS - are important to analyse and to understand the power and effect they have. However, as long as there is no research about how the justifications of these systems are communicated, and then enacted by the influenced publics, there is a huge blind-spot in research. There is still an overall lack of wider public discourse on the implementation of these systems. How then can the question of accountability arise in the first place, if the people who could blame the usage of these systems are muted in scientific discourse? How can research answer the question of where power is allocated if the people who are affected by this power are nearly non-existent in research?

The *public's* perception of algorithmic systems matters. This means, that public(s) in this sense, and this thesis, are not understood as something pre-formed and pre-given, so not in the residual realist way, but as co-produced and in the making, thus as relational co-productionistic (Chilvers & Kearnes, 2019). Analysing these systems through the lens of science communication, meaning the circulation of knowledge, meanings and opinions, opens up new possibilities in anticipating change and participation in the integration of ADMS in our everyday lives. As Felt & Davies (2020) note, one has to acknowledge all kinds of actors in the circulation of knowledge as important. Participation and participants (publics, issues, models) in any kind of discourse “are actively co-constructed through the performance of collective participatory practices, both shaping and being shaped by wider social, political, and technoscientific orders” (Chilvers & Kearnes, 2019, 350). Coming back to Gillespie (2014), it matters how knowledge about algorithms is communicated to the public and how this establishes them, and their supposed impartiality. And the question, especially in public employment services, is not only how accurate or fair profiling tools are, but how and why they are implemented in the first place. Especially as many of such tools are implemented without any necessary democratic debate (Chiusi, 2021). Understanding *the* public's perception of ADMS and their knowledge of them also means shedding a spotlight on many issues that have plagued this state of the art. Analysing assumptions and knowledge on algorithmic systems in the public sphere not only sheds light on how power and politics are exercised through these systems, but also helps to re-think the issues of accountability, accuracy, and fairness of these systems.

With this knowledge can also come activism or democratic participation against such systems, which is crucial. As Chiusi (2021) writes “[m]ost of the time, activists can only react if an ADM system is being trialed or if one has already been deployed. By the time citizens can organize a response, their rights may have been infringed upon unnecessarily” (p. 9). It is therefore also the task of research to understand the enactment of algorithmic systems by the public to build better responses to the implementation of such

systems. Research in this sphere has to understand which knowledge about those systems already gets communicated and appropriated by the public. Through this, one does not fall into the trap of assuming publics to be just out there, receiving outside information, but rather as an active part in the discourse. Understanding ADMS through a science communication lens, shows that the publics are co-produced with the issues at present because "science communication doesn't just show things, it makes them" (Felt & Davies, 2020, p. 18). Highlighting publics affected, or *usees*, through algorithmic decision-making can move research on algorithmic systems away from an institutional viewpoint and tries to understand the issues of publics and how they frame them. Learning about and understanding these issues might be an important step in changing the trajectory of research from one side of the *one-sided mirror* to the other.

Understanding these points will help to tackle the issue of accountability. It will shift research from a mere observing role of one side, to get a bigger picture of the multi-faceted sociotechnical network in which algorithmic systems exist and exercise power. It can shed more light on how and when algorithmic systems exercise this power and, in the end, might even help to hold them accountable. Even if this only means knowing them better in the first place.

While this state-of-the-Art was more focused on giving a theoretical background for this thesis, it still shows central themes in researching algorithmic systems. It shows how, due to their intangibility, these systems bring on different ways of understanding and researching them. This thesis, however, is more focused on understanding their impact and consequences which allows for a better understanding of them. This, then, places it in the field of understanding algorithmic systems through the power they enact. While power and technology is a classical topic for STS, due to their multiplicity, researching these terms through algorithmic systems will help to better grasp their dynamics. In this section, I argued for why research on algorithmic systems needs to tackle the problem of overlooking affected publics or *usees* in understanding ADMS and its consequences. This then also means that it will fill a certain gap in researching the power imbalance created by the use of such systems, but also by researching them.

To fill this gap a specific example of an ADMS in the public sector was chosen. As was shown, using such systems in the employment market may have severe consequences for job-seekers, making them into *usees*. To then understand the power it enacts and through that, understanding the system better, an algorithmic system in the Austrian public employment service (AMS) was chosen. By the time the system was trialled, it was already criticised due to several supposed flaws. This resulted in the trial phase being accompanied by a bigger social discourse on the usage of such systems.

By analysing the case of *the* AMS algorithm, I will showcase how the publics' perception and building of imaginaries is an important way to better understand such systems.

3. Materials and Methods

By now, the background of this thesis has been laid out. What has not been made clear, is which approach could circumvent the problem of researching ADMS in the public sector without falling into the trap of leaving much of its power-dynamics out of the discourse. Through understanding the topic of *the* AMS algorithm and its public perception, which imaginaries it generated and what that says about its power, a first step to understand the accountability of algorithmic decision-making in the public sector can be achieved.

This Materials and Methods chapter will combine many things which are generally put into separate parts of a thesis. At first, the case will be presented through literature. Afterwards, I will present the theories and sensitising concepts that will be used to tie this case together. This will help to provide the necessary perspective for the following research question(s), which hinges, in some way or another, on a theoretical understanding of the case.

At the end of this chapter, I will present how the research was done. Which methods were used and on which methodology they were analysed.

In contrast to the State of the Art chapter, these sections will heavily incorporate the case that is studied, but will also use much of the knowledge gained so far until now, to better understand the direction of this research. Now it is time to open up the case of algorithmic decision-making in the public sector. It is time, to take a look at AMAS, also known as “*the* AMS-Algorithm”.

3.1 Case Description - The AMS and the *Arbeitsmarktchancen-Assistenzsystem (AMAS)*:

The AMS (*Arbeitsmarktservice*) is the Austrian public employment service. Its goal lies in advising job-seekers on employment options, giving them help through further education to create new employment opportunities, and offering unemployment benefits. As with many different public employment services, the AMS also plans to integrate an algorithmic, or statistical, profiling tool in their day-to-day activities. The so-called *Arbeitsmarktchancen-Assistenzsysteme* - AMAS, or often widely referred to as *the AMS Algorithm* - would tackle the same problems as other, already-used profiling tools.

In 2018, the AMS announced that they would soon start integrating a statistical profiling tool in their day-to-day work (Desiere et al., 2019). It was first tested in 2019, in order to see how it performs, but also how the case-workers accepted the technology. It was used to streamline the profiling process by grouping job-seekers into one of three groups (Desiere et al., 2019; Allhutter et al., 2020a). The first group (Group A), *service clients*, have a high chance of entering the job market quickly. The second (Group B), *counselling clients*, have mediocre chances. The third (Group C), *support clients*, have a high risk of facing long-term unemployed. While these groupings are somewhat similar to those presented in 2.2.4, grouping the job-seekers along their *employability*, they differ in that they separate job-seekers into more than two groups (i.e. high- and low-risk). As can be seen through the naming of the different groups, each individual would get a different kind of counselling. High-risk job-seekers would get offered more support, such as for example specialised further education programmes. The service would be semi-automated,

which means that case-workers would judge the ruling of the profiling tool and can, if necessary, overrule it (Allhutter et al., 2020a).

The plan was to fully integrate the system by January 2021, but after a ruling by the DSB, stating that some aspects of the system might be unlawful, the implementation of the system had to be postponed indefinitely (Langer, 2020). After the ruling, the AMS filed a complaint about it, however, the final verdict on the systems integration into the public employment service is still pending (Jelenko-Benedikt, 2022). While the system is not yet in use, these developments showed a strong media interest in the system. Many voiced criticism, that *the* algorithm only distinguished between male and female job-seekers, leaving out inter- and transsexual people, which would be an unlawful process. The topic of citizenship also made *the* algorithm rather vague, as the classification was done only under three different categories: Austrian, EU-citizen, or non-EU-citizen. Many aspects of the decision-making process were criticised as some parameters used to measure *employability* were unclear.

But while the motivation behind the implementation related to an increase in efficiency, this procedure shows the neo-liberal shift in the Austrian employment market (Alhutter et al., 2020a). As with most profiling systems and their rating of *employability*, their counselling is directed towards the needs of the market. The goal seems not to truly help job-seekers, but rather, to give the market workforce as fast as it needs it (Alhutter et al., 2020a). This, however, is not the main problem behind *the* AMS algorithm. As Alhutter et al. (2020a) point out, the inner workings of *the* algorithm reproduce social bias and affect social discrimination of often marginalised groups. Here, it is also notable to point back to the aforementioned production of calculated publics by Gillespie (2015), as this concept can explain the problem more in-depth. While the AMS should try to help marginalised groups to have better chances on the job market, the algorithm, due to its nature in creating different groups, often categorises these disadvantaged people into a weak group, thus giving them less of a chance of gaining an advantage in the job market.

While the state-of-the-art section already went more into depth about the problems of opacity and decisions when classifying *employability*, with a look at a specific paper from Wijnhoven and Havinga (2014) it becomes clear that decision-making algorithms do not necessarily have to be opaque. At least not the decisions made before programming such systems. Here, the authors explain their process of finding the right categories of “soft factors” to be used in the Dutch employment algorithm. In comparison with other profiling tools, Desiere et al. (2019) give the Dutch system an accuracy rating of 70%, thus being worse than Austrias' 80%-85% per cent, highlighting the problem in the approach by the AMS. Wijnhoven and Havinga (2014) highlight their research process on how they found the important soft factors for the algorithm, something which the AMS did not do. This again draws the discussion to one of the main problems behind the AMS algorithm, one already highlighted by Alhutter et al. (2020a): the lack of reasoning behind their choice of seemingly unfair, and in some cases, unlawful categories.

In their research, Alhutter et al. (2020a) focused on analysing official documents and researching how the AMS presents itself. Claims about the objectivity of *the* algorithm by the company could not be validated when looking at the different categories the systems took into account. Due to this lack of

transparent explanation of why these categories were used in the first place, the “one-way mirror” (Pasquale, 2016, p. 9) became more prevalent in this case, leading to a bigger power asymmetry.

Analysing this technology, even though as of now, it is an uncertain infrastructure, makes for highly interesting research. First, while being ebbed down for a number of years it remains an open controversy. While the judiciary process examining whether *the* algorithm is law- or unlawful is still pending, it is expected that the AMS might in the end just re-adjust the AMAS’ programming to counter criticism. The case for further analysing the issue of *the* AMS algorithm lies in its high visibility, as the not-yet completely erected infrastructure still lies open and leads to public conversation about it.

Another reason why the case is so interesting is the arena where it took, and takes place. As previously noted, statistical profiling tools are used by many different countries, thus they are a national technology. Especially in the case of the AMS algorithm, it is interesting to look at the debate surrounding the implementation of the decision-making system through the lens of technopolitical cultures and identities, especially in Austria. As Felt’s (2015) analysis of Austrian technopolitical identity through the controversy on nuclear or agrobiotechnology showed, there is a certain way the Austrian population responds to the implementation of new technology. Using this understanding, and translating it into the new debate surrounding algorithmic decision-making in the public sector, might make it easier to fully understand the opinions surrounding the case. It also helps to understand the controversy fully and gives a nice foundation on which this thesis is built on.

With the case presented, I quickly want to try to integrate it into the broader discussions presented in the State of the Art chapter. As a controversy which was, for a time at least, highly visible, it offers the possibility of better analysing the case through people affected by it. This means that talking with job-seekers about what they know and think about the system, gives great insight into the so-often forgotten side of research on algorithmic systems. Through the technology breaking down in a public field, the infrastructure behind profiling and its classification processes became visible. This not only means that it allows the rare opportunity of seeing such infrastructure, albeit an uncertain and unfinished one but also makes it possible to question the power behind such systems. Analysing *AMAS* through the means of controversy, means in this case, that its visibility can also shed light on the often-forgotten publics in such discourses. It means that actors, such as different stakeholders and activists arguing against such implementation, can be integrated into the research. As can be seen on the web page amsalgorithmus.at, a campaign by many different organisations, was started to petition against the implementation of the algorithm. By now, 4619 people have signed the petition. The campaign is also highly active in informing people about *the* algorithm, either through public talks on the topic, events, such as a tour through upper Austria with a slot machine which should represent the algorithm, or explanatory texts and videos.

The case of AMAS is an interesting one. Researching it may help to unearth many of the issues and topics which are lacking in the literature on algorithms, ADMS, or statistical profiling. It can shed light on the perceived consequences of algorithmic systems in the public sector through integrating publics affected by it and even *usees* (i.e. job-seekers) in the research. Due to the visibility of the controversy from the beginning it will help to better understand how imaginaries of such systems formed and how it makes

use of other imaginaries. Overall, researching the case of AMAS through the Austrian publics will show how the *one-sided mirror* is seen, and understood from their perspective. Thus, this thesis aims to understand the imaginaries publics have on *the* AMS algorithm. To better grasp this concept, it will be analysed through two different aspects:

1. Understanding the perceived consequences of the usage of AMAS, and
2. Understanding on which background information these imaginaries were built upon.

For the second point, it is necessary to understand the technopolitical culture the publics take place in. This then will help, how knowledge, opinions and other imaginaries were formed in a national context and help to better understand the sociotechnical background of them.

3.2 Understanding AMAS through Austria as technopolitical culture

As an organisation, the AMS hinges on being defined as national. Due to this, it is also important to see and understand what a national technology and company means in this case, and then understand why the topic of techno-politics and techno-political cultures is a necessary aspect of this research.

AMAS can be understood in the realm of techno-politics, which are

“politics of devices or apparatuses, typically designed by little-known government planners, that make it possible systematically to gather knowledge about humans as living beings, and to implement targeted interventions with the aim of increasing the well-being of populations.” (Lakoff, 2015, p. 42).

In this sense, AMAS can be understood as both a device of politics and the discourse surrounding it as techno-political. Due to its data usage, one could use the term “public technological information system” (Westin, 1971, p. 9) to describe it further. What both of these terms should show is, that not only is AMAS a political technology (*see* 2.3) but it also hinges on a national, political decision-making process. This is why in understanding the discourse surrounding its controversy, democratic participation in technology processes must be examined.

In this case, the concept of techno-political cultures is fruitful for understanding the backdrop of publics. Techno-political means that both the technological as well as the political are co-evolved, which implies that cultural differences have an impact on the way technologies are perceived (Felt et al., 2010). This in turn leads to understanding techno-political cultures as “how knowledge and its material realisations get embedded in and perform a specific kind of political culture“ (Felt & Davies, 2020) and how technology is entwined in a distinct society (Felt et al., 2010).

Because of this, it is important to understand the techno-political culture of Austria for this case. An EU comparison in 1999 showed, that Austria had the lowest ranking in the category of *general technology optimism* (Grabner, 1999). In a more recent survey by Eurobarometer in 2021, it showed that Austria was one of the three countries where the majority of its citizens claimed that it was not important to know about science in everyday life (European Commission, Directorate-General for Communication). In Austria, 53% agree with this statement, while the European average was 33%. Research on Austria's

techno-political culture (Felt et al., 2008; Felt et al., 2010; Felt, 2015) showed that Austria engages in an ambivalent relation to new technology.

In their research (Felt et al., 2010), through focus groups in France, the Netherlands and Austria, analysed sociotechnical cultures on the topic of organ transplantation and genetic testing. In the case of Austria, establishing a new technology in society often comes with comparisons with other, perceived ideal versions of technology (Felt et al., 2010). This means that a certain script has to be attached to the technology which also needs to fit in the cultural framework of the countries' techno-political culture. Their research showed that Austrian publics may lack a cultural framework for handling and questioning the governance of techno-political questions. As long as the technology was understood as classical or local (as was the case with organ transplantation), there was trust in the technology. If the setting became more complex, less trust in the aims of technology providers was exhibited.

This shows, that especially in the case of Austria as a techno-political culture, the way the technology is perceived, and from where it is related to, was an important part in understanding it. As Felt (2015) shows in her research on imaginaries in nuclear power and GM food, inside of the Austrian protest against nuclear energy, there was a larger battle against perceived power relations. The reason for this might be, as Felt et al. (2010) state, that due to Austria's history and political culture, decision-making in a top-down manner is ambivalent. While regulations are accepted if they are assumed to be beneficial to the citizens, there are also complaints if the decision-making process was done excluding its citizens. This can be seen for example in the case of being against nuclear energy in Austria (Felt, 2015). This stance was also due to enacting former consolidated socio-technological imaginaries on new technologies. Another reason for this was the top-down manner by which atomic energy was perceived to be forced onto the nation's citizens.

Going forward in this thesis, this has to be kept in mind to fully understand the reaction of publics towards a perceived new technology such as AMAS. Understanding Austria as a distinct, socio-technical culture means understanding the backdrop of the publics' understanding and acceptance of new technology.

3.3 Sensitising Concepts & Theories

For this research, two classical STS theories (or concepts) will be used to give a better analytic backdrop in analysing ADMS in the public employment sector: Co-Production and imaginaries.

In the following chapters, I will first give a short historical insight behind these theories, then explain why they are necessary tools in analysing algorithmic decision-making in the public sector, how they were used in previous research, and then explain how they will be used moving forward.

3.3.1. Co-Production

As a sensitising concept, co-production will be used to better understand the different connections between knowledge-making practices and knowledge. In the case of *the* AMAS algorithm it will be important to grasp how imaginaries (*see* 3.3.2) and public discourse on the topic are co-produced with each other.

Following Latour (2019) and his thoughts on the inseparable ways of nature and culture in his work “We Have Never Been Modern”, co-production is an important tool for understanding the world in STS. One focus of co-production lies on how knowledge is both part of social life and also exists through social appropriation.

In the sense of co-production, science is a symmetrical endeavour and thus calls attention to both sides of scientific discourses: both social and scientific (Jasanoff, 2004; Felt & Davies, 2020). It is important to understand where the knowledge surrounding such systems as *the* AMS algorithms comes from, and how it gets translated and then enacted by publics. As Jasanoff (2004) notes, “[s]cientific knowledge, [...] is not a transcendent mirror of reality. It both embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments and institutions” (p. 3). Understanding scientific knowledge thus as embedded in *the* social, means to engage with this embeddedness.

Co-production leads to an understanding that “[a]s an interpretive framework, co-production begs for illustration rather than proof” (Jasanoff, 2004, p. 6). In a sense, the idiom of co-production thus helps this research to understand, illustrate, and re-construct how *the* AMS algorithm looks like through the eyes of publics.

Co-production is a necessary tool to understand the enactment of power (Jasanoff, 2004; Latour 1987) and how, when and through where it is co-produced. In analysing the politics of algorithms, co-production helps to understand “that realities are never given but brought into being and actualized in and through algorithmic systems.” (Bucher, 2018, p. 2). As this world-making power of algorithmic systems is co-productive in nature, power and politics have a big focus in this research.

From this, the thesis aims to integrate the four ordering instruments of a co-productionist approach (Jasanoff, 2004; Felt & Davies, 2020) in its analysis. First, this means that one has to be attentive to “[m]aking identities” (Jasanoff, 2004, p. 39). This means that the idiom enables the researcher to understand how processes of “making, negotiation, and reshaping of identities” (Felt & Davies, 2020, p. 16) are co-productive. In the case of AMAS, this means that the aspect of *employability* and the categorisations of job-seekers can be better understood through co-production. This will help to understand what the consequences of assigning job-seekers into one of the three classes AMAS operates with are. Through that, the aspect of power through AMAS’ consequences can be better understood. This ordering instrument also allows for better analysis and better understanding of the different *sides* of that controversy. Who positions themselves on which side of the controversy is an important signifier of how they understand their identity in the context of the discourse. This then helps to understand the reason for certain participants to decide that they are *against* the implementation of *the* AMS algorithm and their reasoning behind it. This then can be used as a framework to understand how their identities in the discourse and the imaginaries are co-produced together.

As a second ordering instrument, “[m]aking institutions” (Jasanoff, 2004, p.39) will help to understand that knowledge and power are co-produced (Townley, 1993; Jasanoff, 2004), but also how social order and the production of power are co-produced together (Jasanoff, 2004). In this, it will incorporate the AMAS through its institutional side. This means that the AMS, its algorithm, as well as

their claims will be analysed as a source of power. While the thesis will focus on publics, how the institutions frame their technology is necessary to understand the circulation of knowledge. This instrument is essential for understanding the hidden power structures which lie behind assumptions made on these systems. It also helps to engage with these power-structures and how institutions use them in a network of power. Understanding algorithms as networked systems, how these structures are *seen* and what they *do* can thus be better engaged with through understanding their co-productive endeavour through the making of institutions.

As a third point, “[m]aking *discourses*” (Jasanoff, 2004, p. 40) will be used to understand the topic of *the* AMS algorithm in the context of the controversy its implementation first stirred up. Co-production will help “to attend to the closures, exclusions, effects, and openings precipitated by participatory formats as matters of collective reflection, openness, and responsibility” (Chilvers & Kearnes, 2019, p. 9). This is especially relevant in the case of AMAS, as the participatory nature and discourse will play a big part in the research. It will help to better understand claims surrounding the technology, how they get established, or how claims will get neglected (Jasanoff, 2004).

This leads also to the fourth ordering instrument: “[m]aking representations” (Jasanoff, 2004, p. 41) matters in the co-productionist stance. It is by no means an easy task to grasp and understand how *lay* people *see* or *understand* algorithms. However, it is important to acknowledge the multiplicity and complexity of this task and utilise it in its fullest capacity. Co-production leads to understanding that „science communication doesn’t just show things, it makes them“ (Felt & Davies 2020, p.18). In the case of AMAS, this means that knowledge, imaginaries, claims and expectations of the technology are interlinked with the technology itself. Incorporating an understanding of the four ordering instruments of a co-productionist stance makes it possible to shed light on the various blind spots of previous algorithmic research, and as a tool, can be used to better understand the interconnectedness of knowledge about these systems and how they are formed.

The notion of co-production was already used by Allhutter et al. (2020a) in their analysis of *the* AMS algorithm. The main point of this analysis focused on the co-produced claim of the systems’ objectivity and precision on its institutional side. This approach shows that the notion of co-production is essential for analysing claims on algorithmic systems. Especially as Allhutter et al. (2020a) highlight, “[t]he algorithm is coproduced with the objectives and discourses surrounding its introduction, with public discourses on unemployment and the unemployed, and the wider political framework of social security policies that it is embedded in and that it is supposed to stabilize” (p. 3).

Using the research done on claims by the AMS by Alhutter et al. (2020a) is thus important to analyse the *other* side of the controversy and discourse on the implementation brought into light. As Gillespie (2014) notes, it is important to analyse “how the algorithmic presentation of publics back to themselves shapes a public’s sense of itself, and who is best positioned to benefit from that knowledge” (p. 168). Co-production, thus also is an important tool to understand the power dynamics the use of such systems assemble.

As Jasanoff writes:

“Science, in the co-production is symmetrical in that it calls attention to the social dimensions of cognitive commitments and understandings, while at the same time underscoring the epistemic and material correlates of social formations“ (Jasanoff, 2004, p. 3)

Thus, in this thesis, co-production will fulfil two distinct roles through a dialectic measure. It is the fundament upon which the research is built on. It will influence the questions asked and the way I analyse the data. It will also help in finding out which aspects are directly co-produced, as this thesis tries not to prove that co-production is at hand, but rather to understand that the publics’ knowledge about AMAS is a direct consequence of co-production. In this, it will be shown how knowledge and affected publics, lay people, and experts or stakeholders are co-produced together. It will help to integrate the topic of techno-political cultures into the thesis and help how these cultures co-produce their values and ideas on certain technologies. It will help to distinctly understand the publics/*usees* in the discourse through a relational co-productionist view and thus as already *knowledgeable* actors in the discourse (Jasanoff, 2004).

Because the term knowledge often came up in this section, it is needed to understand that while this thesis takes an approach to understanding the forming of knowledge, the building of opinions, and the effect of these processes, it is not a complete epistemic research. Rather, it aims to illustrate, rather than prove. For this, co-production lays out the groundwork for things to come. And because illustration plays a big part in this research, it needs a further tool to reach its full potential: using and analysing Imaginaries.

3.3.2 Imaginaries

Imaginaries are broad concepts in social sciences. Even in the field of STS, the plurality of understandings of imaginaries can be overwhelming (McNeil et al., 2017). In the following section it will be argued why this sensitising concept makes sense to use in this research, but also how plurality might be a good thing. At first, it will be explained how the understanding of sociotechnical imaginaries by Jasanoff and Kim (2009) might contribute to researching ADMS in the public sector. Afterwards, a more refined form of imaginaries, that of algorithmic imaginaries proposed by Bucher (2018) will be presented.

To summarise a short genealogy of the term imaginary, one can find that it “is transformed from a word that designates processes pertaining to reality to one associated with interpretations of reality“ (McNeil et al., 2017, p. 438). These interpretations of reality open up a rich field of research in social studies, that can be more focused on distinct aspects - often highlighted through a modifier before the word itself (McNeil et al., 2017) - as can be seen through the usage of *sociotechnical* imaginaries in STS.

Imaginaries, in whatever form, help to understand how publics create meaning about different forms of information. Sociotechnical imaginaries are “collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects.” (Jasanoff & Kim, 2009, p. 120). While the term social may seem unnecessary in the first place, as all

imaginaries are social in one way or another (McNeil et al., 2017), it draws a necessary emphasis on the collective nature of the theory.

The AMS is a national organisation, which is why the explicit orientation of sociotechnical imaginaries towards “the formation, stabilization, and development of nationalist imaginations” (Felt, 2015, p. 103) and knowledge-making practices of political institutions makes the concept necessary for this analysis.

Sociotechnical imaginaries are not “static or tightly bounded belief systems” (Jasanoff & Kim, 2009, p. 120), thus the approach in this research will not be to find fixed imaginaries about the technology. Because AMAS is not even fully implemented, everything at hand is an “algorithm-in-the-making” (Allhutter et al., 2020a, p. 14). This opens up the possibility of understanding different imaginaries that circulate in the public, as the object itself is not, as of yet, stable. Even though Jasanoff & Kim (2009) state that over time, certain imaginaries prevail while others vanish, this new field might unearth multiple different imaginaries in the making. In a sense, the research by Allhutter et al. (2020a) tried to unearth the imaginaries built by the AMS itself by examining how the system was communicated to the public. What will be important for this research are the counter-imaginaries that circulate in the public, and in turn, were co-produced through the AMS’ communication.

Imaginaries offer a way of understanding desired futures and thus are an important frame for understanding sociotechnical processes (Felt & Davies, 2020; Jasanoff & Kim, 2009). Visions of the future, in this sense, have a performative character. They can be influential in building technologies, disseminating technology, and show whom they are addressed towards. In the case of ADMS, it thus helps to first define relevant publics and analyse their desired futures. These might also shed light on the risks and fears that are entailed through certain innovations. It also helps to shift the focus towards the perception of non-scientific actors (Jasanoff & Kim, 2009). Different imaginaries can co-exist, showing different desired futures, but this can also lead to resistance if some are highlighted and accepted while others are shut down (Felt & Davies, 2020). The process of including and accepting certain imaginaries and shutting down others is especially interesting in this research, as it shows which futures are seen as more desirable than others, and what happens if certain collectively shared imaginaries get shut down through a place of power. In this way, imaginaries help to understand social order (Jasanoff & Kim, 2009; Felt & Davies, 2020) and can be used to understand power in relation to algorithmic decision-making systems.

Another form of sociotechnical imaginaries' performative character is the way in which publics' can act and organise themselves in trying to bring their desired future into being (Jasanoff & Kim, 2009; Joly, 2010; Horst et al., 2017). For this thesis, the formation of publics and the resistance towards certain imaginaries plays a big role, as it shows how conflicting visions of the future, and a *good* society are competing with each other.

Another form of imaginaries used in this thesis is that of algorithmic imaginaries by Bucher (2018). Here, she proposes a theory that is not unlike sociotechnical imaginaries but has a fixed focus on the workings of algorithms and how the individual relates to them. As she puts it, this more precise form of imaginaries enables researchers to analyse “ways of thinking about what algorithms are, what they should

be, how they function, and what these imaginations [...] make possible” (Bucher, 2018, p. 113). Algorithmic imaginaries help to understand how people enact a ‘real’ algorithm for themselves. Because the research is focused on how affected publics understand the working of algorithms, this theory needed to be integrated.

In her research on domestic algorithms, Bucher (2018) tried to analyse so-called “algorithmic stories” (p. 100) from what people told her in interviews. This meant that she analysed stories in which her interviewees talked about special encounters with algorithmic systems. It showed that the imaginaries created by the people not only say something about how they *think* these systems work but also how they think they *should* work. An important point for this research is that it creates opportunities to find out how people would govern and use ADMS by analysing desired futures of such technologies. As Bucher states, “the algorithmic imaginary does not merely describe the mental models that people construct about algorithms but also the productive and affective power that these imaginings have” (Bucher, 2018, p. 41).

Algorithmic imaginaries are both part and an extension of sociotechnical imaginaries. While the ones’ focus lies in understanding the individual's imaginaries (*algorithmic imaginaries*), the other emerge from the data as a whole (*sociotechnical imaginaries*). Connecting both will help to understand how knowledge and meaning of ADMS are embedded in publics. As of now, there is relatively little work concerning Bucher's concept. Baumer (2017) uses it to give a new direction to the design theory of algorithmic systems. Siles et al. (2020) draw their usage of folk theories in their research on Spotify data assemblages directly on Bucher's (2018) algorithmic imaginaries. If researchers want to gain knowledge on public understanding of algorithmic systems, this theory has to be integrated into further research in this field.

It is necessary to point out that while both of these distinct imaginaries are used in this thesis, they both play different roles. In this research, both of them are used as tools in analysing algorithmic systems. Through interviews, algorithmic imaginaries help to understand the *algorithmic stories* individuals tell, while sociotechnical imaginaries emerge through understanding aspects of shared imaginaries. Algorithmic imaginaries will be used as a micro focus. The task which they will be used for, is to focus on single persons. Analysing their understanding of algorithmic systems apart from a broader sociotechnical realm. While nearly all knowledge is somehow connected, the algorithmic imaginaries first have to be analysed as singular entities to further place them in the bigger realm of sociotechnical imaginaries. These will be used as the macro focus of the thesis. They will help to see and understand how the different algorithmic imaginaries relate to each other on a bigger scope. Which relations they built, and which differences there are. The algorithmic imaginaries herein will be strung together through the lens of co-production to understand the broader scope of sociotechnical imaginaries on algorithmic decision-making systems or profiling tools. Especially in the case of AMAS, the connection of both kinds of imaginaries is important, as they allow for a closer inspection into how the technology is embedded in a national understanding, as well as in its publics.

3.3.3 Unknowing Algorithms

Knowing and claiming knowledge might be an easy part of research, albeit it often takes a lot of courage. However, highlighting things which are not known, and thus building a stringent analysis through that, makes things more complicated. Especially in algorithmic systems, there is much that is unknown, especially through their temporality and the different networks such systems incorporate. For this, Bucher (2018) offers an interesting solution which will also be used as a theoretical framework in this thesis: *unknowing* algorithms.

First of all, it is important to note one huge factor in most research on algorithmic systems: Uncertainty. In nearly every paper, a slight sense of uncertainty buzzes around the term algorithm. Uncertainty, it seems, is a key component in researching algorithms. Why then, should research on that topic not work with uncertainty, rather than against it? To find an answer to these problems, one should take a look at Bucher's (2018) concept of *unknowing algorithms*. Discussions on algorithmic systems often come down to the topic of opacity and the question if transparency would change problems inside the system, and whether it could help the research process. As already discussed, this might not be the case.

Sometimes in research, algorithmic systems are seen as "*knowable known unknowns*" (Roberts, 2012, p. 218), which would mean that they could be understood, if one has the right means to gain insight into them. But this assumption would lead nowhere. The problem with research on algorithmic systems oftentimes is its assumption that if one understands *how* the technical system works, it will give the researcher a better understanding of it. This not only delimits research into a technic-centred endeavour but also loses the sociotechnical relations that are some of the most important forms of power and politics in algorithmic systems. A good way to shift around that problem would then be, to analyse the practices algorithmic systems are entangled in. *Unknowing algorithms* could offer a good solution for research. Unknowing, in Bucher's (2018) sense, "means seeing differently, looking elsewhere, or not even looking at all" (p. 46). This approach incorporates the difficulty of *knowing*, accepting it and asks for "distancing or a form of engaging with the seductive qualities of algorithms that cannot always be explained in fully rational terms" (Bucher, 2018, p. 46). For social science researchers, this means that one has to investigate the assumptions made about algorithms. It means that research has to shift its focus and distance itself from the devices and move on to the circulation of knowledge surrounding them. In unknowing algorithms, it is not important to think about any black box that may conceal the technology and its function, but rather "opening the black box of one's own assumptions about knowing algorithms" (Bucher, 2018, p. 46). This also leads back to the previous discussion about power and algorithmic systems. Shifting the focus and analysing claims and knowledge about them, means that the power aspect of algorithmic systems can be better understood.

Unknowing algorithms was also the reason why seldom work on other algorithmic systems were highlighted in the state of the art. Due to algorithmic systems being distinct, heterogeneous networks or assemblages, no algorithm acts or is perceived like another. Unknowing, in this thesis means working upward and understanding each algorithmic system, as well as their perception, as unique. This then will help to better grasp their perception through publics and *usees* alike. While a clean slate in research never

is possible, it nonetheless helps to understand AMAS as distinct, sociotechnical-network. Unknowing algorithms thus means that research should embrace uncertainty about the object which is analysed.

3.4 Research Question(s)

The main research question this thesis follows will be:

Main Question: Which imaginaries around algorithmic decision-making and profiling tools exist in affected publics?

The reason why this question is necessary to ask in the first place is that it offers crucial insight into the many different ways algorithms are seen. To not integrate AMAS in the formulation of the main question was a deliberate choice. As shown in the section on imaginaries, there is not *one* imaginary, and thus most imaginaries are not focused on *one* specific object. The task, thus, is to abstract the knowledge gained on AMAS, and integrate it into the broader apparatus of imaginaries on ADMS and profiling tools and how they are reflected back to the system of AMAS. Focusing the question on the vague term of algorithmic decision-making systems offers a dialectic approach towards the research, integrating all the different strands of imaginaries that are used, re-used, re-contextualised or even rejected in forming imaginaries on one distinct system.

For this, it is necessary to incorporate two sub-questions, as they are used to gain more information on how the imaginary is constructed, as well as to understand which knowledge is linked to them. Thus, the sub-questions for this thesis are as follows:

SQ 1: On what background information are imaginaries on AMAS and profiling tools built on and influenced by?

SQ 2: In which ways are the mobilisation of power and the consequences of AMAS conceptualised by affected publics?

The first sub-question will be used to generate more insight into how the imaginaries are constructed. Answering this first question is a necessary step to learning more about assumptions made on these systems. It also helps to embed them in the context they are part of, and how the technology might relate to others.

The second question will tackle the topic of power. As stated in the State-of-the-Art, power is a necessary component in fully understanding algorithmic systems. Through answering this question, two important points can therefore be highlighted. It will show how AMAS is supposed to work, but also why. It will show, in which way it operates and who benefits from it. The aspects of the consequences will show how things could be otherwise. It will help to understand which effect the usage of profiling systems in the public employment generate, and maybe what to do to counteract these.

These two sub-questions are necessary to get a fuller picture of how imaginaries on algorithmic decision-making and profiling tools are understood and created by affected publics, stakeholders and uses alike. This also shows the interplay between the two main theoretical stances in this research. For the sub-questions, a focus on co-production is necessary to understand the relation between knowledge, where it comes from, and how it is used, to then translate this knowledge on how the imaginaries are created and enacted.

3.5 Methods:

The methods used in this thesis are directly linked to both questions and theories. At first I will lay out the reason for the methods used, then explain my data collection and the period of time needed for this endeavour. Following this, I will shortly explain my approach to analysing the data to fully contextualise the results presented in the empirical chapter.

3.5.1 Interviews

The most optimal solution was to integrate interviews as the main source to acquire data. Using this method offered several advantages for the thesis. Due to the nature of the questions asked and the subject itself, I aimed to integrate the perspective of job-seekers in my research. As science communication was at the forefront of my research design, it was necessary to have an understanding of what is presumed to be either recipients of the communication processes of AMAS, or actors involved in it. Because of that, I wanted to have the possibility of having a conversation with people involved, especially job-seekers or people near them (e.g. labour policy organisations). Interviews offer the possibility to shine a light on often underrepresented groups in research (Silverman, 2006). It also made it possible to single out opinions and thoughts, which would be harder in focus groups, for example. What I was interested in, was to understand the personal experiences of job-seekers and stakeholders acting in the debate on AMAS. Through this, it was possible to discover more about the *algorithmic stories* they told of their experiences with AMAS. While in Bucher's (2018) use of this concept, she was interested in the experience of people using a specific algorithm. In this thesis it will be changed towards understanding the interviewees approach of understanding AMAS' function. No one of the interviewees acted as direct user of the algorithmic system, but still tried to make sense of its functions through the information they gathered. Interviews made this possible, as they can be used to dig deeper into experiences of discourses, opinions or personal experiences (Jensen & Laurie, 2016). AMAS is/was not tangible, and more often than not, appeared in the background through newsmedia reports. Because of that, the instances where the interviewees could experience the algorithmic system was when they were acting in the discourse on AMAS. Understanding these *algorithmic stories* then is an important way of gathering data on the (in)formation of algorithmic imaginaries and how they were co-produced through the discourse.

After a first literature review, I created a guideline for said interviews. While testing out the guide, I realised that the questions and the topic itself might lead to discussions which would be too broad for this thesis. Thus, I changed the structure from open-ended to semi-structured, as this made it possible to go into other important topics through discussions, but not to delineate the research too much from its first design.

Especially since I was interested in the individuals' experience and knowledge on specific topics (Jensen & Laurie, 2016), this form of interview was chosen. This structure made it possible for me and the interviewees to have a proper and reflexive conversation with the possibility for both sides to ask questions, without striving too far off from the topics.

As for finding interviewees, I chose to follow a snowballing method. My main goal was to both integrate job-seekers as well as stakeholders in organisations which had a direct connection to the debate on AMAS. For this, I first generated a map of actors I had found through online research and e-mailed them, asking whether they would consent to an interview on the topic and, if not, whether they could refer to other suitable candidates.

The first attempt was to come into contact with people connected to organisations either linked to the labour market policy field, or data rights organisations. The reason for this was that they could be seen as the driving force surrounding the discourse on AMAS through the public eye. In the end, 2 stakeholders from data rights organisations and 3 stakeholders from labour policy organisations were interviewed. The latter group proved most interesting as it included an important link between usees and the AMS.

An important benefit of including stakeholders in the research was that they often worked with job-seekers and could offer insights into the initial thoughts and feelings of the people affected. This also helped me in getting in touch with the social realities of the job-seekers. Since this thesis focuses on job-seekers, it has to be pointed out that a high level of attention was necessary in organising contact and interviewing them. It has to be mentioned that I am in a rather privileged situation. One, that affects how I think and approach things. Since the thesis also approached not only job-seekers but also long-term unemployed people, at first, it was necessary to understand their living conditions, their fears and thoughts, to have and start an ethically aware conversation. As the process of the thesis showed, it was hard to get in contact with job-seekers. After several different snowballing attempts, I came into contact with 2 different job-seekers.

In the interviews with them, I was discouraged from further acquiring job-seekers as interviewees, because they stated that either there was little to no knowledge of the system in their community, or that the topic itself would be straining for some. Because of this, I just integrated two people in proximity to job-seekers into my research. These interviews, however, were structured differently. At first, I followed the same guidelines of the semi-structured interview I had in place for each stakeholder, but in the end, I diverged and talked about specific topics which came up in my other interviews to better understand their perspective on them.

In the end, 7 interviews were conducted over 6 months (from April 2022 to November 2022). Due to different attempts at finding participants, and giving myself time to reflect on the interviews, the interviews were done in two batches of two to three interviews a month, with at least one month between each batch. The length of each interview was between 45 minutes to 90 minutes. Apart from one via Zoom, they were all done at locations of the interviewee's choosing, which often meant in public spaces. One interview was conducted in Graz, while the others were done in Vienna. All the interviews were done in German and recorded on tape-recorder and were deleted after the transcription. For the later analysis,

important quotes were translated into English, but the German original quotes can be found in the Appendix (see p. Appendix II).

3.5.2. Rich Picture

An important part of the interviews was to ask the participants to draw what they believed *the* AMS algorithms looked like and how it functions. This method was inspired by a similar research approach by Siles et al. (2019).

While oftentimes rich pictures are used in focus groups or other group activities (Bell & Morse, 2012; Bell, Berg & Morse, 2019; Bronte-Stewart, 1999), I found that using them in a one-to-one interview situation also worked.

The reason for integrating this method was not only to take the term *imaginary* literally, but also to give the interviewees time to think and reflect on their knowledge of algorithmic systems.

Often, it was hard for the participants to put into words how they thought such systems function. With the means of the rich picture, they had time to think about their assumptions and then could better describe their drawings. Especially since while drawing the pictures, I asked the interviewees to explain what they were drawing - inspired by think-aloud/talk-aloud practices (Fonteyn, et al., 1993) - it gave more depth into their thinking process.

Drawing a rich picture as an activity in the interviews was integrated when the interviewees talked about the symbolic nature of AMAS. They were provided with a blank sheet of paper and pencils. For each interviewee, I posed the same: What do you think AMAS/the algorithm looks like? Using the same question was necessary, to make the different drawings comparable. Apart from that, the interviewees were completely free to draw whatever they wanted to, without interference. After they had drawn the picture and explained it, they oftentimes came back to them in later questions and explained their answers by pointing out several parts of their picture, which made the usage of this approach a fruitful one for this research, as it gave the interviewees the possibility to express themselves better.

In the empirical analysis, the pictures themselves are used as representations for different cases of arguments. When they are shown, each of them will first be described when they show up, and then interpreted in the context they are used in. The reason for this is, that while the pictures should *speak* for themselves, often while drawing, through thinking aloud, participants added descriptions and gave more context to the drawings. However, the drawings were not understood as a holistic *thing*, but rather as one part of a larger understanding of the technical system and the sociotechnical network (Bronte-Stewart, 1999). Because of this, everything that is not seen in the rich-picture and was said verbatim will as well be added to fully understand them in context.

All rich pictures can be found in their original format (DinA4) in the Appendix (see p. Appendix I).

3.6 Methodology:

To make sense of the data, the interviews first were transcribed. The transcription was done verbatim, however, due to the different dialects of the interviewees, they were sometimes streamlined. Nonetheless, important words in dialect were written down and integrated into the sentences.

After the transcription process, each document and rich picture was imported into MaxQDA for coding processes. In coding, I chose to be inductive, because *unknowing algorithms* also meant, that I wanted to distance myself from assumptions made on algorithmic systems. Because the interviews were done in batches of 2-3 interviews with one to two months in between, I could integrate a zig-zag approach through open codes (Rivas, 2018) in my methodology. Insights through coding earlier batches of the interview were used in the literature I used and in later interviews, to better understand topics which were not expected. This made it possible to flexibly integrate these topics in my research design, but also through coding these first interviews superficially at first, it refrained me from building theories too early in the research process.

Formal coding after doing all the interviews was done through in vivo codes, as they allowed me to distance myself from the data at first, and find different links through what was said, and not what I assumed. Coding in this first round was done sentence by sentence. These codes were then analysed through pattern analysis (Jensen & Laurie, 2016) through which I tried to categorise and group the codes into certain themes that arose in the conversations. In this, my coding methodology was inspired by thematic coding (Rivas, 2018).

After this first round of coding sentence by sentence, I then used the themes and groups I found for another round of coding to see if these patterns could be applied to the thesis. For those that worked, I operationalised the codes and further condensed them into groups. After several rounds of coding like that, condensed patterns, groups and theories arose which were then used as points when analysing them through my research question(s).

The rich pictures were also analysed using this technique. This made it possible to first look at the pictures and what they showed without connecting them to what was said by the interviewees, and consequently, understanding them separately. This helped mostly in building an understanding of how the rich pictures were drawn and how they contributed to shared imaginaries. The pictures also were analysed the same way the interviews were coded, through MAXQDA. This helped to connect their topics to that of the interviews. In the end, both the interview and the rich picture codes were assembled for further analysis. This meant that both were not understood as distinct entities in research, but rather as two different ways of expressing the questions asked.

In comparing different codes from different interviews, seldom did big discrepancies in what was said arise. In the instances where there were conflicting statements, I noted them down. In the writing process of the empirical chapter, however, I decided to either present these conflicting ideas as separate interviewees saying separate things, or further analyse the reason for these differences. Mostly, they only arose between comparing interviews with job-seekers and stakeholders, which I contextualised in the text.

4. Deciphering Digital Dreams: Exploring Imaginaries of Algorithmic Decision-Making through the AMS algorithm

Each section is built upon using several examples given throughout the interviews, through the means of paraphrasing, quoting or showing rich pictures. The different chapters are structured through different categories which were important throughout all interviews. At the end of each category, I will present an *Interim Result*, where I will summarise the most important points of the chapters and link them together through the theoretical lenses of co-production and sociotechnical/algorithmic imaginaries and discuss them in the context of this thesis.

The first part of this empirical analysis is concerned with the start of the discourse and how it shaped the later consolidation of algorithmic/sociotechnical imaginaries. What I will show here is that especially *how* the AMS communicated the new technology had severe repercussions first on how imaginaries on AMAS were built in the first place, and also which other imaginaries were used to consolidate them.

Afterwards, I will analyse the way AMAS was criticised by the interviewees. It will help to better understand the system through the aspects which were seen as lacking but also, how the consequences of the use of such systems were understood. One key argument I will make here is that AMAS was clearly distinguished from an AI, and thus understood as an inferior system.

While understanding the consequences through how AMAS was criticised is an important step in understanding its repercussions, the last part of the empirical analysis will focus on the aspect of power and AMAS. Here, I will show in which ways AMAS and the consequences of the systems' use are related to the enactment of power, but also show the sociotechnical-network on which AMAS was built. This then is necessary to understand the sociotechnical imaginaries on AMAS, as the system was always understood as part of a larger network of different actors, that, through its inclusion both gains validation, but also enforces a certain power structure.

In the end, what will be shown is that AMAS is understood as *simple* and oftentimes neutral technology, which mostly is criticised due to its connection to other sociotechnical networks. AMAS is a tool, which reinforces certain power structures. To understand these points better, however, it is necessary to understand the network surrounding AMAS better.

4.1 The AMAS through time - Now and then:

This and the following chapters will focus on the communicative, participatory, and knowledge-making dimensions of the AMAS discourse. At the end of this, some aspects will be used to answer the sub-question “*What background information are imaginaries on AMAS and profiling tools built on and influenced by?*”. The goal in understanding the beginning of the discourse is to grasp two important things for this questions’ answer:

1. How and where did the first information on the system circulate?
2. What were the interviewees’ building blocks to better understand AMAS at the start?

This then will give an opportunity to understand how imaginaries on AMAS were shaped over time.

To conceptualise this better, this chapter will at first show the contemporary point of view of the discourse, while the next chapters will chronologically build up from the start of the discourse up to the present. This is necessary to highlight, as these discussions are placed at specific points in time, which require attention towards their situatedness and how knowledge claims changed (as well as the technology) (Felt & Davies, 2020). I will refrain from using the term *controversy* too often in connection to AMAS going forward in this thesis. The reason for this decision is, that seeing and understanding the topic in the light of a *controversy* would add new dimensions, layers and sensibilities to the research, which do not help answer more important questions surrounding AMAS’ imaginaries. For this, I will use the term discourse, as most of the processes presented were discursive, be it through the incorporation of outside information, or negotiation processes on the topic. Looking at newsmedia, the topic seems not of interest anymore. The last articles on the topic were published between April and May 2022. When asking the interviewees how they perceived the status, however, a different perspective on the presumed silence arose.

At the time of the interviews, the project AMAS was being processed by the *Verwaltungsgerichtshof*. This meant that the system was investigated and evaluated whether it was following Austrian law. The outcome, some interviewees speculated, would be one of two cases. Either, the *Verwaltungsgerichtshof* does not find any violations of Austrian law in the usage of AMAS, thus leading the AMS to immediately start to reintegrate the system again in their organisation, or the court rejects the system. This, as some interviewees assumed, would again not be the final verdict because they expected that the AMS would then work with the ruling and change the system according to the law. In any case, all the interviewees expected the system to be integrated into the AMS in the future.

On the reason why the AMS would not just drop AMAS after the public criticism, the same arguments for its integration were named again by the interviewees: using it as a cost-effective measure. Some interviewees speculated that with the coming economic recession, the AMS would again face budget cuts, which would lead it to once again argue for the implementation of the system, to cut resources (e.g. case-workers).

In any way, the integration of the system was seen as inevitable. This could also be seen throughout the interviews. One interviewee perceived the situation as a “stalemate” (Interview 3). This perception then influenced how the development of the discourse and engagement was perceived in retrospect. This is a

needed context for this empirical analysis, as it shows that the interviews on AMAS were not about an abandoned technology nor the end of a controversy. The topic is not as silent as news media reports might suggest but rather, is still happening in the background. However, what can be seen through the interviews is that right now, there is no negotiation process for the actors. It seems like the roles and places in this discourse are settled, with both *sides* waiting on the final verdict.

One interviewee stated, “we are standing in front of ruins” (Interview 6), with ruins referring to the infrastructure surrounding AMAS. The public discourse and activism against the system were perceived as damaging to the external perception of both companies and the algorithmic system.

Especially in hindsight, understanding AMAS as both an infrastructure as well as embedded in a larger sociotechnical infrastructure shines a light on how the status quo was perceived as a defunct infrastructure. If “the question is not whether a given thing *is, in essence*, an infrastructure but *when* it is an infrastructure” (Slota & Bowker, 2017, p. 531), the case of AMAS becomes right at the start of the interviews a story about the perceived establishment and fall of an infrastructure. As part of a heterogeneous network, or infrastructure, the quest to understand AMAS and its imaginaries is not only to understand the technology but also how the interviewees connected it to a larger sociotechnical network.

This network can already be observed in how the supposed failure of the system was connected to consequences for the company behind it. One interviewee assessed the consequences of their efforts in campaigning against AMAS: “[the AMS] now [has] a PR problem” (Interview 7).

This means, that while the roles of the actors in the controversy on AMAS seem to be settled, due to campaigning against the system, the interviewees perceived a change in the public discourse on the topic. For them, due to making the infrastructure behind AMAS visible, a new form of knowledge and discourse arose in public. While many interviewees were confident that their activism and engagement on the topic helped to at least create awareness, due to seeing AMAS as inevitable, there was never a clear sense of final victory. It is to note, however, that all the interviewees fulfilled some kind of role in the broader debate on the topic, making it hard to have a clear assessment of the real public participation and outcry of some informational campaigns or support by stakeholder organisations generated. Many, especially ones in proximity to long-time unemployed groups, understood themselves as engaged publics, and not as experts. Others, like organisational stakeholder, were heavily engaged with affected publics in times of the discourse. Because of that, it is possible to still integrate the view of general *publics* in this research, albeit mostly through stakeholders and spokespersons, with the exception being job-seekers in the interviews.

One interviewee criticised the lack of perceived public engagement on the topic. Commenting on the number of signatures of the “Stop den AMS Algorithmus” campaign (4.000 by the time of the interview), they said: “Great! But if you think about how [the petition] was pushed, it is astoundingly little. And if one thinks about it, that every year one million people are affected by unemployment... So, one million and you have 4.000 signatures.” (Interview 6)

This quote shows that there still is a necessity to engage with the topic, as many interviewees perceived AMAS as only a symptom of bigger issues connected to unemployment in Austria.

In understanding the status quo of AMA the important things need to be highlighted at the end of this chapter: AMAS is seen as inevitable; due to this, there is no negotiation process anymore. Thanks to activist and educational efforts, now AMAS is understood as a broken-down infrastructure, which was made visible.

4.1.1 First contact - When the topic became known

Through knowing how the topic developed since its start, it gives crucial context for the time the interviews were done. Now, however, it is time to understand how the interviewees first heard about the system. This will help to understand when and how the first imaginaries about AMAS were formed. It will show how the topic of an automated profiling tool first came into the discourse and how the interviewees tried to make sense of it. Through that, it will be shown that right at the start of the discourse surrounding AMAS, different actors and other imaginaries were co-productive in how imaginaries on *the* AMS algorithm were built. This then will help to find some answers about “*What background information are imaginaries on AMAS and profiling tools built on and influenced by?*”.

For this analysis, four different entry points in the discourse can be identified: rumours/news about AMAS through media, possibly affected people contacting stakeholder organisations, a perceived change in labour distribution and insider information. Throughout the interviews, it became apparent that these four points were interlinked. For this, I will try to build them up logically, rather than chronologically, as it also showcases how reactions towards the initial news on the system co-produced different actors and information in the discourse. It will be shown how this new phenomenon was perceived at the start, and how this was co-produced through the interviewees. This will shed light on how engagement with the topic first and foremost came through a lack of first information on AMAS. Furthermore it shows how the object of AMAS was shaped in a communicative setting at the start, and how this was co-produced with new participatory networks.

For many interviewees, the topic first became known between the end of 2018 and the start of 2019. In the conversations with interviewees close to the self-organised jobless people, the first media reports on the system piqued their interest. It was often stated that these reports were second-hand accounts, meaning that the information did not directly come from the AMS but through different sources such as news articles or friends. These accounts lead to an interest in the system. As the interviewees stated, many job-seekers, hearing the news, understood that this might affect them. The interviewees, in consequence, tried to gather pieces of information for themselves through research. Other job-seekers took a different route.

Some organisational stakeholders from labour market policy organisations first heard of the system, when job-seekers came to them to understand more about the system. Often, it was recounted, that unemployed people heard rumours about a system that might get added to the workings of the AMS. This, in consequence, led the organisational stakeholder to first research the topic to share the pieces of information and thus, they became engaged with the topic. For both these points of entry, the lack of information in the early phase of the discourse led them to engage with the topic. Unknowing was

understood as the main motivational factor to fuel interest in the topic. Especially since this sudden unknown for many was connected to a change in the labour market.

Uncertainty on the topic thus led to the necessity of making a risk assessment, which mobilised the different actors to engage with the topic. For the actors now engaged in the topic, their reliance on “trusted ‘others’” (Grove-White et al., 2000, p. 23), in this case, advocacy groups, led them to both enlarge their information network, but also shaped further discussions and opinions on the topic.

Both of the previous points had to occur in late 2018 when the system was announced, albeit not yet implemented in its first test run. This test run, however, would again call forth new actors, as some interviewees stated that their first point of entry into the discourse was the sudden noticeable change in labour distributions they noticed. Suddenly, more people, who were not directly employable because of different reasons, were assigned to BBEs (*Beratungs- und Betreuungseinrichtungen*). This showed that something had changed inside the internal segmentation processes of the AMS, as “there came people, I believe, which were previously not at all on the radar of the AMS” (Interview 4). Through this, research was conducted, finding out that this change might be connected to the newly employed test phase of AMAS.

What these three different points of entry show is that curiosity, due to the lack of official information about AMAS, led many interviewees to first seek out answers. AMAS was a blindspot, its (potential) integration a black box which evoked the necessity to understand it.

While these accounts might show that the system was perceived as completely new to the interviewees, one account is the most interesting one for further developments of this research.

As they showed, AMAS itself is not a particularly new technology, but rather an old concept that got embedded into technology. Segmentation and classification of job-seekers is a useful way of presumably making the job of case-workers easier, as was shown in the state-of-the-art. It is also not deniable, that at least some form of segmentation also happens inside the heads of case-workers. However, in the case of the AMS, the first notion of, at the very least, segmentation and classification - if not automating it - presumably came up in the late 90s, the interviewee said. But while these attempts died down after a while, he said that: “I would say a decade ago, this gained more dynamic” (Interview 3). At first, the AMS used a study on different typologies of job-seekers who might get into contact with the AMS sooner or later. These groups, 9 to 10 distinct ones according to the interviewee, were already somehow similar to the groups AMAS would later segment its job-seekers in. “Then, amid the last decade, AMS resources became sparse again and they reinforced starting automatisisation, increasing efficiency.” (Interview 3). This, in turn, led the AMS manager to reevaluate the former groupings, trying to slim it down to three to four groups. These groupings, which were used then by case-workers, became what was known as PAMAS (*Personalisierte Arbeitsmarkt Unterstützung*), which in turn became known as AMAS in its automatised form.

While the story in itself is an interesting account of the development of AMAS, it also shows that there is a long history of re-adjustments and negotiations about the system inside the AMS. The technology, thus, did not suddenly, nor secretly, occur. At least through the knowledge of inside information. This also

meant, for this particular interviewee, that they already experienced and were part of certain negotiations which in the end led to the formation of AMAS. For them, when AMAS was announced, it was experienced as a more public form of already acknowledged inside processes. As they described “Of course, we have been sharp-eyed from the start, after this discussion was not the first time” (Interview 3). The only difference in the case of AMAS was that the discourse was not led within AMS, but publicly.

With the last example, it was clear that previous knowledge of developments inside the AMS was the cause for one organisation to go against AMAS when it was announced. However, this is only a direct example of how previous knowledge of the company shaped the way the first reactions towards the system emerged.

One interviewee in proximity to long-term unemployed people described their reaction to first hearing about AMS as: “astonishment, and at the same time ‘aha there again is something’” (Interview 5). In this way, while the technology was understood as new, the concept of integrating new measures within the field of the Austrian labour market was for some, experienced as familiar. For interviewees with a bigger connection to jobless people, it was experienced as one of many inventions, interventions, or projects that for a long time were perceived as suppressing the real needs of job-seekers. This relation and experiences to previous new programs or technologies of the AMS led to scepticism among the jobless groups. Something similar was seen in the GM controversy discussed by Grove-White et al. (2000). As they showed, “positive or negative expectations of new products and technologies tended to be grounded in previous direct or indirect personal experience of the promoters in question” (Grove-White et al., 2000, p. 23). As the source (the AMS) was seen as not trustworthy, the actors relied on the interpretation of the topic through trusted sources (labour market agency groups). These networks then were one of the main reasons for the building of certain imaginaries and co-produced their understanding of the technology. Information on the topic and potential information networks thus also were co-produced.

While all these points seem to divert from the expected research on imaginaries, they still offer a valuable ground from which this research can go forward. It shows, how people first engaged with the topic. It shows, that a lack of concrete information was one of the reasons that heterogenic “knowledge spaces” (Law, 2017, p. 47) were built. And, as the most important part of this section, that at the start, there was no direct information of what the system really was. This will later be important, as this non-knowledge had severe repercussions on how imaginaries formed. The next chapter will show how these first contact points were then used to create shared imaginaries of the technologies, but also how these efforts of gathering information were essential and how and why imaginaries were built in the first place.

The algorithmic system of AMAS did not emerge from a clean slate but was from the start embedded and perceived in a bigger sociotechnical infrastructure. The knowledge of this connection, combined with the non-knowledge of what the system might be, led many actors to engage in the topic as a means of risk assessment.

4.1.2 Great Expectations - The promissory technology

In this chapter, I will show how these initial pieces of information about the technology were seen and understood as promises. They shaped the discourse and imaginaries, especially since many interviewees later saw these promises as broken, which in turn again shaped their actions towards the system. These promises, thus, were performative and co-produced certain realities and actions. These initial pieces of information, thus can be seen as imaginaries the AMS used to promote their technology, which then lead to counter-imaginaries on the publics' side. Through this, it will give more insight into which background information were used by the interviewees to better understand the system.

In this section, I will use different authors and their understanding of technoscientific promises as the main basis for the argument I will build up. What is important in this kind of analysis, again, is to point out that these experiences were told in retrospect. Thus, what was perceived as promised, and later as broken, could only be understood as such while looking back from a time, when the reality of the system was disclosed. This phase of the discourse can also be understood as the phase of "innovation communication" (Plesner & Horst, 2013, p. 1115), a communication where support for the technology is tried to be generated (Horst et al., 2017).

In the following discussion, I will explain the performativity the expectations of AMAS had, and how they were co-produced through counter-imaginaries on the technology by the AMS.

The reason for this to happen was that the necessities for a promise were breached, thus rejecting both the AMS' imaginaries and promises.

The solution to a problem

After the initial rumour phase, and when some actors already settled on their role in the controversy, the first official information by the AMS was released. For many interviewees, AMAS was announced as something new, something which would be better for processing and distributing big amounts of data, compared to case-workers. As one interviewee recounted, the system was sold as a "great innovative product. Packed with Artificial Intelligence" (Interview 3) adding: "In the initial phase, I thought, that it really is a learning, self-learning, self-adapting formation, black box" (Interview 3). Another one talked about their first time hearing of AMAS through a news report where the AMS board director at first presented "that there would be such a great thing [i.e. AMAS]" (Interview 6). However, as they experienced it, "he [bet] a little bit on the algorithm hype [in his presentation]" (Interview 6). Other reactions from interviewees were similar, as they experienced the first news as a rather vague recounting of what the technology really would be like ranging from terms like AI, algorithm and decision-support system. By claiming what the technology could be, a certain future got enacted, and through that, the first glimpses of the AMS' imaginaries of their technology.

But, as "[expectations] change over time in response and adaptation to new conditions or emergent problems" (Borup et al., 2006, p. 286), so did the way the interviewees imagined AMAS. One interviewee experienced the promised version of the technology compared to the actual AMS as more nuanced. On the question of whether they thought that the previous claims would have been better than the end product,

they answered: “No, not better. Subtle? So closer to the idea [of] machine learning. Closer to the idea of artificial intelligence. Closer to this idea. And what it turned out to be, that it was more [of a] grouping thing.” (Interview 6)

This account shows that not only disappointment about greater promises occurred, but also that oftentimes, something different was expected.

Looking at the sociology of technoscientific promises, it is important to look at the problem they try to solve, as “[t]he first step in the production of a promise is problematization.” (Joly, 2010, para. 14). With the first announcement of AMAS, it was claimed that the technology would be used only as a supportive measure for the case-workers. It was reasoned that AMAS would be used for efficiency reasons within the company.

The “mobilisation of resources [...] requires that large audiences in heterogeneous public arenas be convinced” (Joly, 2010, para. 7). In the case of AMAS, the AMS acted as “promise entrepreneurs” (Joly & Renard, 2021, p. 900), which means that they were steering the expectations as being necessary, and thus trying to convince the different audiences in the discourse. Here, however, the first problem in the AMS’ outer communication arose.

In this case, where the effect of AMAS was first communicated, some interviewees felt that they were not the main audience of the AMS claims. It is interesting to note how often the interviewees referred to these pieces of information as *sold* to the public. The interviewees did not see themselves as the target audience of the promoted technology. This in turn also resulted in the system not being experienced as a solution to a problem, as the AMS stated in their communication about its usage, but as a product whose potential inclusion into its system needed to convince publics. As for the sociology of technoscientific promises, the first necessity, the solution to a problem, thus fell flat.

There was no real process of negotiation. At least not in the realm of affected publics by the technology, i.e. job-seekers. One job-seeker experienced the communication about the systems function: “So it was about marketing this thing to the public and not that the [job-seekers] get something out of it. The affected.” (Interview 6). Science communication also produces the publics it addresses (Felt & Davies, 2020). These instances of job-seekers feeling disappointed in being excluded from being addressed by a technology which might affect them shows, that they seemed not to be part of the AMS’ performance of actors to be engaged with. The side of the AMS, which formulated the techno-scientific promises can be understood as “the future makers” (Joly & Renard, 2021, p. 900) here. The assumed publics of the AMS’ communication can be understood as “the future takers” (Joly & Renard, 2021, p. 900). As technoscientific promises “generally have to convince wider audiences” (Joly, 2010, para. 8), and with the AMS being part of a public service, it might be understandable, that its communication was directed towards the broad population. However, algorithms, due to their multiplicity, can also be communicated towards more, diverse publics in different settings (Gillespie, 2014).

What this shows is that AMAS was promoted as a solution to a problem, which for some, was not a problem, while for others, it was not the correct solution. In this instance, the promise and the AMS’ imaginaries were rejected. This led to speculations on the system, as it was feared that the automatisa-

of certain sectors inside the AMS would leave out the human component in consultation processes. The problem here was, that it was not clear, or not properly communicated, how (sometimes even if) case-workers would manage the sorting of the system. Combined with sparse knowledge of how the grouping process would work, meaning who would be allocated to which group and why, in turn, led many interviewees to at least doubt a useful implementation of the system into the AMS.

Credibility

After activist organisations contacted the AMS to find out more about the system, they experienced a complete lack of transparency and outer communication from the company. A sentiment and experience, shared by all the interviewees. As one interviewee said, “If they [...] deny communication [with us], then I have to assume that something might not be in order” (Interview 7). Similar reactions can specifically be seen in comparison to other controversies, as “people appeared to interpret information in the context of what they knew about its assumed source.” (Grove-White et al., 2000, p. 27). The assumed source, in this context, then was not only tainted due to the interviewees' previous experiences with the company but also because, for some, it seemed like neither the AMS board knew what the system was. As one interviewee recounts:

“And my perception always was, that the AMS board director, that is, his reaction was, that nobody really understands what [they] are doing here. And I thought that this was annoying, because I thought, if nobody understands it, then explain it so everybody can understand it.” (Interview 4)

In communicating what AMAS is, and how it should be used, the AMS became the main source of distrust. Because “the credibility of promises is [...] both a matter of credit and a matter of rhetoric” (Joly, 2010, para. 13), the second category of technoscientific promises, credibility, also was not fulfilled. More than that, it also shaped the way the AMS was perceived by some of the interviewees. Claims of technoscientific things need to be credible to hold up (Joly, 2010). In the context of algorithmic systems, if this fails or if the information provider does not give more explanations, the legitimacy of the system will be questioned (Gillespie, 2014). The promissory technology AMAS thus was rejected.

One interviewee used a specific example of how they experienced those promises: “With medicine, we have mandatory leaflets, where also it is written ‘please look out for side effects’. That is sadly not the case in selling IT” (Interview 2). This quote gives a good example of how the expectations got built up, and why they failed. How the technology functioned never was at the forefront of the initial discussions. Only the (positive) effects at first were important. The moment these consequences were articulated, the promissory technology, and its inflated expectations, collided with reality. Claims about new technology, as was the case with AMAS, may concern actors who might be affected by it (Joly & Renard, 2021). This can be especially seen in the case of AMAS. Its potential inclusion was seen as threatening. This is why the promise was quickly rejected by its users. As an interviewee stated, the first example of the function of AMAS the AMS released was understood as problematic, thus tainted further expectations:

“according to the AMS page, [they] only wanted to give one example of how [AMAS] functioned and this was used as that example and that, it soon struck [me] as discriminating because the algorithm was clever, like the AMS case-workers also always were, that foreign names, or the wrong gender, or wrong age are somehow really not good for being liked by the first labour market.” (Interview 5)

What the technology was, and how it would have been used, was different from the promissory technology. The promissory technology was connected to larger promises about machine-learning systems, and the positive aspects of automatised processes. These were the backdrops on which the AMS built their imaginaries. As it turned out, however, the promissory technology only showed what AMAS was not. Through all these accounts, one can see that in its initial phase, the AMS performed a future through AMAS, which in retrospect could not fulfil itself. This future was performed in the realm of different other imaginaries, such as AI. In its initial phase, the AMS used these imaginaries to co-produce an image of a system, which in the end could not fulfil itself. This image, however, was adopted by the interviewees in their way to build counter-imaginaries on AMAS, as can be seen in how they connected, and criticised the system.

4.1.3 How algorithms are seen - Simplicity, Artificial Intelligence and human-computer interaction

As the section before showed, understanding and imagining AMAS hinged on expectations of both algorithmic systems and AI. How the interviewees understood algorithmic systems, it is thus important to understand which definition their algorithmic imaginaries are connected to. As one stated, “[a]lgorithm is that, when a programmer is too lazy to explain [it]” (Interview 6), showing how the term itself can be seen as an artificial explanation for something more complex. Another one gave an interesting example, “simply, a cooking recipe is an algorithm too, isn’t it?” (Interview 4).

Overall, algorithms were always understood as simple technology, running on simple computers. “And the algorithm is, so to speak, a mechanism for collecting data, upgrading, apprehending, merging, and putting that together to find conclusions. What happens from that is what we, so to speak, thought ahead.” (Interview 2) An algorithmic system, thus, is only the mechanised calculation the programmers had intended. What is interesting in this understanding however is how much it hinges on human intervention. One described how they understood the function of algorithmic systems:

“if you have a programming, [...] you have to [tell] the computer, who is stupid in the first place if you don’t say to him run from A to B, he does not do anything. This means, what you do with programming, is that you learn the computer to go from A to B. But he now only runs from A to B, as you defined it before. You say [...] you start at A, then the computer asks where is A? Otherwise he just runs. [...] And that is similar to the AMS algorithm. You have to preset really clear decisions.”

(Interview 7)

This understanding of *an* algorithm as simple machination with a reliance on human intervention can then be transferred to how the interviewees understood AMAS. As one interviewee said: “I think that the technology [of the AMAS] is not really sophisticated” (Interview 4). Through this example, one can see how the failed expectations through the announcement later co-produced a criticism of the technology as *simple*. This later also played a role in activism and informational campaigns. After the initial reaction of fear, confusion and incomprehension, one interviewee wanted to show that the system was “technological frippery” (Interview 6), thus showcasing his distrust towards a functional and benevolent usage of the system. Frippery, in the interviewee's case, was the result of the clash between expectations and reality. Understanding the system as such, and thus in consequence as faulty, led the interviewee to engage in the topic through a means of a solo informational campaign.

Criticising AMAS as frippery, broken technology, or unfulfilled promises often hinges on two different fields of other imaginaries. First, it uses the interviewees' understanding of algorithmic systems. In this case, seeing them as simple. Second, it compares it to their imaginaries of Artificial Intelligence, using this notion to point out why it is better and how. Both, in turn, created and influenced the imaginaries the interviewees had on AMAS. The relationship between AI and algorithmic systems was understood as two sides of the same coin. However, both of them were understood as functioning differently. An AI, for most interviewees, was understood as the more sophisticated version of an algorithm. By comparing the algorithmic function of AMAS to AI, the former was seen as not reaching the potential the latter could.

Because the technology was seen as an algorithm, and thus as a simple tool, it was understood as hinging on humans, which in themselves, were seen as flawed. A solution, then, for many, was to argue that a technology, in this case, AI, which is more detached from human intervention, could be better. Of course, using an AI for the task of segmenting job-seekers would “still bring up the question, who defines the goals” (Interview 5), as one interviewee stated.

In this section, I showed the first glimpses of how imaginaries on AMAS and algorithmic systems influenced each other. This then also shows, on which background information imaginaries of AMAS hinged upon. How the system was at first perceived shaped the way the interviewees reacted towards it. Knowledge and imaginaries of AI and algorithmic systems co-produced imaginaries on AMAS. By likening the former to the latter, incorporating the diffusion and uncertainties which was the AMS' communication, and distancing themselves from their imaginaries, the first counter-imaginaries of the system were shaped.

4.1.4 Interim Results - How the initial phase of the announcement shaped the way, AMAS was experienced

The initial phase of releasing pieces of information on AMAS is an interesting case for the co-protectionist stance, as it shows how the institution itself (AMS) shaped the way knowledge on the system was built, and how this knowledge, in turn, influenced reactions (i.e. research, activism). It was the subject of discourse, and at the same time shaped the discourse through its (non-)communication. Be it through previous bad experiences with the company, inside information, the lack of public communication of the system, the discourse - of course - did not come out of a clean slate. To succeed, the technology providers initially relied on the building of expectations. When the AMS first communicated the technology, they tried to mobilise their audiences through promises. These statements, which grew to expectations and promises, contained a “script” (van Lente & Rip, 1998). A script which contained what the technology should be, but also which other imaginaries it hinged on (e.g. AI) and which audiences should be addressed. However, “the wider the claims of the narrative related to an innovation, the stronger the counter-narrative” (Joly, 2010, para. 7). This leads to different visions of the future being contested. The AMS’ imaginaries thus produced counter-imaginaries and narratives in publics, which either felt threatened by the technology, were disappointed in how the technology turned out to be in reality, or already were against the AMS’ workings. Because of these, both how the company AMS was perceived, as well as how their imaginaries were communicated, were important backgrounds in the interviewees building of imaginaries concerning AMAS.

The communication, or at least how the interviewees perceived it, made several things: first, it shaped the way AMAS was understood and experienced. At the start, different, heterogenic “knowledge spaces” (Law, 2017, p. 47) emerged out of the first announcement. They were, at first cluttered and unorganised, but due to them wanting to find out more, networks were built and knowledge-spaces were formed. Thus, knowing spaces and the discourse on AMAS co-produced each other. While these knowledge-spaces were heterogeneous, in the view of the interviewees, in the end, there were two distinct knowledge-space: the AMS, and the *activists*. While through the interviews, it was understood that even though at first these knowledge spaces informed each other, there were several splits on the side of the *activists* as the discourse progressed.

These networks, in their communication, used their understanding and criticism of the system to first solidify a vague form of AMAS. It is noteworthy how important this first phase for the building of the imaginaries is. As later examples will show, the more defined imaginaries still rely on this first vague form.

It shows how at this phase, different imaginaries collided, which for the interviewees made their imaginaries stronger. Their belief in how the system should look, but also their fear of how it might look, performed an amalgamation of a vision of AMAS. This vision, in turn, was performative for their initial reaction, both out of uncertainty of what AMAS is in reality and expectations of what it could be. For interviewees in job-seekers' proximity, this first communication also was performative in as much as they perceived their group to be excluded from the discourse. This brought resistance because first, the technology was understood as probably threatening their livelihood, but also because they did not feel

addressed by the AMS' announcements. Technological resistance needs a base for support (Nelkin, 1995). This in AMAS' case, came to be through people feeling threatened by the technology, and people who thought that the technology was against their values.

As an interesting example of how activism looked, one interviewee recounted a shared effort among the job-seekers, to find out what AMAS *looked* like. In the short time, AMAS was enrolled in a couple of AMS departments, job-seekers tried to find out what was shown on the case-workers monitor. At this time, it was unclear, as it sometimes still is, what the output of *the* algorithm would be. What they did was, sometimes stubbornly, ask the case-workers to show them their monitors. In some cases, the case-worker consented and showed them the screen. What they saw was only a number. Their score, so to speak.

While such actions, in the end, were described as effortless, it still shows one important facet of the co-productive power of AMAS. Non-knowledge was the starting point for the interviewees to engage with the topic, thus, they drew comparisons with technologies they were familiar with. In the case of AMAS, both engagement with and activism against the topic and the system were co-produced through the information, or lack thereof, given to them.

Thus, in understanding the algorithmic and sociotechnical imaginaries built around AMAS, the initial phase is important to understand *how* the actors formed, *what* information was put out there and how it got transformed, as well as on *which* relation to other things the imaginaries got formed.

4.2 The “problem” of the algorithm

Criticising the technology and its outcome is often also related to how participants expected a better technology to look. It is an important part of understanding imaginaries through criticism, as they show what future the interviewees would prefer to be performed. Criticising then, also has a performative character, because it shows how the technology can be otherwise. Criticism in these chapters is understood as a necessary means of shaping imaginaries in a certain way. Imaginaries, as visions of futures, can also highlight potential risks and problems in innovation processes (Jasanoff & Kim, 2009). Thus, they also might be used in performing visions of certain futures by highlighting and criticising problems of colliding counter-imaginaries. Criticism then, can be used to both understand the background information the interviewees drew upon from to create their imaginaries, but also have an insight into how they thought the consequences of the system to be, thus helping in answering the sub-questions of this thesis.

In the case of AMAS, criticism can be distributed to two distinct strands. First, criticism of the technology, which shines a light on how it could be better and how an ideal version of the system would be performed. Second, criticism of the consequences, which will highlight how it could be used better.

4.2.1 Criticising AMAS: Biased Code

One of the main points of criticism for the interviewees was, what they called, biased code. The segmentation AMAS did would disadvantage some people over others. As one said, the problem was, “that the existing bias is continued” (Interview 1). This topic often came up when talking about the problems of AMAS, as well as decision-making systems overall. Biased programming meant that many interviewees

expected that already established biases towards certain job-seekers, which were prevalent in the normal AMS decisions, were translated into the system. It even was not seen as a singular problem of AMAS, but algorithmic systems overall, as one interviewee stated “every algorithm is basically a bias of the programmer embedded in code” (Interview 2). As another one said: “Algorithms originate from men. Men are biased, in whatever respect. So, what they produce is also always biased.” (Interview 6). Asked about how such a problem could be resolved, the sentiment that “I believe [...] if the algorithm is created by old white men, [the algorithm] treats everything else as bad” (Interview 1) often occurred. The old white man as a programmer as the reason behind biased code were often recounted when stating the problems behind the algorithmic system. The old white man in these instances can be seen as an external source in the algorithms' making. As a source, which assuredly already brings with themselves certain biases, and translates them into the system. While the term itself can be taken at face value, it is interesting to think of it more as a stand-in for an experienced past of discriminatory problems. It shows aversion towards repeating biases and problems of the past leading into the future. However, understanding the *old white man* in its literal form, means that biases come through a singular force, which continues their oftentimes subconscious or unconscious biases into the system. One interviewee, for example, used this criticism as an example for automatised facial recognition software, to reflect it to AMAS:

“We know for example, that facial recognition functions well for white men, for coloured [sic] it does not function as good, [not] because the camera can distinguish better between white skin colour and black skin colour, but because white men programmed it.” (Interview 2)

A solution to this problem, many interviewees shared, would be a diverse team of programmers: “If I have a diverse Team relating to disabilities, gender, ethnics, all factors if I have a diverse team that develops this algorithm, then the potential bias is as low as possible.” (Interview 1). A heterogeneous and diverse set of programmers would then be the solution against the perceived singular *old white man* as a source for problems.

Bias towards certain groups was already seen as a problem within the AMS long before AMAS' implementation. This notion was shared by many. What this means, in turn, is that not only the programmer is blamed for biased programming, but that bias is, and was, an already prevalent structural problem in the working of the AMS. The problem of biased code thus can be seen through two different sources. For one, it comes from programmers who transfer their biases and opinions into the code. Often in the interviews, programmers were understood as secluded from the companies they work with. Integrating their own biases and assumptions inside the systems. The same was understood in the case of AMAS' workings. This, in turn, also meant that in the discussion of *who to blame* for biased code, the interviewees both pointed at the company itself, which integrated their own biases and workings throughout the years of classification into the system, but also the people directly, and assumed to be detached, working on it. This means, that next to the *old white male* as a problem for biases, the bias was understood as an already prevalent institutional and structural problem of the AMS itself. However, in these sources what is not blamed

for *having* bias or creating bias, is AMAS. The system itself was only seen as “continuing the bias” (Interview 2). Algorithmic decisions, thus, were not understood by the interviewees as coming from a clean slate but were always connected to human decisions and interventions which influenced its perceived *neutrality*.

The problem with AMAS, many identified and referred to, was that it hinges too much on human interference, choices, and flaws. One interviewee even identified their main criticism of AMAS, “that it is human-made”(Interview 6). For them, using an AI instead of a simple algorithmic system, thus, would at least eliminate some of the flaws of the system. This also can be seen when interviewees talked about the biggest differences between man and machine. As one stated, a reason for using automation in the first place instead of humans is “that the computer can quickly calculate something, for which the human would take longer” (Interview 1). This meant that calculative power was used as reasoning for showing that algorithms were better than humans because they were quicker. This, in turn also makes it more understandable that AI always was highlighted compared to *simple* algorithmic systems, as they have a larger capacity for more calculative power, and thus, are quicker.

What became centre stage after asking the question of what should be changed about the system, was that the participant often said that making it more sophisticated, i.e. in the sense of an AI, could improve the system. Criticism towards the system was not due to technophobia or -scepticism, but the contrary. The primitive technical nature of the system was understood as its main flaw. As “public choices are not for or against technology but for or against particularly imagined forms of life” (Felt, 2015, p. 121), it seems like the main reason for criticising bias *in* the machine was the translation process of bias already prevalent in human and organisational decision-making into a machine. Of course, as research shows, algorithmic systems are not free from human influences (Diakopoulos, 2014) which starts with the human selection of criteria and categories the system uses, to how it is programmed to do things.

One of the main criticisms, thus, it turns out, was not about the code itself, even if it was stated as such, but about the technology repeating biases which were perceived as prevalent in society. The criticism was not directly pointed at the AMS but was criticism that was adapted from previous experiences with similar technology which were perceived as either unfair or biased. The criticism was therefore built upon this knowledge. What the interviewees wanted was a *value-free* technology. While such algorithms, by definition, can not exist (Diakopoulos, 2014; Bucher, 2018; Seaver, 2019), the wish for a value-free technology relates to Austria's technopolitical culture. Felt et al (2010) showed, that the inscription of a new technology in Austria meant, that it was measured with an ideal version of it. If this script is not accepted, the technology might get rejected.

This process especially, can be seen here, as most of the criticism of the code comes through measuring it *against* human bias and thus free from human interference. The main criticism, it turns out, was seeing the process of translating human prerequisites into the programming as faulty. This is an interesting point, as it opens a dichotomy between human decision and technical calculation. It also highlights that AMAS is understood as a neutral tool, which is created and used by humans, who are expected to be influenced by their judgement.

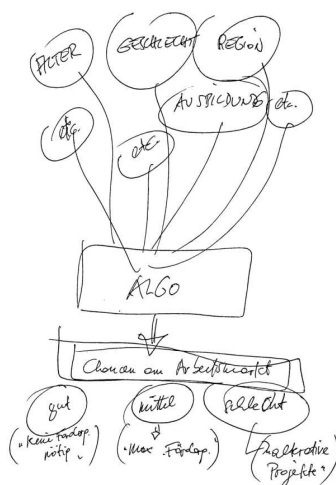
4.2.2 Criticising AMAS: Insufficient Data

The second main principle for criticising the programming was the assumption that the data *the* algorithm worked with, was insufficient for making real-time judgements on job-seekers. To understand this notion better, at first, it has to be understood which data AMAS uses according to the interviewees.

In this case, all the interviewees agreed with each other, that most of the data used came from the AMS internally. “The AMS gathers all the data [...] from every job-seeker that registers with them.” (Interview 4) The question of how the AMS acquired this data, was harder to answer. As one interviewee recounted, they tried “via the instrument of the law of disclosure obligation, therefore so to say as citizens, [...] which data [...] basis, or where the data comes from, for what they will be used to find out what. Because basically we officially did not know anything.” (Interview 5)

The notion that transparency as a means of checks and balances towards automated systems often came up when talking about the non-knowledge of both the origin, and usage, of data. “It is not traceable what comes in, what comes out” (Interview 4). While transparency might often not be the solution for problems in algorithmic systems (Diakopoulos, 2014), the interviewees related the problem of transparency more with agency and trust. Because they did not know which data the systems used how, the output of the system was harder to understand and also gave away agency from the people whose data was used (i.e. job-seekers) because they could not intervene. It especially influenced how the interviewees estimated the reliability of the output through the data used, with one saying: “What happens there, on the job platform are strokes of luck. That’s all that is.” (Interview 3).

On the point of origin of the data, only one interviewee gave a guess where they expected all the data to come from: “on the one side from registry data and on the other side through self-disclosure?” (Interview 1). Whatever the origin of the data used, what nearly all the interviewees could answer was which data was used. Many examples were given, like “university degrees, education, life situation, financial situation, preferences, regions” (Interview 4). Overall, there was unity in that the data used was mostly hard factors rather than soft factors.



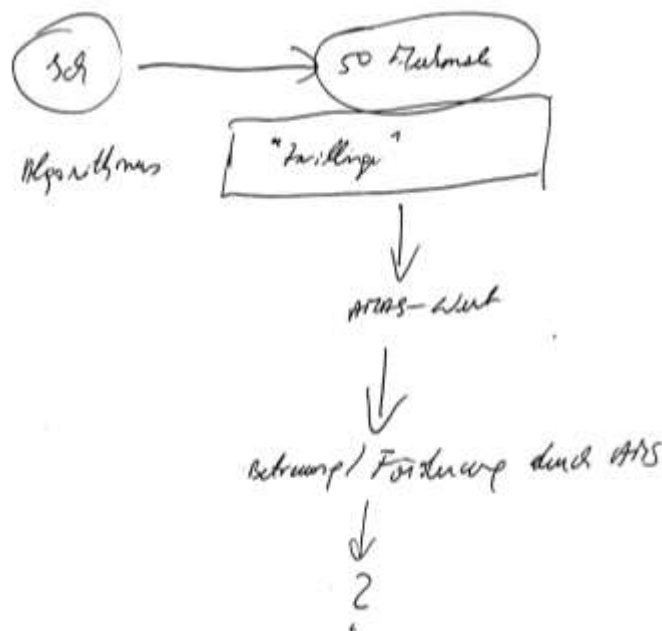
Rich Picture A



Rich Picture B

To better visualise the expected data usage, two rich pictures might give a good impression of how the interviewees understood the process to look like. As can be seen in both rich-picture A and B, certain distinct attributes are fed into the algorithm. What rich-picture B shows well is the understanding that the data comes into a funnel which then transports it somewhere. As the interviewee drew and explained, there is no real weighting of the different attributes which get put into the algorithmic processing. In this context, the term *throwing* was often mentioned. As one interviewee explained, “One throws in some old numbers” (Interview 3). The word throwing used in this context could be understood as the interviewee feeling that oftentimes, there is no thought given to which data is used and why. A sentiment that was also shared by other interviewees. This shows that many interviewees understood the data collection process as an unbalanced one.

While the data usage and its origins were often mentioned as the reason for expected faulty results from AMAS, the main reason for criticising the system’s data usage came from the topic of historical data, or, the lack thereof.



Rich Picture C

As the last quote shows, the interviewee believed the data used by AMAS to be old. A sentiment, which often came up in reasoning about the (in)validity of AMAS’ rulings. Profiling systems often use historical data about the employment market to make their assessments on the employability of job-seekers. This historical data means that different factors, like how job-seekers with similar attributes, so-called twins, fared in finding a job (as can be seen in Rich Picture C). This assessment then is used in turn, to find suitable strategies for the job-seeker (i.e. consultation, training, etc.). A problem with these digital twins is, that it is a deliberate search for correlations, which in the end can not thoroughly paint a full picture of

the *usee* (Williams et al., 2018), and are prone to false negative or false positive results (Diakopoulos, 2014). Twinning of older data thus raises issues as the data is and can not be current, as some developments in the employment market need time to settle. Because of this, oftentimes, the historical data which is used comes from several years prior. The twin in the model, thus, is a mere phantom of the past, which is used to assess present job-seekers' ability to integrate into a future job market, which only existed in the past. This past data then would further influence real future data, such as new entering job-seekers, and thus would continue its influence.

A problem, for many interviewees, especially because of the current times: “2020 was a break, also in the employment market [...] we are talking about a completely different labour market” (Interview 7) one interviewee stated, later adding: “You can not compare [the data] anymore, because the data used [for AMAS] comes from before 2019” (Interview 7).

Another said: “It is no use for me, that the result of the algorithm comes from three years before, where I had an economic boom” (Interview 3). This meant that many interviewees criticised the usability of historical data, as both the pandemic as well as the Russian-Ukrainian war led to many changes inside it.

For many, the data used by AMAS was too old to make a valuable decision on the labour market and job-seekers' chances in it. The sentiment that better use of historical data might result in better outcomes of the calculation by the algorithmic system reminds of Klaus Hoeyer's (2019) concept of promissory data. If the data would be good enough, accountability in the decision-making process would be more believable. However, unlike in Hoeyer's paper, in the case of AMAS, the data which is accessible for the system is understood as good enough. The main reason for the criticism is how it is used.

As one interviewee stated, “the data situation in Austria is nearly sensational” (Interview 3), adding “[t]he AMS retrieves overnight who is currently job-less, job-seeking, who is an apprenticeship seeker” (Interview 3). Highlighting a good data situation in Austria in contrast to the criticism that the AMS uses data which is too old to give important assessment shows again, that the blame is shifted towards how AMAS is programmed, or in this case, which data it uses. The nature of the data is conceived as out of date, which frames how the interviewees perceived their nature. As data can not be *raw* (Kitchin & Lauriault, 2014) it shows that the interviewees understand this. However, through highlighting good data situation there also shimmers a certain sense of the promise of data objectivity through it. The wish, which was veiled in criticising data thus was, that *all* data that can be and should be used. It was expected that such a use would then free the data from human interference and choice. For many, thus, the solution to shift around this data problem would be a more sophisticated system, which could calculate real-time data more quickly.



Rich Picture - Algomat

Interlude: Experiencing data assemblages

In asking one interviewee about their approach to visualising AMAS, they pointed to a specific machine they conceptualised. In their campaign to both explain the function of AMAS to the public and get people to talk about their experiences and thoughts on the system, the campaign “Stop den AMS Algorithmus” led by Epicenter.Work used an interesting machine, called Algomat. This machine, built like a one-armed bandit, or a slot machine, was used in upper Austria as a means of symbolising the function of AMAS. The machine was placed in front of several AMS offices. Job-seekers as well as case-workers were then asked to use the machine for themselves to *show* them how AMAS works.



Algomat Input

In operating the system, the user first chooses their data, presented through several flip-switches. This either-or input - either Austrian or a foreigner; either male or female; etc. - then gets processed in the machine. Through a display, akin to the one of a slot machine, the different slots move for a while and then stop, giving the user their job chances in the AMS. Using the same grouping as the AMS, the *player* would then find one of three different groups as output: *good chances*, *medium chances* and *bad chances*. This machine and its output were modelled through reverse engineering what was known about the AMS’ data usage, and how it affected in which of the three groups the individual would land.

While I also gave this machine a spin, answering truthfully, the output was good chances, i.e. the upper group. What was interesting, however, was that when I changed only one parameter - an expensive residential area to a cheap residential area, the output completely changed, showing me bad chances, i.e. the lowest group.

Understanding AMAS as some kind of slot- or gambling machine, however, is only the first layer. As the Algomat shows, only on the surface it seems like chance or in this case, luck is determined through coincidence. In the background, the data input determines the chances, making the output a deliberate calculation process which is far removed from sheer luck. Through directly inputting the data, one experiences a slimmed-down version of AMAS' data assemblages themselves. Data assemblages are sociotechnical systems which "frame what and how data are produced and to what ends they are employed, but they are themselves organised and managed to produce such data" (Kitchin, 2014, p. 25). In this sense, what the Algomat is and shows is a direct interface of those assemblages. The direct input through flip-switches always brings to mind where and how this data was chosen. While data assemblages are always in transformation (Kitchin & Laurialt, 2014), Algomat's static nature also directly shows the criticised data usage directly. The inputs are directly translated into outputs, without any adjusting to real-time situations. Through the shape of a gambling machine, it becomes a monolith. This, in turn, makes the Algomat in more than one way a good representation of the foremost mentioned criticism of the data usage of AMAS and also connects it to a visual imaginary.

The calculation process and its output create an air of objectivity, the data input and the choice between two different parameters, oftentimes make it out to be unreasonable. It shows that objectivity, in AMAS' case, is just performed. As demonstrated before, only changing the parameter from an expensive residential area to a cheap one, completely changed the Algomat's assessment of employability.

The Algomat can be understood as a citizen science project and as such, again points back towards the performative character of the discourse. Due to not knowing what the AMAS is and what it would do, the Algomat was created as a representational model of the technology. It was used for participants to see, and in a certain way, the decisions AMAS makes. The Algomat, as an object, was directly co-produced through non-knowledge about what AMAS *is*.

Understanding the system as a *sophisticated* gambling machine, which only on the outside seems to generate random outlets, but on the inside is a calculative machine, is however vastly connected to previous imaginaries. It shows that AMAS in itself is more than a *simple* technology, but due to its outer appearance and its usage inside the institution AMS, it loses much of its sophistication, in the end, *gambling* with the lives of different job-seekers.

4.2.3 Critique on the consequences

In criticising the consequences the usage of an automated profiling system would raise, two main strands could be identified. First, especially through its segmentation process, the use of AMAS might influence an uneven distribution of funds, and second, the system would influence the judgements made by the case-workers negatively.

There were first expectations that the system might influence the funding process of the AMS. As it turned out, this, to some degree, proved to be right. The effect of AMAS in use would have been, that job-seekers would be assigned into one of three groups according to their chances, or *employability*, on the job market. Which group the job-seeker would fall in, then would have influenced how much funding the individual got distributed to. The group with average chances in the job market would get funded the most. The problem that would arise from this, many interviewees stated, is that such a segmentation would leave out the often most vulnerable group, the ones with the lowest chances, and would make it even harder for them to find a place in the labour market. In irony, one interviewee described the process as: “[t]he middle sector are the half-lazy. We make them nice again. And we forget the real lazies. Or rather we make other projects with them, instead of direct support.” (Interview 5)

However, this segmentation also was used by the AMS before planning to implement AMAS. As one interviewee recalled, “That is how the AMS worked long before, with three categories” (Interview 4). What would have changed through AMAS, however, was that this segmentation would be done by a machine, turning job-seekers into data and sorting them into one of these groups. This aspect of automatisisation was seen as problematic, mostly because of two different reasons.

The belief was that the machine itself would be used as an objective source of validation. This stems from the previously made point on its supposed neutrality, as the outcome of AMAS would be seen only as a mechanised calculative process. This, in turn, would be more believable for the case-workers, as some form of “the promise of algorithmic objectivity” (Gillespie, 2014, p. 169). Because the system is neutral, and only a tool in itself, it would be impartial, thus objective in its operation. However, as this discussion should have shown, objectivity is not possible in a neutral technology, if the prerequisite for neutral handling (i.e. no bias, complete data) is not given, nor possible. This is because any algorithm needs to first have certain metrics, categories, data and measures which then will translate the output data according to them (Diakopoulos, 2014). In this case, the output then defines the ranking of job-seekers and where it places them.

The other point of criticising the automatisisation overall was, that it would mean a loss of human contact in the consultation setting. Some interviewees feared that automatisisation would take away human judgement. People, the interviewees agreed, could make a more nuanced judgement on the job-seekers. Especially since, “[t]he human is a contradictory, irrational being” (Interview 3) making it harder for a machine such as AMAS to judge them only on hard skills. Different factors, which can not be translated into data used by *the* algorithm could be better seen by case-workers. As one interviewee said, “I believe the problem is simply that one can only check hard skills through the data situation. In contrast to soft skills, which one has to establish through human care and human contact” (Interview 7).

Algorithmic decision-making is understood faulty, because it mechanises human judgement, and establishes claims of algorithmic objectivity. As one interviewee stated: “As well as the assignment, where are the borders? With which probabilities, labour market opportunities, does one come into the top or lower segment? This is more or less absurdly made.” (Interview 3). The problem here, too, was that this segmentation was seen as “stiff, mechanical segmentation” (Interview 3).

While case-workers, or people working as users on algorithmic systems, are not immune to the influence of algorithmic choices (Diakopoulos, 2014), this criticism highlights one important distinction: Trust in humans. The case of criticising AMAS then becomes more about the distinction between trust in human decision, as more flexible and good-meaning, and distrust of mechanical decision-making.

The consequences of the usage of AMAS thus, were that it would manifest certain problems in the segmentation process, and would take away any leeway and reflexivity necessary in decision-making processes. AMAS then would stabilise certain problems and hide them behind the veil of objectivity. Understanding the criticism through this aspect also means that AMAS’ operation is understood, again, as static. It is seen as manifesting certain problems from the past and building an infrastructure which is nearly immune to change. It becomes a reflection of perceived past problems. In establishing a vision of the future, the interviewees thus saw AMAS as an embodiment of past scripts, continuing towards the future.

4.2.4 Interim Results - Building imaginaries through criticism

Criticising AMAS, throughout the interviews, was the predominant way the interviewees enacted the technology. In co-producing algorithmic imaginaries of AMAS, the information given to the interviewees formed the first shape of how they expected the technology to be, contrasting it with how it should not be. In criticising, it was possible to gain more knowledge for answering the sub questions of the *background information* and the *consequences* of the system alike.

Oftentimes one of the main complaints was that its function hinged on humans. Be it either through the different classifications made on employability inside the AMS before AMAS was released, the data *the* algorithm needs to process its programming, or through the case-workers making decisions which could be influenced by it. AMAS, in itself, was often described by interviewees as a rather primitive system.

According to the interviewees, the machine is simple, thus it is on the same level as case-workers. Because of that, AMAS is as flawed as humans. However, if AMAS would be better, in this case operating as AI, it would be detached from human intervention. But this would again leave out the human contact and empathy which was highlighted throughout the interviews. In a way, this pointing towards the human component and blaming their integration reminds of Akrich’s (1992) concept of inscription. The previous groupings, biases and problems get inscribed into the system. While the choices at first were made by humans (either programmers or case-workers) they get ingrained into how AMAS works. Through that, these decisions were seen as solidified in technology. Through that, the system became immune, or at least not prone to change. This might also be the reason why an AI, and thus a further detachment from human interaction, might be seen as a suitable solution for some of the problems behind AMAS. An AI was then

understood as flexible due to its constant nature of updating itself. It then highlights what AMAS is not: flexible to actions in the real world.

Such an assumption might then hinge on “automation bias” (Pasquale, 2016, p. 107). It still relies on assuming that automatised processes might provide better results compared to human decision-making. Such automation bias however still hinges on the claim of algorithmic objectivity (Gillespie, 2016), it just translates it into a supposedly better technology. What can also be seen here is, that criticism still hinges on the former promises by the AMS (*see 4.1.2*) and is used in showing that AMAS *could* be more than it is imagined to be.

The discussion about how AMAS would be used also brings into question who or what is at fault when the decisions made are perceived as wrong or unfair. Interestingly, the blame is never directed towards the system. Most often, it is either the programmers behind the system, or the case-workers working with the system, who are directly blamed if things were to go wrong. The reason why both programmers and case-workers were so often criticised in their work was that these people were seen as the only intersection where criticism would achieve improvement. People understood themselves as knowledgeable about what to change in AMAS and argued that people in responsibility only care about their needs and not the needs of job-seekers.

The networks built around AMAS were and are understood as places of power, where criticism would not lead to change the system, as the criticism would come from a place with little leverage. Only people working for these systems could achieve positive change. AMAS, thus, is also criticised because it is a black box. It is a box, inside a box, inside a box, inside a box. This boxed setup also made it harder for the interviewees to understand at which point in the process of finding work through the AMS, they would encounter algorithmic interference. This question again raises concerns towards both interference and claims about transparency. If the decision-making process in the case-worker/AMAS hybrid is not transparent enough, the points of entry for the job-seekers to complain vanish. Mentioning the case-worker/AMAS hybrid and the job-seekers’ impotence against such a system offers the first glimpses of how the interviewees perceived the sociotechnical network of AMAS. To understand this network better, it is important to look at how AMAS executes power to a certain degree.

4.3 The search for agency and accountability - A study in layers

AMAS was never understood as working in a vacuum. The network(s) surrounding the technology sometimes were even more important than the technology itself. The social circumstances in which AMAS was created, and functioned in, were described by the interviewees as closely related to certain power structures. Already here it can be seen that AMAS was not understood as coming from a clean slate, but rather as a technology of power and politics. While it is generally accepted in research that 1. technologies are political (Jasanoff, 2004) and that 2. algorithms are connected to power and power structures (Bucher, 2018), this part of the thesis will try to understand the specifics of these relations in connection to AMAS.

In this analysis, power will be understood as forms of relations, which become evident when it is used (Townley, 1993). This means, that in discussing power, two important aspects will be analysed:

1. On which relations is AMAS built upon? (Where is power enacted in the sociotechnical network of AMAS?)

2. When and how is power used in the context of AMAS?

Answering these questions will give important results in the search for imaginaries on AMAS. It will show which actors were understood to be part of the sociotechnical network of AMAS. These actors both informed its imaginaries but are also part of AMAS' sociotechnical network. It also will give more context into how the consequences of using AMAS were understood in the context of power. Both of these points then will build towards fully understanding sociotechnical imaginaries of AMAS. It will also help to understand the relations between actors the interviewees used to describe the system. This then will help to better understand which background information the interviewees drew upon. It will show that AMAS was not coming from a clean slate, and because of its connections with other actors, it was seen as enacting power.

Akrich (1992) states that “technical objects participate in building heterogeneous networks that bring together actants of all types and sizes, whether human or nonhuman” (p. 206). Because these networks were so important in the interviews, it is necessary to understand them, as they are also understood as part of AMAS' imaginaries.

To structure this section, I will try to link together certain parts of the networks into where and when the interviewees thought that power was executed. This is necessary, as AMAS' sociotechnical network was understood as co-producing itself through a net of power relations. These networks of power then were used to solidify an infrastructure. Technology “stimulates the coevolution of agency and structure” (van Lente & Rip, 1998, p. 222), but does not come from a clean slate. As already discussed, AMAS was never understood as being neutral due to its influences from outer sources. These, in the following section, will then be understood as power networks which were co-produced through AMAS. The power networks that will be analysed thus, will show from where AMAS was perceived to come from. This will help to understand which actants influenced the systems' actions.

This analysis then will help, to integrate an important demand in contemporary research on algorithm, which means to shift “attention away from questions of *where* agency is located to questions of *when* agency is mobilized and on whose behalf” (Bucher, 2018, p. 55). To achieve this, it was important to understand to whom the interviewees related agency. As Diakopolous (2014) states, algorithms often are perceived as “the new power brokers of society” (p. 2). They are seen as the main source which enact power. However, as Ziewitz' (2011) shows, algorithms act as accountabilia, which are “objects mobilized to enact relations of accountability” (p. 7). They are necessary for shifting the accountability of actor-networks onto the technical systems. They are used to alter and modify networks. While in a normal operating infrastructure, these points of accountability may be veiled, in the case of AMAS they are visible. Because it is a non-stabilized technology (Akrich, 1992), and due to it in times of controversy being a broken-down infrastructure, these links are easy to spot. While the understanding of power will follow Foucaults' relational aspect, it will not only ask the *how* of power, meaning “those practices, techniques and procedures that give [power] effect” (Townley, 1993, p. 520), but also needs to ask who, at what time,

exercises the power. It is also important to point out that the decision to associate actors with each other while leaving out others is also a deliberate act of power (Diakopoulos, 2014) that the interviewees performed. The building of associative chains then is only possible through understanding that they are performative in as much as the interviewees perceived them to be.

In this discussion, four layers will be examined. First, it will be important to understand *if* and *how* AMAS enacts power. As previously discussed, the system was sometimes understood as a simple *tool*. What is interesting then is to understand if there are any indices of whether this *tool* is capable of mobilising power itself. It will show that through its function and data translation processes, it can indeed mobilise power. But that is only possible through the actors which directly (or indirectly) employ it. This then leads to the other layers of AMAS' power-network.

The second layer will show how the AMS, through using and communicating the system, is also mobilising power. It will show how some aspects of how AMAS enacts power, is only a direct translation from the former working of the company.

This then will lead to the point of politics. Here, politics is not only understood in an abstract way but will also integrate Austrian national politics. This section will show that both the AMS as well as AMAS were understood as powerful because of a political legitimisation process.

The last section will discuss how the labour market too is seen as legitimising, and the power mobilising aspect within AMAS power-network. It will show how the function of the Austrian labour market as a concept is necessary to connect and legitimise the previous layers, but also how it too gains power through the function of AMAS.

This discussion will follow an aspect of *layers*. These layers are a way to better understand the relational aspect of power. They will show how power is co-produced in the sociotechnical network surrounding AMAS. It should not be understood that power in these layers is hierarchically linked. The power in these layers is co-produced through the different human and non-human actors. While the understanding of these layers closely resembles that of Latours' (1990) concept of chains, the decision to use layers was made because the interviewees referred to them as such. These layers, in a way, for most of the interviewees, are how they built their imaginaries on AMAS' power infrastructure and network but at the same time were part of AMAS' imaginaries.

4.3.1 First Layer - AMAS

To start unearthing the power network of AMAS, it is first necessary to understand if the system itself exercises power. If it even can, and if so, when and how it does it?

Most of the power distributed through the system comes from its data-translation processes. It takes raw, human data (mostly related to hard skills on the job market) and translates it into a new form of data, in this case, the chance a job-seeker has on the labour market.

This data transfer, calculation and output are where interviewees saw most of the power mobilised through the system. One interviewee saw the process as “dehumanising” (Interview 6), later quoting from

an Indian poem, saying “I’m not your data” (Interview 6) akin to a plea. The act, it was seen, of transforming people into data, was described as the main reason why AMAS itself was exercising power.

The power which AMAS exercises comes from the process of making humans into data assets. Birch & Muniesa (2020) define assets as something “that can be owned or controlled, traded, and capitalized as a revenue stream, often involving the valuation of discounted future earnings in the present” (p. 2). Making humans into assets, and then deciding where and how to use these assets, can be understood as a process of assetization (Birch & Muniesa, 2020). A similar process can be seen in the following rich picture.



Rich Picture D

As this rich picture shows, the end product of the calculative process is a “package of information” (Interview 1). Calling the end product a package would not be as special if the picture depicting it would not be presented as a gift package. Especially with the connection to the criticism of assetisation, the process behind AMAS is seen as a transformative one. The *concept* of a human, as it only uses some parameters of the person, gets translated so that the end product itself does not resemble the person anymore. It is just a parcel, which is used for further processing.

The question which also arises throughout the classification processes of AMAS is, whether it would be more fruitful to understand this process more as a segmentation rather than a classification. This relates to algorithmic systems as world-making machines. They make and translate the job-seeker into an asset for further utilising them in the labour-market. It transforms job-seekers into *usees* and co-constructs the job-seeker as an asset and makes them part of the systems data assemblage, without the *usee* consenting to it.

In how AMAS is understood to work, the system also refers back to the aforementioned digital twins (see 4.2.2). It deliberately chooses data so that the system can find a past digital twin, a performed phantom. Through this segmentation, the *usee* gets transformed into a specific set of data which is used to build a setting from a past future. This also means that the *usees*’ value gets transformed through this future-past alignment. The job-seeker, through this transformation, then is changed from having a functional value to only having a symbolic value (Beckert & Aspers, 2011) in the data assemblage of the algorithmic system.

In this instance, AMAS is used to shape a future through a past scenario, which can have consequences for the job-seekers.

Through all this, AMAS then acts as an instrument of standardisation. It transforms the *uses* data into standardised data - which is necessary to compare them to *digital twins* - and through that, co-produces the claim on those standards. It establishes these standards and manifests them in its infrastructure, which makes it hard to challenge them. These data assemblages are also inscribed with power through power/knowledge (Kitchin & Lauriault, 2014). As a reminder, the power/knowledge concepts refers to the elliptical endeavour of both concepts. Exercising power creates objects of knowledge, and knowledge produces power (Townley, 1993). This then means, that data assemblages fulfil a strategic function in their form as infrastructure, because they delimit who can access the data and for what purposes.

As one interviewee said, referring to the calculative world-making power and presumed unfair process of segmentation, “[AMAS] is power imbalance. A coded [power imbalance]” (Interview 6). It produces a certain reality, and at the same time acts in it. Thus, AMAS in its assumed form, would co-produce such a reality.

This calculative power and transformation process is also the reason, why an interviewee stated that “[t]he problem with an algorithm is, that nobody dares to disagree with it.” (Interview 2). Power, thus is exercised and manifested through the promise of algorithmic objectivity (Gillespie, 2016). Through this claim, they further stabilise the infrastructure they act in.

Due to the previous knowledge that all the interviewees referred to the system as *simple*, the notion of no contact or vicinity point most often stemmed from the presumed knowledge that the system can not be as reflexive to outer input as needed. Its simplicity, thus, is also understood as a reason for how the system exercises its power because it functions as an authority. As Barnes (1984) writes, “[a]ll those who direct routines routinely and automatically are thus to be thought of as authorities” (p. 182). AMAS, as a world-making machine which creates assets through segmentation, thus acts as an authority in its power-relation network.

However, authority, in Barnes's (1984) words, “is power minus discretion”. This in the end means that, while AMAS exercises some power through certain measures, it still needs agents which leads it, to some extent. In this, and how the interviewees described AMAS, the system can be understood as accountabilia. In a network, accountabilia can be understood as “objects for the deferral of accountability” (Ziewitz, 2013, p. 6), which are used to build a network of validity and diffuse accountability. This aspect however, only works in a functioning infrastructure. Only because the infrastructure surrounding AMAS broke down, the search for accountability could go further.

4.3.2 Second Layer - AMS

As even the widely used name for AMAS, *the* AMS algorithm, shows, the technology is in close connection to the company which is using it. Especially through understanding that decision-making algorithms “cannot be described and defined in an abstract way, independently of the material conditions of their enactment.” (Callon & Muniesa, 2005, p. 1241), the AMS which uses the technology, has to be better understood in its socio-technical network. Many interviewees pointed at the company in the discussion about power. For them, first, the company exercises power through their lack of transparency, and second, the consultation situation for many was already seen as a place of tension.

While previous discussions already pointed out that the AMS, at the time of AMAS’ announcement, was sparse with information on the system, this secrecy, as some interviewees recounted, was seen as part of a larger power asymmetry. As discussed in the state-of-the-art, Pasquale’s notion of the “one-way mirror” (Pasquale, 2016, p. 9) can also be used in defining how AMAS is used by the AMS. As one interviewee said, “The AMS is also a bit of a black box, like the algorithm itself” (Interview 7). Understanding the AMS as a black box, veiling its decisions and only giving out as much information as necessary, was understood as a demonstration of power. One, which makes it hard for people to go against it. In this case, through veiling their decision-making processes, the AMS, as the AMAS, is part of the one-way mirror.

Furthermore, the oftentimes mentioned claim of algorithmic objectivity came from the company itself. In this, they too are responsible for how the system was perceived but also exercised power through those claims. They were semantic in nature, and used to perform a certain reality. Power, thus was co-produced in a discursive manner. Claiming what the AMAS is, while being secretive about how it functions, the one-way mirror was co-constructed and solidified the sociotechnical network in an infrastructure.

Another place where power is exercised is the consultation setting of the AMS. As one interviewee showed, previous bad experiences or disappointments about the inner workings of the company itself “eats itself into the heads of the job-seekers” (Interview 3). In connection with this, another interviewee stated: “The AMS says, we administer and manage the unemployed and [...] that means they reach really deep into the privacy of people and in this area of tension is, naturally, everything that changes there, always leads to nervousness.” (Interview 2)

As already touched upon, job-seekers who are reliant on the AMS for both new job perspectives, as well as unemployment benefits, often saw the working of the institution as threatening. As some interviewees stated, job-seekers often have the feeling that they are reliant on the goodwill of the case-workers and their ruling, which opens up a rather one-sided power dynamic. Through implementing AMAS, this power dynamic would have been reinforced. On the question, if there is or would be any difference between case-worker and AMAS, one interviewee said that “one would at least hope” (Interview 5). This split between processes, would lead to more insecurity, but also to a strengthening of the power imbalance, as the interviewees stated, one would not know anymore who or what reached a decision in the first place. In this, AMAS would again be used as potential accountabilia in the consulting situation. This, then, would take away the agency of the job-seekers, as it would make it harder for them to complain about

the decisions made. In making choices, power is exercised (Kotliar, 2020), however, diffusing who made the choice, and how the choice was influenced, would create uncertainty. Which then, would make the consultation situation even harder to navigate for job-seekers. This situation as a place where power can be exercised can be seen through the following rich picture.



Rich Picture E

When asked to draw what the interviewee *thought* AMAS to *look* like, they drew a picture which in itself heavily hinges on a certain power allocation between case-workers and job-seekers. As they described the picture: “That is so to speak the big mountain AMS. Up above, there is the case-worker, that sits on a distant balcony [...] and those, that are dependent on [him], lay on the floor.” (Interview 2). Further, giving details on the relation between the case-worker and the job-seekers, they added: “[the case-worker] simply is so distant, so far away. It is a predefined way, which no one can walk, and he is up there on the throne and tells the people what is wrong and what is right.” (Interview 2).

The interviewee understood this power asymmetry as *the* algorithm. This means that the main point of AMAS for them was not the technical nature, but the manifestation of an already existing power imbalance. This rich picture gives two interesting perspectives on the power dynamic in this case. First, the distance between case-worker and job-seekers and their positioning to each other, second the hard-to-reach path towards the case-worker. Understanding the picture as AMAS would then reinforce the perceived hierarchical nature of the consultation situation.

This means that the consultation, apart from both the company AMS and the system AMAS, is seen as a place where power is exercised. Using the system in consultation with case-workers would reinforce the already prevalent power imbalance behind the AMS. This, in a sense, can be connected to the infrastructure which the AMAS co-produced, and consequently means that the technology can never be seen as detached from the company, but that assumptions and thoughts on the AMAS are always built upon previous knowledge, thoughts, and assumptions on the AMS. Thus, power, in this understanding, was also enacted through *how* the company would use the technology. By using AMAS as an instrument of power, the AMS then would integrate and use the power/knowledge combination in their operation. Through all

of these measures, AMAS is used to stabilise the operation of the AMS and its perceived mobilisation of power. AMAS is seen and understood as *the AMS algorithm*, and through that becomes the one-sided mirror of power imbalance in more than one way.

4.3.3 Third Layer - Politics

AMAS is a political technology. It was already stated how algorithmic systems are technologies of politics. In this discussion, the term politics refers to a certain world-making power these systems can have. This is true as well for AMAS. However, another important point in its imaginary is that AMAS is also a political technology.

As it became clear in the interviews, the AMAS is also closely related to the political climate in Austria in its implementation year(s). As one interviewer recalled, “It is highly political the whole thing.”(Interview 7) The choice of using such a profiling tool was often related to the political change in Austria around the time between 2016 and 2019. As already elaborated, the technology and concept of AMAS already were negotiated behind closed curtains long before the final announcement. This negotiation process was also influenced by political intervention, one interviewee recalled. In the time between 2016 and 2018 however, the idea was fuelled again because of the change in Austria's political landscape. As one interviewee said, “With turquoise-blue⁴ it got new energy again.” (Interview 3)

Due to this change of government, which was perceived by some as controversial, some people were highly attentive to the new decisions made. As one interviewee recalled: “And I think the reason for this was a little bit because the political [situation] was that one kept one's eye closely on the government.” (Interview 4), later adding: “If an SPÖ labour minister would have commissioned and implemented [AMAS], I think that the resistance, at least from us, would not have been as big.” (Interview 4). This also recontextualises some of the previously mentioned efforts to go against the technology, as for some actants, the reason to argue against AMAS was seen as a battle against a certain political ideology.

Through this political dimension, the implementation of AMAS becomes a case of a perceived top-down approach to integrating a certain technology. Felt et al. (2010) describe the reactions towards a top-down implementation of new technology in Austria as “citizens simultaneously accept regulations and use what is beneficial, while at the same time lamenting their exclusion from the decision-making process- however without taking any action” (Felt et al., 2010, p. 547). To some degree, this then explains the lack of proper public participation - which was criticised by some of the interviewees - with only some actor groups rallying against the system. As a political technology, AMAS was accepted by the broader masses. As a political technology, it gained its validation.

While the opinion that the AMAS was viewed worse because of its connection with the ÖVP was often brought up by other interviewees, some stated that the political affiliation of the party did not matter. The reason for this was, as they told, that already in 2016 Hundsdorfer, a labour minister of the SPÖ⁵,

⁴ This refers to the Austrian coalition between the liberal-conservative ÖVP (turquoise party) and the national-conservative FPÖ (blue party).

⁵ Refers to the Austrian Social Democratic Party

introduced “ethnic profiling” (Interview 2) into the workings of the AMS. As the interviewee said, in their opinion: “it does not matter which party” (Interview 2). What is important here, however, is that the act of political intervention was still criticised. It was just not understood as a party political topic, but an overall governmental intervention. As one said, Austrian politics is the “expression of the AMS” (Interview 6). What this means is, that while the connection to the ÖVP and the dissatisfaction with the Austrian leadership played a big role in how the AMAS was criticised, the bigger reason behind it could be the overall dissatisfaction behind politicians pushing such a technology. This opinion, while shared between the interviewees, can be shown through the following quote: “There was political intervention. In an algorithm. That means, here is a machine, which gets manipulated, to achieve political goals.” (Interview 2).

This, then, makes it necessary to broaden the understanding of AMAS through that of civic epistemologies. They show how both the state and its citizens arrive at collectively shared agreements on public life through knowledge-making practices (Miller, 2008). This then means that civic epistemologies enable us to see how epistemic practices are co-produced with political ones. Civic epistemologies, however, also entail how publics expect the state to act. In this way, AMAS’ closeness to Austrian politics, was a reason for the interviewees judging the technology in a national political realm. Knowledge of AMAS, and expectations of how the state should act, then were co-produced.

Through this political aspect, the claim on AMAS was again strengthened. As with the AMS, to what institutions of power the technology was connected to, strengthened its infrastructure. This, in consequence, led many interviewees to criticise the system as a nexus, where political power and intervention get combined.

In consequence, this means that AMAS was not only seen as a national technology, but also as a political tool. As one said, AMAS is “the outflow of the [political] system” (Interview 6). Austrian political decisions, thus, are seen as one of the main reasons why the system works as it does. But at the same time, this political landscape also legitimised its usage. Through that, one can also refer back to Foucault (1973) and see AMAS as an instrument of power through which the state exercised power and control within society, including how it regulated and produced knowledge. In this, and how the interviewees described it, AMAS was used to further the power/knowledge relation on a national political level.

Understanding AMAS as a political tool, also meant that after its shutdown, it was seen as a “political stillbirth” (Interview 7), again reflecting how important the system's relation to politics is. Power, in this case, comes not only through its close relation to the Austrian political landscape but also because it was understood as a tool, wielded and legitimised by politics.

4.3.4 Final Layer - the labour market

This layer was mostly referred to by interviewed job-seekers or people close to self-organised jobless people. For the other interviewees, it was nearly nonexistent, at least not as a place through which power gets mobilised.

One interviewee described the need to get into the labour market as quickly as possible as a “gainful labour fetish” (Interview 4). This was understood as a problem. A problem, which AMAS contributed to and is at the same time a symptom of it. As some interviewees said, the term labour market itself in this context is a problematic one, asking “What is the labour market? That this is a construct in itself. Within the meaning of market, [...] and ultimately it serves a certain setting. And this setting, I would not say, is in the benefit of jobless”(Interview 6).

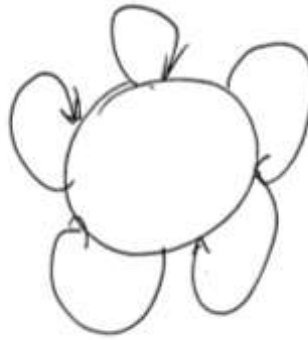
Markets are not out there but operate and function in the sociotechnical world (Mitchell, 2007). Through that, they should not be understood as hypothetical *things*, but as real and performative entities. Beckert & Aspers (2011) state that a distinguishing feature of the market is its form of coordination: competition. This competition in its simplest form can be understood as demand and supply.

Criticising the term market in itself, means a critique of the commodification of labour forces. Connecting this with the translation process of making job-seekers into assets, it shows how both these processes co-produce each other. The necessity of doing so is deeply ingrained in how the AMS functions.

Understanding AMAS and its transformative capabilities (*see* 4.3.1) in the context and usage in the labour market, also means that it transforms its *uses* to align with values on the market. Goods on a market need to be legitimate as tradable entities and fulfil certain requisites to become valuable (Beckert & Aspers, 2011). If the job-seekers are transformed through AMAS, and valued as commodities in the labour market, then they are also measured in terms of their value to the market. In the context of a market, this means that their data needs to be singularised and objectified (Callon & Muniesa, 2005). Objectified, because the data got standardised and thus stabilised. Singularised, as the data needs to be comparable to others, such as the *phantom* twins. In these two instances, the *uses* get transformed to fit in the market the AMAS got co-produced with. In this, AMAS's world-making power also co-produces the labour market it acts in.

With both AMAS and the urge to bring job-seekers back into the labour market, it creates a feedback loop, or “revolving door effect” (Interview 6). Job-seekers who get assigned a job through the AMS might lose this job again quickly, making it necessary for them to come back to the AMS. A vicious cycle, which the jobless interviewees saw as both draining and compulsive.

One interviewee showed this understanding in their rich picture:



Rich Picture F

When asked what it should represent, they answered: “It is about a self-referencing system [...] it serves itself, so to speak.” (Interview 6). Here, what is interesting is that AMAS was not seen as technology in itself, but rather as a larger system which feeds itself through job-seekers. As they further stated: “So, the people who get processed by the system, come back into the system. [...] There is the so-called revolving door-effect, that people work shortly and so on. Yes, this whole thing is the system.” (Interview 6)

This revolving-door effect can be related to Ian Hacking's (1999) “looping effect”. It refers to the way in which data changes the *things* it classifies. In classifying *things* by grouping them based on similar characteristics, these *things* might adopt and act like their category. In the case of humans, this then would lead to what Hacking (1999; 2006) describes as *Making Up People* (Crane & Sewell, 2014). Job-seekers, as *uses* of AMAS, thus are transformed towards reshaping “society in the image of a data ontology.” (Kitchin & Laurialt, 2014, p. 11). AMAS, thus performs a certain reality in how it and the labour market get co-produced with each other. The problem herein lies in that, as the interviewee describes, that first and foremost the AMS, but also AMAS, are using job-seekers as a quick measure to meet demand in the job market. However, these job-seekers would be only integrated for a short amount of time, needing to come back to the AMS for new employment again. The critique herein lies in that neither the system nor the company were solution-oriented. Job-seekers would be stuck in a cycle of being employed and unemployed again, seeing themselves more as long-term unemployed rather than employed, thus changing their identities.

Coming back to the last rich picture and the interviewee's quotes, one can see that AMAS’ is not understood as an enclosed technical system, but rather a bigger, sociotechnical one. Thus, the scope of AMAS’ influence and the ground on which it operates also gets enlarged. AMAS, in this depiction, is not part of the system, it is the system. As the final part of the power network, the employment market gives validity to both AMAS, the AMS and politics using the system as a tool.

4.3.5 Interim Results - Decision Makes Power and social order

In understanding where power gets mobilised throughout the network of AMAS, one understands how the system is built up. Technical objects “stabilize, naturalize, depoliticize, and translate” (Akrich, 1992, p. 222). In the case of AMAS, it both stabilises and depoliticises the decision-making process. It naturalises the categorisation of job-seekers and translates job-seekers into *usees*. Technical objects stabilise systems and define and connect actors (Akrich, 1992). In the interviewees understanding as simple and neutral technology, AMAS functions as a stabiliser for the different actors, and how they co-produce their power through it. Because the infrastructure was broken down, the links in the networks are still observable and not completely naturalised. Because of that, AMAS is not a complete “instrument[...] of knowledge” (Akrich, 1992, p. 221).

Through these power relations, one can understand that AMAS is a political technology in Winner's (1980) understanding of the term. Politics, for Winner (1980) are “arrangements of power and authority in human associations as well as the activities that take place within those arrangements” (p. 123). It is a system, which is compatible with, and requires political relationships. It “regularly produces results counted as wonderful breakthroughs by some social interests and crushing setbacks by others.” (Winner, 1980, p. 125). AMAS requires specific social conditions (i.e. politics, the labour market) to function. It encompasses more than a simple work inside a company, but only functions and is legitimised through its social relations. This then also means, that an important part of the interviewees’ imaginaries of AMAS’ are at the same time co-produced through these relations. Coming back to the sub-questions of this thesis, that means, that the *background* information of AMAS, and its relations, are interlinked in how the sociotechnical imaginaries of the system are built.

This is an important point in understanding and translating algorithms into algorithmic systems or networks. Especially throughout the interviews. It shows, where the interviewees drew the relation outside of the technical system, but also how the system derives its agency. Understanding AMAS as a system was also not only something which was unearthed through analysis, but was plainly stated by some interviewees: “For me, the AMS algorithm is a culmination point of a dysfunctional system” (Interview 6). According to them, this dysfunctional system is highly politicised and mobilises great power, which comes together in AMAS and also gets manifested through its usage. In this, AMAS and social order are co-produced. Understanding AMAS, thus, is interlinked with understanding these relations.

Thus, all these different layers of power reflect onto the algorithmic system, while the system itself is there to strengthen these layers. Coming back to the term *accountabilia*, it is clear how AMAS can be understood as such in this heterogenic assemblage. It acts as a delegation for its human actors, shifting accountability towards the technological system. This especially, through its claim of objectivity, reinforces pre-established power structures. The *accountabilia* however, would have only been seen as such in a naturalised, stable infrastructure. Due to its breaking down, it can be seen that AMAS is part of an agentic swarm (Bennet, 2010), meaning a system, in which both human and nonhuman actors mobilise power.

There is a constant process of legitimisation through each layer. The national labour market is legitimised through the political landscape and a neo-liberal shift (Allhutter et al., 2020), as well as how

AMAS is used by the AMS. Both give agency and legitimisation to the AMS to work in a specific way, compatible with the system (i.e. Political landscape and labour market) the company operates in. This, then again, creates and legitimises AMAS, which not only implements agency through the AMS but also the Austrian government and the labour market overall. AMAS, thus, is a description in Akrich's (1992) sense, of the network it functions in. The way it includes some actors and their concerns, motives and biases and excludes others shows in which way its functions have to be understood. It is performative in as much as it re-establishes and manifests social orders.

It also paints a specific image of the co-dependency of all the actors, which in turn, integrate and legitimate themselves in the system. They co-produce power with and through the system. This is an important part of the imaginaries built on AMAS, as it shows that the system is never understood as the sole technology, but always as part of a larger system. AMAS is highly entangled in Austrian technopolitical culture, in some sense even a description device of its national labour policies. Thus it can not be demarcated from the political.

As stated in the state of the art, an important step to understanding algorithmic systems in networks is to accept their black-boxed setup. Through this, not through opening them, one can understand important points of power in these systems. These power relations show an important part of the co-production of algorithmic systems. They show, especially in this case, that these systems are not secluded from outside intervention, and how they are seen and understood always hinges on which relations are connected to them by the individual. Algorithmic imaginaries, thus, are networked relations, which more often than not, can be seen through discovering where power is allocated.

Power, more often than not, was understood as the possibility of actors to wield *the* algorithm as a tool and change it to their own accord. This way of enforcing power "in actu"⁶ (Latour, 1984, p. 265) through different actors, is the main reason why AMAS can be understood as a technology of power and politics. It is one part of a network of actors that delegates power, and thus diffuses it. It is a tool, used by actors to enforce their power, and at the same time, legitimise this and stabilise the network around it.

This then means that it is necessary to understand AMAS as a technology of politics when discussing its imaginaries. This whole discussion about power and politics was used to show that power and politics can not be demarcated when discussing the public understanding of decision-making algorithms in the public sector. They are part of it and are understood as such. Through this, one can combine the two sub-questions of this thesis and understand that *background information* about AMAS leads to understanding its *relations and consequences*. Thus, it is possible to understand the system not as enclosed anymore, but fully grasp its sociotechnical imaginaries. This then means that understanding AMAS and imaginaries that are built around the system can not be demarcated from its power-network. Especially if one analyses what affected *publics* think about the system.

⁶ "when you exert power - in actu - others are performing the action and not you." (Latour, 1984, p. 265)

5. Discussion: THE algorithmic imaginary:

AMAS is not one thing. In fact, by its very nature, it can not possibly be just one thing. Indeed, AMAS is different to whatever sociotechnical networks it is referred to. AMAS is different to whatever sociotechnical background it is placed in. AMAS is different to whatever relation the interviewees had to job-seekers and the labour market. This then once again brings back the topic of multiplicity and gives a new dimension. Multiplicity here does not mean that the systems change and that there are many different ones. It means, that each person sees and understands the networks built around the system differently, making it a different system through perception each time. AMAS, until now was strung together through many different threads.

To structure this section, I will first try to answer the sub-questions of this research.

5.1. Sub-Question: On which background information are imaginaries on ADMS and profiling tools built upon and influenced by?

While coding and analysing the different interviews, I realised that there was one important fact that could not be integrated through a simple sorting process, as each interviewee was different in this respect. In every interview, AMAS was used as a projection for other problems. To answer this sub-question I will follow a lead given by a thinking piece by Barocas et al. (2013) and ask one important question in analysing algorithmic systems: “would the meaning of the text change if one substituted the word “algorithm” with “computer”, “software”, “machine”, or even “god”?” (p. 3)

It is interesting reviewing the interviews and seeing, that while the system itself is present throughout all the conversations, clarity about what it is most often comes through looking at the relations and sociotechnical networks built around it. In all of the interviews, the topic of AMAS was used to point to different flaws and problems surrounding the Austrian labour market, technological intervention, human-computer interaction, privacy, and the exclusion of certain groups in activism, discourse and science. This can especially be seen in the discussion about power in the empirical chapter. While at first, power and politics of algorithmic systems were only tangentially touched upon in the initial design, the first interviews showed that these relations are an important part in the interviewees' understanding of AMAS. Through this, it was shown, that AMAS is more than a technical system and that the interviewees needed the frame of reference (AMAS) to talk about other things.

For one, AMAS was a representation of larger misconducts in data privacy, and thus only the symptom of larger societal problems in connection to data usage. The problem for them was not the technology behind AMAS, nor its seemingly unfair nature, but the reason for how and why this data was used and misused. Going against AMAS, in this case, meant that they wanted to raise awareness of these problems before the use of such technology became common.

For another, AMAS was seen as a manifestation of the labour market and thus, perceived as a technological extension of a system they perceived as unfair. Arguing about AMAS' usage, thus was an attempt to criticise labour market policy. The labour market was, thus, perceived as not fully trying to integrate unemployed people, something which was seen as a shift from the previous goal of the market.

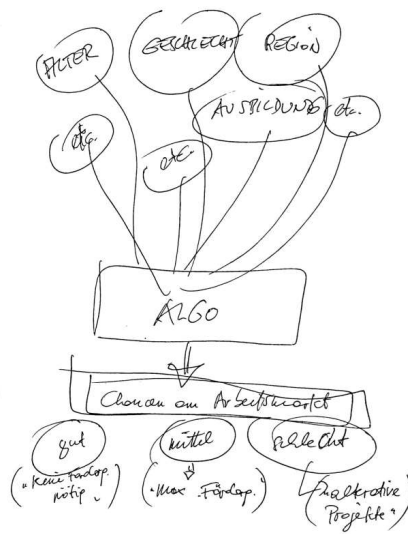
For another, AMAS was understood in the bigger debate of automatisisation processes in every sector. For them, the technology was understood as the first governmental attempt to outsource human labour to algorithmic systems. For them, going against AMAS was understood as a necessity as it would prevent an automated future from happening.

AMAS is more often seen as a symptom of different, bigger problems. The algorithm was never seen or described as a tangible object, rather it was always more or less a concept, riddled with uncertainty on what it exactly is. This can also be seen with the rich picture approach.

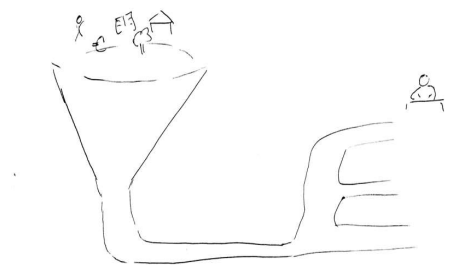
AMAS as transformative process:



Rich Picture D



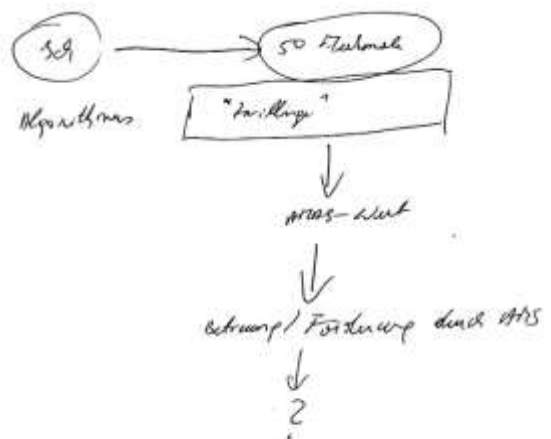
Rich Picture A



Rich Picture B



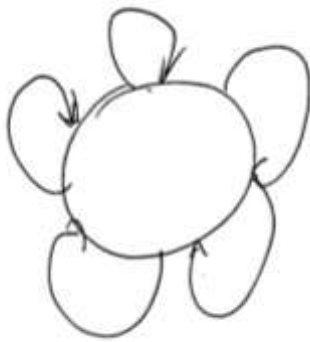
Rich Picture - Algomat



Rich Picture C

Most aspects of the function of the algorithm were shown in a black-boxed setup. In the technical depictions, the algorithm itself always was shown as a point where input data gets transferred to output data. In consequence, AMAS was not seen as a technology per se, but rather, as a transformative process. AMAS, thus, was more of an idea, shaped through previous experiences and problems on which the interviewees drew their connections from. This idea only functions throughout the network(s) it functions in. Without this network, or these network(s), there would be no AMAS.

AMAS as representation:



Rich Picture F



Rich Picture E

AMAS, in the end, is a representation of larger societal problems, which are all connected to a power imbalance which people saw as problematic. Where the power was allocated, thus influenced how and, specifically, why AMAS was criticised in the first place. Through these assumptions, it becomes clear how AMAS can act as accountabilia for this story. Accountabilia means that it gets “mobilized to enact relations of accountability” (Ziewitz, 2013, p. 7). It is a necessary pointer in starting bigger discourses on other sociotechnical imaginaries. It is used as a signpost in the present, to criticise past- and future problems. However, this is only possible because the infrastructure broke down and AMAS’ relations lay open. Without that, the technology might have been the sole accountabilia and nexus for these problems.

Understanding AMAS through this perspective then helps to understand that the communication on the topic also shone a light on other perceived problems and co-produced them. Resisting AMAS, then, was used to resist other developments. Understanding how AMAS and other sociotechnical imaginaries are co-produced then means that AMAS can be understood as symbolic. It is a way to transport past experiences, and future risks into the present and acts as a wayward point on how the future should be performed. Through that, one can come back and see AMAS’s transformative power in the shaping of publics. It is used as a goalpost for how the future should not be like. Through that, the technology forces its publics to ask: “how things could be otherwise” (Felt & Davies, 2020, p. 33)? The debate surrounding AMAS, thus, is a fully fledged technopolitical one.

This brings back how technopolitical cultures are important in understanding imaginaries of AMAS. The interviewees often used national frameworks to describe and understand the technology. There was a stark contrast between what they perceived as national technology (AMAS) and other external technologies (i.e. facial recognition software, and social media algorithms). AMAS was criticised, because it was understood as working like these external technologies, and not how they wanted a national political tool to work. The script of AMAS was thus rejected, as it too closely resembled that of *outside* technology.

AMAS, in the context of the interviews, was used as a signifier for multiple visions of the future the interviewees did not want. So, while there is not ONE unifying imaginary, the reason for building the multiple, different imaginaries can be understood. AMAS as imaginary is only formed because it is an example of other sociotechnical problems. Imaginaries on AMAS are just a building block for forming other imaginaries, which are co-produced through it. Unknowing algorithms, thus, is an important part of understanding how algorithmic imaginaries and sociotechnical imaginaries are constructed. I would go as far as to say that, through unknowing algorithms, one understands how algorithmic imaginaries get transformed into sociotechnical ones. Only through understanding what is not known about algorithmic systems, and accepting *the* algorithm as a blindspot, the system, and thus *the* algorithm becomes visible.

5.2. Sub-Question: In which ways is the mobilisation of power and the consequences of AMAS conceptualised by affected publics?

What was interesting in all the conversations was that the term algorithm, while often used, was mostly defined through that what it was not. Algorithmic functions were always understood as *simple*. This assumption, however, was only possible because of the comparisons to AI. Previous discussions oftentimes seemed like the solution to AMAS' presumed simplicity would be a more sophisticated system, perhaps even connected to the notion of AI. In every interview, the notion that AI would be better than the proposed AMAS technology was voiced.

AMAS is built on many promises: AI, Algorithms, AMAS. However, these promises also are part of a bigger *promise*: The further automatisation - or, as I will term it because of its relation: the algomathisation - of the workplace.

As research on promises shows, they are often a lengthy process of (re)adjusting. What the promises of AI, and that of AMAS show is, that both of them lead to a larger set of promises, which are simultaneously connected and distinct from one another. Both show algomathisation as inevitable, while the means of achieving a better future differ.

This inevitability is then also one of the consequences of AMAS' usage. AMAS, then, is also connected to larger promises about technology. If there would be better data, the system might make better projections. If the system was more technologically sophisticated, it might work better. If the system would add solution strategies, rather than classifying job-seekers, it might help them better. The important question to ask then is, what does it mean that AMAS was conceptualised in this way?

First, through all the layers of power which are in the end both entangled and embedded in AMAS, it was seen that there was not much chance of stopping the project altogether. This power asymmetry meant

that many interviewees thought that their reactions toward the system might only help to improve AMAS, as the introduction of the system itself was seen as inevitable. Criticising thus was understood as the only way they could engage in the debate. This, then, is the reason why the wishes for something better, for example, AI, were formulated. Due to its inevitability, the only way to change the system were suggestions which would improve the system in a way that its implementation would be acceptable to the interviewees.

Another reason for how AMAS was criticised and conceptualised, was through understanding that it would adopt all the previous inner-organisational processes of the AMS. Many of the perceived problems, thus were not criticised because AMAS would create them, but because they already were institutionalised. The only thing AMAS would change is that it would make them more stable.

In understanding the consequences of AMAS which were conceptualised by the interviewees, this then means that the system was understood as a stabiliser for prevalent problems. This then, again, is connected to the aspect of power and who was placed inside the power-network surrounding AMAS. If both the power, as the consequences of AMAS usage are seen as continuing previous institutional/social/political problems, then AMAS is indeed the “culmination point of a dysfunctional system” (Interview 6). Whether the system, and thus AMAS, is seen as dysfunctional then hinges on whether the actors in AMAS’ power-network are seen as criticisable. This again means that AMAS can not be understood without its relations.

However, through that, one can at least come back to an essential problem from the State-of-the-Art and work out a solution to that. As Bucher (2018) states: “A major obstacle to holding algorithms accountable, [...] is to know them in the first place.” (p. 41). Knowing them, then, means to shift away from their technicalities and understand their power networks. This then might help, to hold *them* accountable. Otherwise, these systems will continue as accountabilia.

Through all these previously made points, thus, AMAS can be seen more as a concept. This concept then hinges on the context it is used in. At least through the interviews, AMAS is not an *existing* object, but rather a concept which can only be understood in the ways it is used.

5.3 Do algorithms dream of fair decisions? Or how AMAS can only be understood as a concept

This thesis started with the assumption that conversations about AMAS hinged on the perceived (un-)fairness of the decisions the system makes. This was also the reason the title was a homage to Philip K. Dicks (1968) novel "Do androids dream of electric sheep". As it turned out, fairness was not an important topic in the discussions.

What was important, however, was how, and by whom, such a system as AMAS is used. The last chapters already answered this, so what does this mean for the technology AMAS and its imaginaries? How can a *thing* be understood if its understanding hinges only on other relations?

The answer is that AMAS can only fully be understood as a *concept*. Not only, because its implementation was never fully achieved, but also because AMAS was always understood as a signifier, whereas where it points to was the signified. In Foucaults (2010) understanding of the term, there can be

“a plethora of the ‘signified’ in relation to a single ‘signifier’.” (p. 118). If AMAS then is understood as being the expression (signifier) of a multitude of contents (signified), it means that all these different relations where it points too are also part of it.

AMAS, as a *thing* is a hybrid of various imaginaries and is performative of them at the same time. In essence, AMAS is a thoroughly performed concept. By the AMS, because it performed its power through (non-)communication and its implementation. By the interviewees, because the technology itself never truly and fully existed.

In the end, an important quote from the State of the Art has to be brought back into discussion: „Algorithms,” [...] are social constructions that we, as outsiders and critics, contribute to.“ (Seaver, 2019, p. 413) Claiming what the system is, if it is a concept or a construction, also further fuels claims of algorithmic decision-making tools. Profiling tools in public institutions can not be non-political or without power if there are no claims about these systems. Through this research alone, the claims have been further manifested. I, as a researcher, co-constructed the system I analysed. Despite trying to be mindful of these implications, I realised that I often described algorithmic systems as *simple* in the state of the art. The interviewees, same as this thesis, are also part of AMAS' power network. Through these statements and claims these actors too became part of AMAS' heterogenic assemblage and, at the same time, co-produced the system. If AMAS is understood as a simple tool, which is only criticised because it is used by certain actors, as was the case throughout the interviews, then this too fuels the claims of algorithmic objectivity.

The question then is, if algorithms are “the new power brokers in society” (Diakopoulos, 2014, p. 2). In the example of AMAS, and in understanding the system as accountabilia, this would be true. It diffuses and veils power just by existing. However, this is only possible because through claims made about it.

Imaginaries on algorithmic decision-making tools, at least in the case of AMAS, thus are performative in a kind of feedback loop. AMAS might be a concept, a hybrid of many different imaginaries. But this concept itself is used to perform the imaginaries it represents. It both signifies them, but is also signified by them. Imaginaries on algorithmic decision-making tools, thus are not only multiple, but also co-produce themselves. A better question then would not be "Which imaginaries around algorithmic decision-making and profiling tools exist in publics?", but “What do imaginaries around algorithmic decision-making and profiling tools perform?”.

However, to give a satisfying answer to the research question of this thesis, these two questions can be combined as their answers are co-productive. While the answers are not as streamlined in reality as will be presented, the building of imaginaries and what they perform can be structured as follows:

Which imaginaries around algorithmic decision-making and profiling tools exist in publics?	What do imaginaries around algorithmic decision-making and profiling perform?
Counter-imaginaries to the AMS claims (uses: imaginaries the AMS built; imaginaries about the AMS)	- Counter-imaginaries - knowledge-making practices - activism ⇒ Understanding AMAS as simple algorithm, because it is not AI
AMAS is simple (uses: imaginaries of algorithms; algorithmic imaginaries; imaginaries of AI)	- AMAS can be criticised, because it is simple - AMAS ⇒ AMAS is a simple tool which can be shaped and wielded
AMAS is a tool (uses: technopolitical imaginaries; sociotechnical imaginaries)	⇒ AMAS produces and diffuses power
AMAS as a process (uses: imaginaries of data translation processes;	⇒ AMAS stabilises the network it functions in
AMAS is part of a network (uses: political imaginaries, imaginaries about the labour market,	⇒ the network is visible ⇒ if the network is invisible: AMAS performs power as accountabilia
AMAS is a hybrid AMAS is a concept (uses: counter imaginaries to the AMS claims, AMAS is simple, AMAS is a tool, AMAS is part of a network, AMAS is a hybrid	⇒ claims about the power of algorithmic decision-making tools in the public employment

This then also shows why the thesis was structured the way it is. To understand this performative loop between these different imaginaries, it was important to begin at the start of the discourse to understand how and why these imaginaries were developed.

It also shows, why the aspect of power is necessary to fully understand the concept of AMAS. Not only, because the AMAS power-network was understood as part of AMAS' imaginaries, but also, because these networks were performative in creating imaginaries about AMAS. Through understanding AMAS as accountabilia, and analysing the system as such, it becomes a concept which signifies.

5.4 Where does that lead to?

While previous discussions were often placed in the past or the present, it is necessary to look towards the future and ask an important question: what can be done better? This question is also necessary, to fully understand the imaginaries on AMAS and algorithmic decision-making as a whole, as visions of the future are part of how imaginaries are used in the present, especially in the discourse on AMAS, where futuring played a vital role.

In the empirical part, I first examined the present debate around AMAS. This was necessary to understand the context for the interviews, but also will be important now. In most of the conversations, there was always a slight sense of defeat. Not because the interviewees thought that their activism was to no avail, but rather, because the system itself was seen as inevitable. While the failure of AMAS shows an infrastructure breaking down, thus making it visible, it in no way lost its power. What got unearthed through the visibility was only how far-reaching the power structure and network the system should have functioned in was in reality. Because of this, it can be said that only going against the technical system and representation of this network, would in the end, be to no avail.

Only one interviewee, who is close to self-organised jobless people, saw the stop of AMAS' implementation as a "satisfaction that we [dared] to lift a stone" (Interview 5). This was related to an achievement of going against a system, meaning the AMS, which they perceived as a constant oppressive force which influenced many lives, and against which many previous attempts had failed.

As was already stated, going against AMAS was not done out of technophobia or a dislike for the technology. As one interviewee stated: "I can imagine that one can use such systems in support to humans. [To] detect needs and then to cover needs." (Interview 1) This then means that ADMS should transform themselves from *Making* to *Helping*. However, transforming an ADMS (Algorithmic Decision-Making System) into an ADHT (Algorithmic Decision-Helping Tool) can not eliminate all problems from such systems. As it was often said, the system is not at fault and the assessments of it could be as wrong as those of the case-workers, what would be needed, would be a balance between the technical side of decision-helping (i.e. better capabilities to calculate a job-seekers data) and the human side of choice-making (i.e. using the data in support to their own decision-making). Of course, it is arguable whether an ADHT would not be too different from the ADMS, but it certainly would help the agency-power problem often found in ADMS. It would make it clear that the decision was not made by the technical system, but rather would make the process behind the decision - the so often mentioned sociotechnical network and infrastructure - more transparent.

However, to use a tool like that, it needs to be wielded only by the case-workers. Not by the many different arms of power that right now would influence AMAS. Detaching the case-workers from all the layers of power that come together inside the system, is nigh impossible. Even though case-workers were not seen as a problem in the system, many interviewees highlighted their efforts inside the AMS, they still are part of a system which is nearly impossible to disconnect from, or change.

What is important however, and this became apparent in the talks I had with stakeholders close to job-seekers is, that these affected publics or usees have to be more integrated in every facet of AMAS. This

does not only mean that they should be integrated in the planning and conception of different technologies which affect their lives and livelihoods. It also means that these publics have to play a more important role in research. While this was already hinted at in the State-of-the-Art chapter, research oftentimes does not integrate affected publics in its research. And this is a far bigger problem than silencing a specific group. While many researchers try to criticise certain technologies, they do it from a platform of certain power. Choosing which views to valorise and who to silence is a deliberate choice. This choice then also reflects back to the interaction researchers have with affected publics. As all of the interviewees in proximity to self-organised job-less people told me, they felt left out by researchers who were studying the algorithm. From both private companies in AMS proximity as well as public research agencies. This then in consequence also shaped their way of activism, as they felt unheard and powerless. Some even stopped taking an interest in this topic, as they felt that their opinion did not count in the debate. This especially means that the concept of usees, and their voice, has to play a bigger role in social sciences, moreso when the task is to analyse certain digital infrastructures, software or technological systems. In the end, shunning usees in research, especially when the research comes in times of certain controversies, reinforces their role as usees. Indeed, this makes them pure data to analyse, without any agency in themselves.

It also becomes apparent if one combines the different results in this research. Many of the criticisms, the different opinions, the feelings, and attitudes are a result of not integrating usees in the innovation phase, as well as in the public communication. Knowing how (broken) promises shaped the interviewees', above all, the usee's, perception of AMAS should show that it is important to build upon their experience.

Of course, the term usee also incorporates a high level of power, and with their integration, these publics would not be usees anymore. However, one has to ask if it is even necessary to have usees. Transforming usees into users, people who also profit from the working of a system, who know how the system works, and willingly contribute to its development and usage would eliminate some of the power-relations that are so heavily criticised here in this paper. It should also be self-evident, that an integration like that is important in a democratic sense.

While the point of integrating *usees* in this paper was necessary to fully integrate and grasp the publics which were needed to analyse the system, there are other findings which relate back to points which were made in the State-of-the-Art. How to hold algorithms accountable was one important question which plagued this part. As conceptualised here, the question is not to hold them accountable per se, but understanding them as accountabilia. If this will be done, then the focus is not to look *inside* the system, but rather *outside* and *around* it. This was possible through unknowing them. *Unknowing Algorithms* thus is an important tool which research on algorithmic system should integrate in the future to unearth their hidden structures. Through that, one can see the relational aspect of algorithmic systems and truly understand their multiplicity. This then helps to, as Gillespie (2014) warned, "firmly resist putting the technology in the explanatory driver's seat" (p. 169).

It thus might help, to understand algorithmic systems and their power, to use Actor-Network-Theory to truly grasp their power-network. This knowledge then can be used to shift the question of

accountability away from the technical object. This might help to understand these systems as social constructions, which again brings back the necessity of further integrating affected publics. However, while ANT might be used as a tool to better understand these networks, I propose that using imaginaries the way they were used in this thesis is still the better way to shift around certain gaps in researching algorithmic systems. As shown, they help to understand the performative character of both the sociotechnical networks of these systems, but they also make it possible, to fully integrate the often forgotten affected publics. As was shown, they are an important part in fully understanding the consequences the use of such systems entails and through that, are a productive way in finding solutions for and against the implementation of these systems. Analysing imaginaries on profiling tools in public employment systems, or any kind of algorithmic function in (public) institutes, through the eyes of (affected) publics then helps to work towards understanding the power such system exercise. Thus, helps research tackle the gap which was formulated by Diakopoulus (2014): “What we generally lack as a public is clarity about how algorithms exercise their power over us.” (Diakopoulus, 2014, p. 2)

As was shown in this research, the usage of algorithmic decision-making systems in the public sector is a fruitful one. If one accepts the uncertainty that comes with analysing these systems, and embraces the concept of unknowing algorithms, it is a field which is rich in analysing these systems and their impact further.

What this research showed is that while knowing algorithmic systems might be hard, one does not need to know them to understand their accountability. What is necessary however, is to understand the network they function in and how this is perceived by people that are affected by it.

6. Conclusion – Algorithms that do

This thesis has shown, that through understanding profiling tools as concepts, they might unearth interesting and important power-networks. This then can help to better understand the important contact points in searching for accountability in such systems. It was demonstrated that *unknowing algorithms* is a useful tool to shift the uncertainty of algorithmic system to highlight the power-structure lying underneath them. Through this, it is possible to understand profiling tools in the public sector as accountabilia, which are used to shift the accountability of these system and concentrate it towards them. In unearthing these oftentimes hidden structures, one can fully grasp the sociotechnical network of these systems. This then not only helps to move away from “putting the technology in the explanatory driver’s seat” (Gillespie, 2014, p. 169), but might also be used to respond to the implementation of such systems.

After this concluding paragraph, I want to go back to the start of this thesis. This thesis begun with a positive example of machines that dream and how this shaped my excitement about future possibilities. Chronologically, I now want to shift this excitement into the present day and show how it changed. While writing this thesis, news about ChatGTP, DALL-E 2 and Midjourney arose. These new forms of Artificial Intelligence have shown me just how good the technology has become, but also how scary it could be. Suddenly, people could make chats with famous people, their answers only artificially generated. Pictures and paintings, for the first time, did not have the tint of mechanical creation, they looked as if made by

people. It was a huge step, seeing this, and comparing this with the many dog faces of *the computer that dreamed*.

But this new technological achievement and availability also fell in the time frame of my interviews, where people started to talk about automatisisation in several work sectors, the AMS just being one of them. And while AMAS itself, as the thesis should have shown, was not understood as sophisticated, nor as an improvement, the technology itself was not seen as dangerous. It was seen more as a metaphor for changing times. A change, where more and more labour might get outsourced by machines. And while this story may be as old as time, and by no way should it be in the vein of technophobia, what applications like ChatGDP or Midjourney show is that for the first time, creative labour might be threatened in the future.

With this knowledge, and this thesis in mind, a bit of my enthusiasm subsided. Computers, or algorithms, do not dream anymore. They woke up and do things. The question here is then, how can we contribute to a good and useful integration of these machines into society, without limiting the individual to mere data used by these new actants. With all this said and done, I am still sure society will find a way. Only that algorithms do not dream anymore. They do. In a hybrid network.

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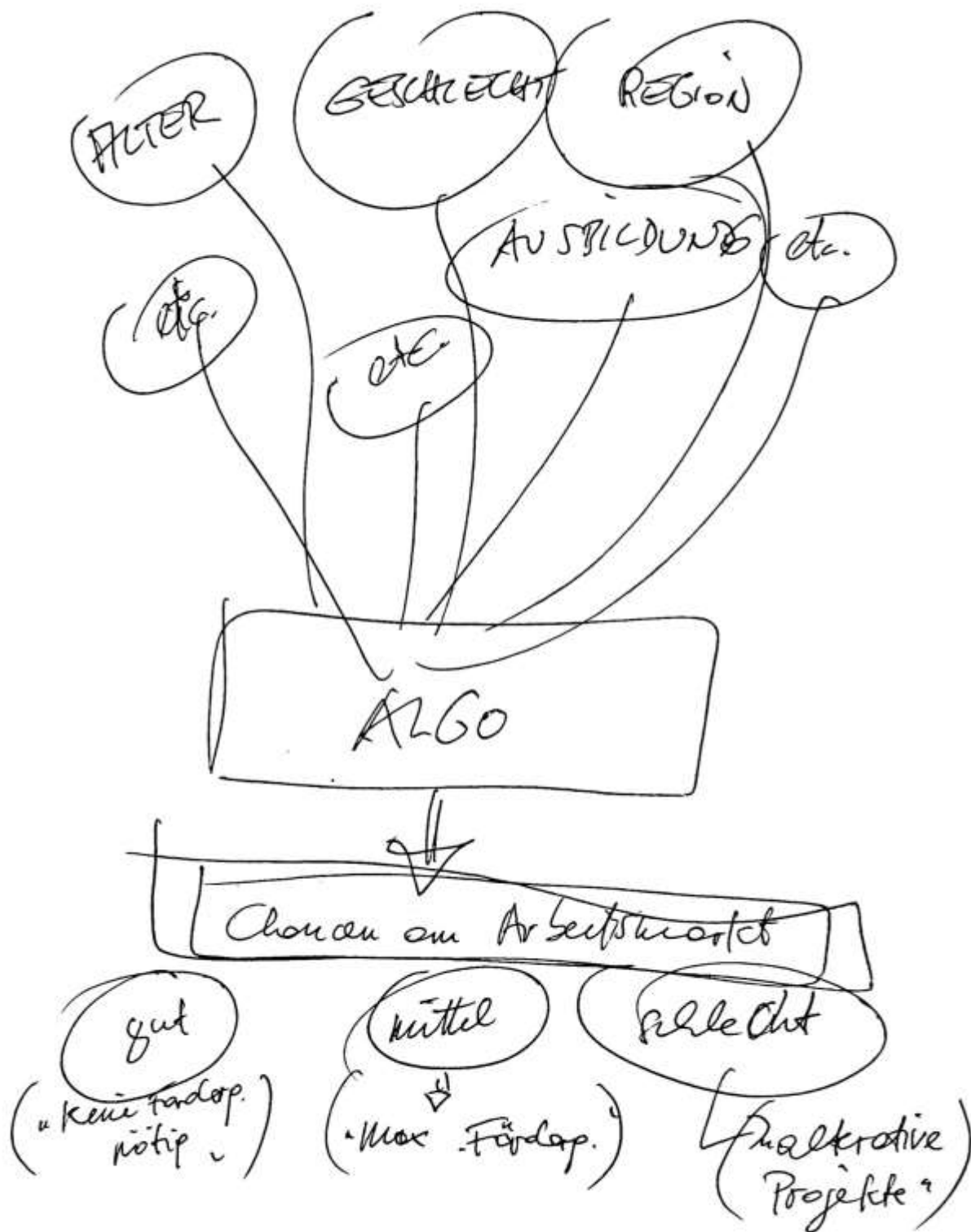
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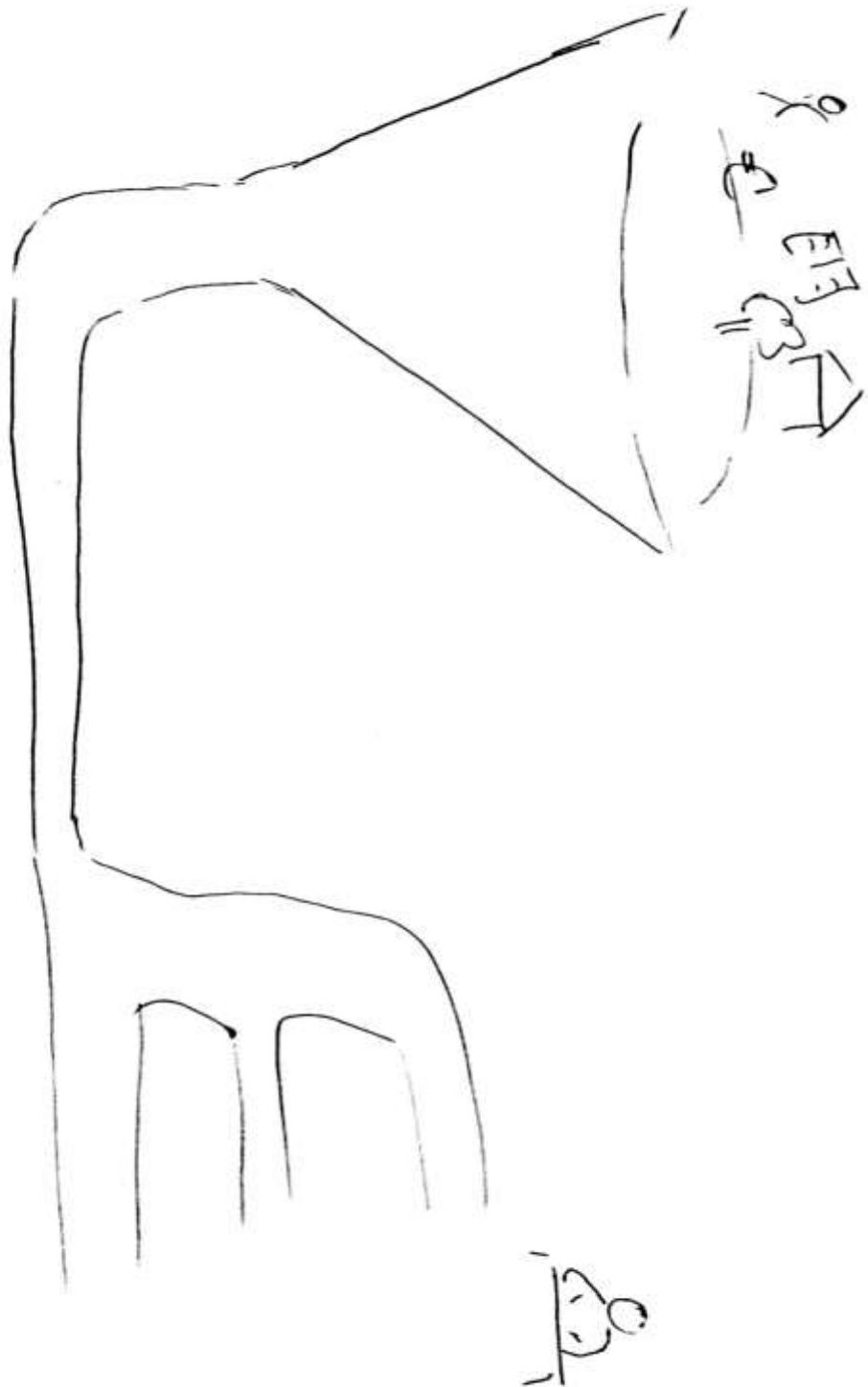
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Appendix I - Rich Pictures

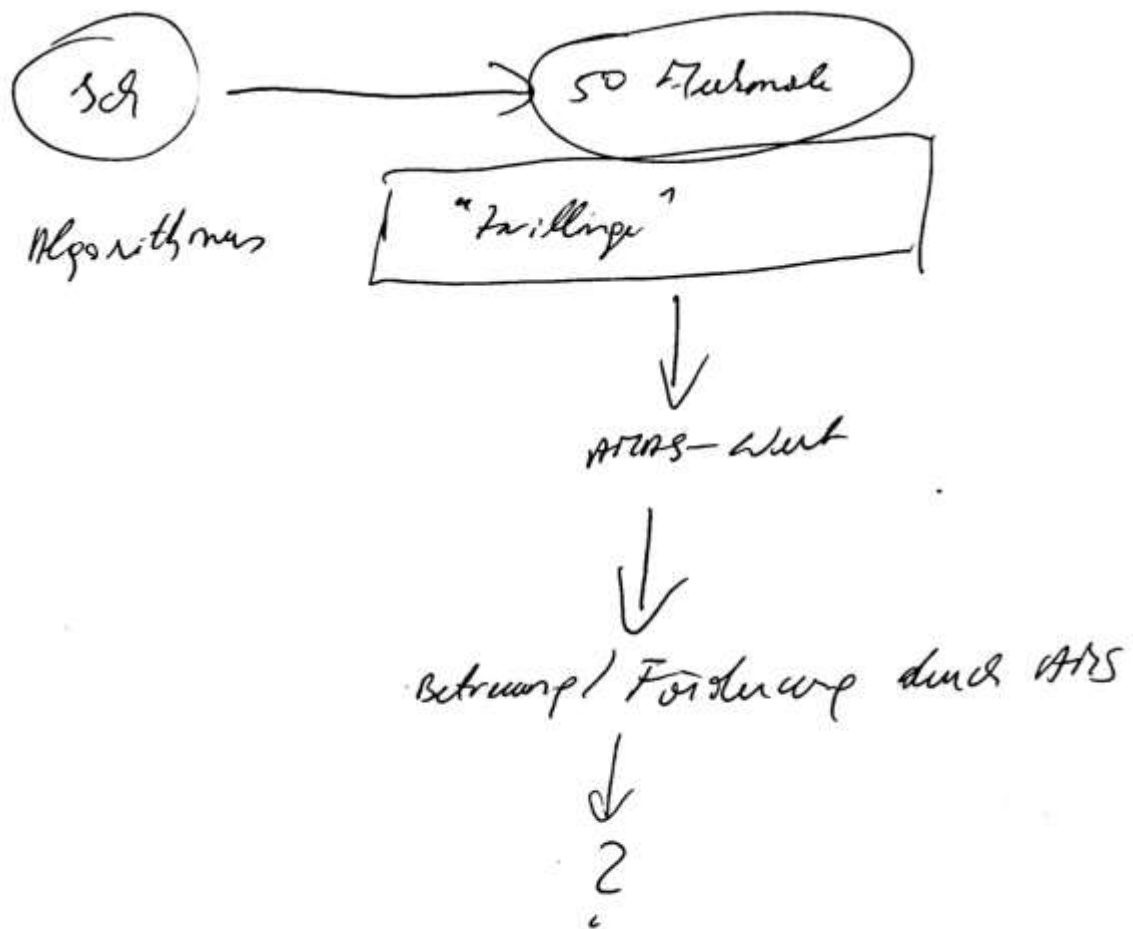
Rich Picture A



Rich Picture B



Rich Picture C



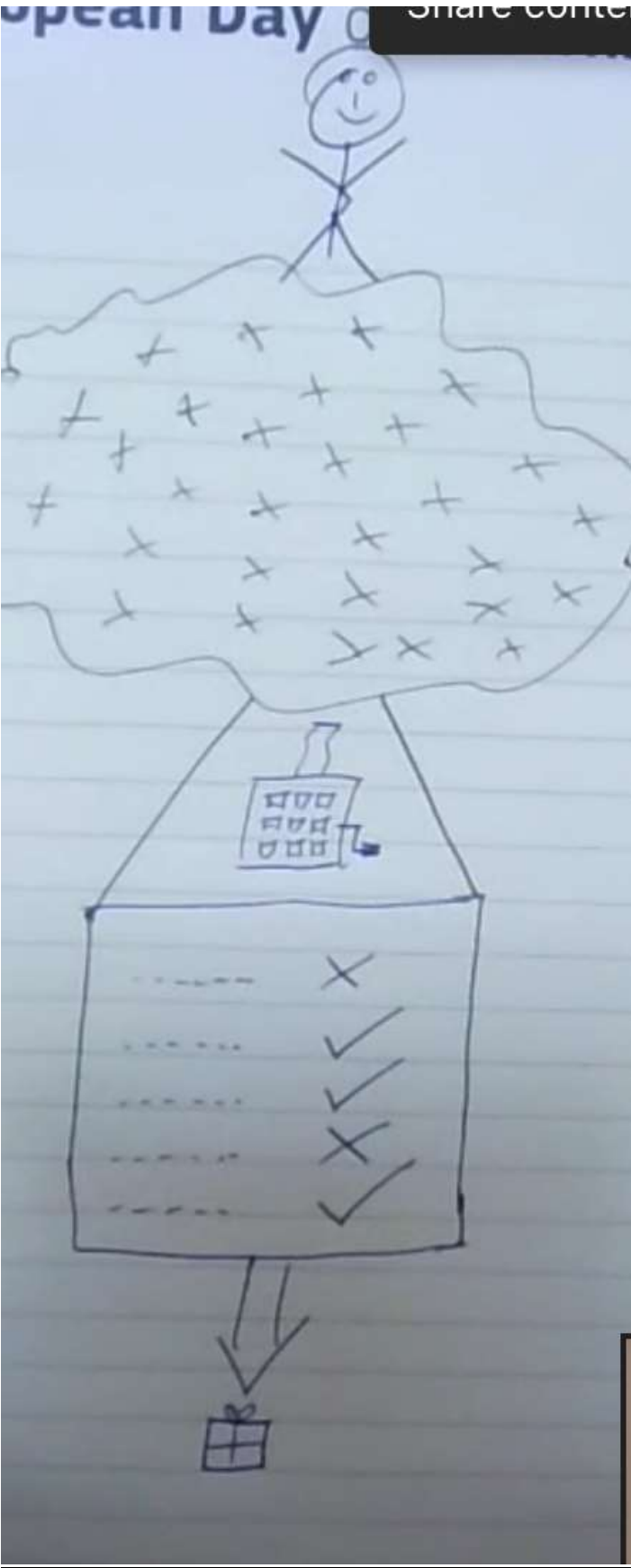
Algomat



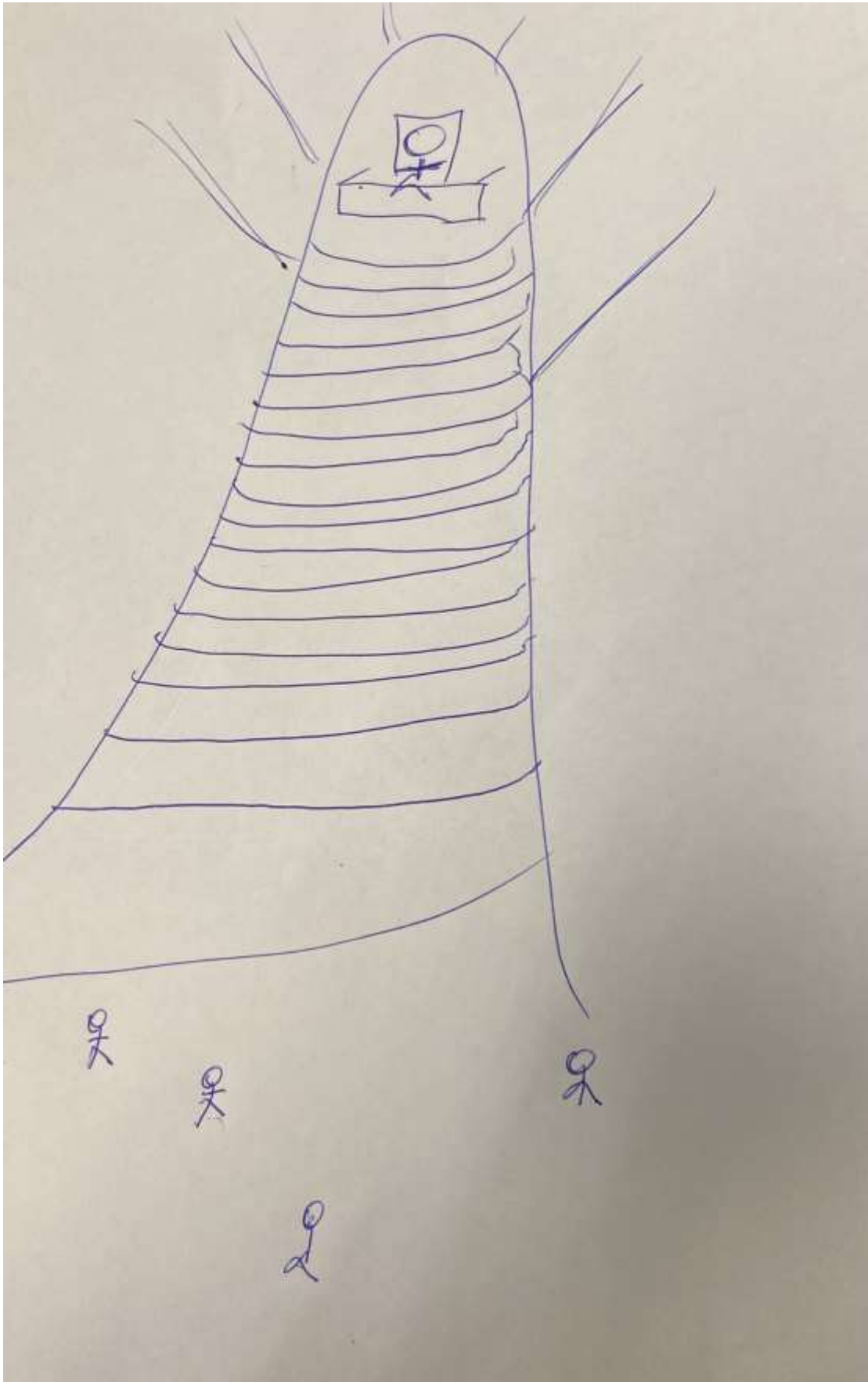
Algomat Data Input



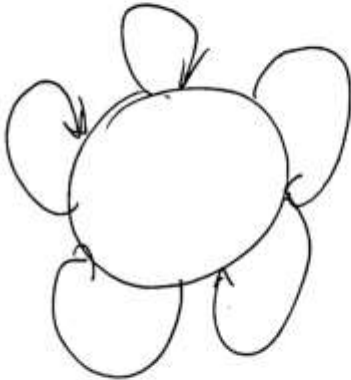
Rich Picture D



Rich Picture E



Rich Picture F



Appendix II - Interviews

The following quotes are ordered in the way they appear in the thesis.

<u>Quote</u>	<u>Translation</u>
“Patt-Stellung”	“stalemate” (Interview 3)
“wir stehen ja vor Trümmern.”	“we are standing in front of ruins” (Interview 6)
“ Die haben jetzt ein PR Problem.”	“[the AMS] now [has] a PR problem” (Interview 7)
“Super! Aber wenn man sich überlegt, wie das getrieben wurde, ist es erstaunlich wenig. Und wenn man sich überlegt, dass es im Jahr eine Millionen Leute von Erwerbsarbeitslosigkeit betroffen sind. Also eine Millionen und dann hast’ 4.000 Unterschriften.”	“Great! But if you think about how [the petition] was pushed, it is astoundingly little. And if one thinks about it, that every year one million people are affected by unemployment... So, one million and you have 4.000 signatures.” (Interview 6)
“da kamen glaube ich Leute die vorhin noch überhaupt nicht im Radar des AMS waren”	“there came people, I believe, which were previously not at all on the radar of the AMS” (Interview 4)
“Und, ich würde jetzt sagen, vor rund einem Jahrzehnt hat das dann wieder rein mehr Dynamik gekriegt.”	“I would say a decade ago, this gained more dynamic” (Interview 3)
“Und dann Mitte des letzten Jahrzehnts sind die Ressourcen beim AMS wieder knapper geworden und man hat dann wieder verstärkt angefangen, automatisieren, effizienzsteigern.”	“Then, amid the last decade, AMS resources became sparse again and they reinforced starting automatisisation, increasing efficiency.” (Interview 3)
“Und wir sind natürlich von Anfang an hellhörig gewesen, nachdem die Diskussion nicht zum ersten Mal war.”	“Of course, we have been sharp-eyed from the start, after this discussion was not the first time” (Interview 3)
“erstaunen und gleichzeitig ‘aha und da gibt’s wieder was”	“astonishment, and at the same time ‘aha there again is something” (Interview 5)
“ein großes innovatives Produkt. Vollgespickt mit künstlicher Intelligenz.”	“great innovative product. Packed with Artificial Intelligence” (Interview 3)
“In der Frühphase, habe ich gedacht, das ist tatsächlich ein Lernendes, sich selbst lernendes, sich adaptierendes Gebilde, Black Box.”	“In the initial phase, I thought, that it really is a learning, self-learning, self-adapting formation, black box” (Interview 3)
“dass es da so ein tolles Ding gäbe”	“that there would be such a great thing [i.e. AMAS]” (Interview 6)
“also der hat sich so ein bisschen auf den Algorithmen Hype draufgesetzt”	“he [bet] a little bit on the algorithm hype [in his presentation]” (Interview 6)
“Nein, nicht besser. Subtiler? Also näher an der Idee eines... eines Machine-Learning. Mehr an der Idee an künstlicher Intelligenz. Näher an dieser Idee dran. Und	“No, not better. Subtle? So closer to the idea [of] machine learning. Closer to the idea of artificial

eben halt, das war, als herausgekommen ist, dass das mehr Gruppierungsdinge sind.”	intelligence. Closer to this idea. And what it turned out to be, that it was more [of a] grouping thing.” (Interview 6)
“Also es ging sozusagen um die Vermarktung der Geschichte in der Öffentlichkeit und nicht, dass die Leute davon was haben. Die Betroffenen.”	“So it was about marketing this thing to the public and not that the [job-seekers] get something out of it. The affected.” (Interview 6)
“Und wenn die so knallhart die Kommunikation verweigern, dann muss ich da irgendwie etwas vermuten, was nicht in Ordnung ist.”	“If they [...] deny communication [with us], then I have to assume that something might not be in order” (Interview 7)
“Und meine Wahrnehmung war immer so, dass der AMS Vorstand, also dass die Reaktion so war, niemand versteht das eigentlich was wir hier machen. Und das fand ich ein bisschen nervig. Weil ich mir dachte ja wenn es keiner versteht, dann erklärt das halt so, dass man es verstehen kann.”	“And my perception always was, that the AMS board director, that is, his reaction was, that nobody really understands what [they] are doing here. And I thought that this was annoying, because I thought, if nobody understands it, then explain it so everybody can understand it.” (Interview 4)
“Wir haben bei Medikamenten sozusagen diese Beipack Pflicht, wo auch hingeschrieben wird "Bitte beachten Sie Nebenwirkungen". Äh, das ist leider im IT verkauf nicht der Fall.”	“With medicine, we have mandatory leaflets, where also it is written ‘please look out for side effects’. That is sadly not the case in selling IT” (Interview 2)
“laut AMS Seite hat man nur ein Beispiel geben wollen wie das funktioniert und das ist dann als DAS Beispiel und das ist dann gleich als diskriminierend vorgekommen weil der Algorithmus so gescheit ist wie es ja im übrigen die AMS BeraterInnen auch immer waren, dass Ausländische Namen, oder falsches Geschlecht oder falsches Alter oder so halt irgendwie voll blöd sind dem ersten Arbeitsmarkt zu gefallen.”	“according to the AMS page, [they] only wanted to give one example of how [AMAS] functioned and this was used as that example and that, it soon struck [me] as discriminating because the algorithm was clever, like the AMS case-workers also always were, that foreign names, or the wrong gender, or wrong age are somehow really not good for being liked by the first labour market.” (Interview 5)
“Also Algorithmus ist das, wenn der Programmierer zu faul ist, das zu erklären.”	“[a]lgorithm is that, when a programmer is too lazy to explain [it]” (Interview 6)
“Oder, jetzt ganz vereinfacht gesagt, ein Kochrezept ist ja auch nur ein Algorithmus, oder?”	“simply, a cooking recipe is an algorithm too, isn’t it?” (Interview 4)
“Und der Algorithmus ist sozusagen ein Mechanismus, um irgendwo Daten zu sammeln, aufzuwerten, aufzugreifen, zusammenzufügen, und daraus dann Schlussfolgerungen zu finden. Das, was daraus dann passiert, ist immer das, was wir ihm sozusagen vorausgedacht haben.”	“And the algorithm is, so to speak, a mechanism for collecting data, upgrading, apprehending, merging, and putting that together to find conclusions. What happens from that is what we, so to speak, thought ahead.” (Interview 2)
“wenn du ‘ne Programmierung hast, dann ist es ja so, dass du dem Computer, der ist ja erstmal doof, wenn du dem nicht sagst, lauf von A nach B, dann macht der gar nichts. Das heißt, was du mit einer Programmierung machst, ist, du lernst dem Computer	“if you have a programming, [...] you have to [tell] the computer, who is stupid in the first place if you don’t say to him run from A to B, he does not do anything. This means, what you do with

von A nach B laufen. Der läuft aber jetzt nur von A nach B, wie du es davor definiert hast. Du sagst, okay, du fängst bei A an, dann fragt der Computer ja, wo ist denn A? Sonst läuft er einfach. Und läuft und läuft und läuft. Und so ähnlich ist es ja beim AMS Algorithmus auch. Du musst ja da ganz klare Entscheidungen sozusagen voreinstellen.”	programming, is that you learn the computer to go from A to B. But he now only runs from A to B, as you defined it before. You say [...] you start at A, then the computer asks where is A? Otherwise he just runs. [...] And that is similar to the AMS algorithm. You have to preset really clear decisions.” (Interview 7)
“ich finde es als Technologie jetzt nicht wahnsinnig ausgefeilt”	“I think that the technology [of the AMAS] is not really sophisticated” (Interview 4)
“irgendein technischer Firlefanz.”	“technological frippery” (Interview 6)
“wo dann immer noch die Frage ist, wer setzt die Ziele fest”	“still bring up the question, who defines the goals” (Interview 5)
“dass einfach der bestehende Bias fortgeschritten wird.”	“that the existing bias is continued” (Interview 1)
“jeder Algorithmus im Grunde ein in Code gefasstes Vorurteil eines Entwicklers.”	“every algorithm is basically a bias of the programmer embedded in code” (Interview 2)
“Algorithmen stammen von Menschen. Menschen sind gebiast, in welcher Hinsicht auch immer. Also ist das was sie produzieren auch immer gebiast “	“Algorithms originate from men. Men are biased, in whatever respect. So, what they produce is also always biased.” (Interview 6)
“Ich glaub’ tatsächlich, wenn, um das jetzt überspitzt zu sagen, wenn der Algorithmus von alten weißen Männern kreiert wird, wird er alles andere schlechter behandeln als das.”	“I believe [...] if the algorithm is created by old white men, [the algorithm] treats everything else as bad” (Interview 1)
“Wir wissen zum Beispiel, äh, dass Gesichtserkennung bei weißen Männern gut funktioniert, bei farbigen nicht so gut funktioniert, äh, weil die Kamera weiße Hauttöne und dunkle Hauttöne besser auseinanderkennen würde, sondern weil es weiße Männer programmiert haben.”	“We know for example, that facial recognition functions well for white men, for coloured [sic] it does not function as good, [not] because the camera can distinguish better between white skin colour and black skin colour, but because white men programmed it.” (Interview 2)
“Wenn ich ein diverses Team hab’ im Bezug auf Behinderung, Geschlecht, Ethnie alle alle alle Faktoren, wenn ich hier diverses Team habe, dass diesen Algorithmus ähm entwickelt, dann wird das Bias Potential auch möglichst gering sein.”	“If I have a diverse Team relating to disabilities, gender, ethnics, all factors if I have a diverse team that develops this algorithm, then the potential bias is as low as possible.” (Interview 1)
“Weil Algorithmen unsere Vorurteile widerspiegeln.”	“continuing the bias” (Interview 2)
“das ist Menschenwerk.”	“that it is human-made”(Interview 6)
“sozusagen dass der Computer ähm schnell was ausrechnet wofür der Mensch lange braucht”	“that the computer can quickly calculate something, for which the human would take longer” (Interview 1)

“Das AMS erhebt alle Daten... erhebt all diese Daten von allen Arbeitssuchenden, die sich bei ihnen melden.”	“The AMS gathers all the data [...] from every job-seeker that registers with them.” (Interview 4)
“über das Instrument des Auskunftspflicht Gesetzes herauszufinden, also sozusagen StaatsbürgerInnen, in dem Fall welche Daten puuuh... Basis, oder welche Daten woher kommen, wofür verwenden werden sollen um was herausfinden zu wollen. Weil im Grunde habe wir ja offiziell... wissen wir ja nix.”	“via the instrument of the law of disclosure obligation, therefore so to say as citizens, [...] which data [...] basis, or where the data comes from, for what they will be used to find out what. Because basically we officially did not know anything.” (Interview 5)
“Wenn es dann nicht mehr nachvollziehbar ist was hineinfließt, was herauskommt.”	“It is not traceable what comes in, what comes out” (Interview 4)
“was da auf der Job-Plattformen läuft, sind Zufallstreffer. Mehr ist das dann nicht.”	“What happens there, on the job platform are strokes of luck. That’s all that is.” (Interview 3)
“Also auf der einen Seite aus Registerdaten und auf der anderen Seite durch Selbstauskunft?”	“on the one side from registry data and on the other side through self-disclosure?” (Interview 1)
“Uni-Abschlüsse, Bildung, Lebenssituationen, finanzielle Situationen, Vorlieben, Regionen”	“university degrees, education, life situation, financial situation, preferences, regions” (Interview 4)
“Man schmeißt ein paar alte Zahlen rein.”	“One throws in some old numbers” (Interview 3)
“2020 war ja einfach so ein Bruch, also auch im Arbeitsmarkt [...] wir sprechen über einen komplett anderen Arbeitsmarkt.”	“2020 was a break, also in the employment market [...] we are talking about a completely different labour market” (Interview 7)
“Und ihr könnt das überhaupt nicht mehr vergleichen, weil die Daten, die dafür hergenommen wurden, stammen von vor 2019.”	“You can not compare [the data] anymore, because the data used [for AMAS] comes from before 2019” (Interview 7).
“Da nutzt es mir nicht, das Ergebnis vom Algorithmus aus vor 3 Jahren, wo ich Hochkonjunktur gehabt habe.”	“It is no use for me, that the result of the algorithm comes from three years before, where I had an economic boom” (Interview 3)
“Es ist ja die Datenlage in Österreich ja fast sensationell.”	“the data situation in Austria is nearly sensational” (Interview 3)
“Das AMS lässt über die Nacht sozusagen abrufen, wer ist aktuell arbeitslos, arbeitssuchend, wer ist lehrstellensuchend.”	“[t]he AMS retrieves overnight who is currently job-less, job-seeking, who is an apprenticeship seeker” (Interview 3)
“Der mittlere Bereich sind die halb Faulen, die machen wir wieder ein bisschen schöner. Und die ganz Faulen vergessen wir. Beziehungsweise machen wir mit denen andere Projekte als die direkte Förderung.”	“[t]he middle sector are the half-lazy. We make them nice again. And we forget the real lazies. Or rather we make other projects with them, instead of direct support.” (Interview 5)
“AMS Arbeitet ja schon länger mit drei Kategorien”	“That is how the AMS worked long before, with three categories” (Interview 4)

“Der Mensch ist ein widersprüchliches, Irrationales Wesen”	“[t]he human is a contradictory, irrational being” (Interview 3)
"Ja, ich glaube das Problem ist einfach, dass man anhand der Datenlage einfach bloß Hardskills irgendwie abchecken kann. Im Gegensatz zu Soft Skills, die man anhand menschlicher Betreuung und menschlichen Kontakt dann auch herstellen muss. “	“I believe the problem is simply, that one can only check hard skills through the data situation. In contrast to soft skills, which one has to establish through human care and human contact” (Interview 7)
“Genauso auch, wie die Zuordnung, wo sind denn die Grenzen. Mit welchen Wahrscheinlichkeiten, Arbeitsmarktchancen, kommt man denn ins obere oder ins untere? Das ist mehr oder weniger hanebüchen gemacht.”	“As well as the assignment, where are the borders? With which probabilities, labour market opportunities, does one come into the top or lower segment? This is more or less absurdly made.” (Interview 3)
“steifen mechanischen Zuordnung”	“stiff, mechanical segmentation” (Interview 3)
“entmenslichten”	“dehumanising” (Interview 6)
“I’m not your data”	“I’m not your data” (Interview 6)
“so dass am Schluss dann ein Backerl rauskommt an Informationen.”	“package of information” (Interview 1)
“Die Maschine ist ein Machtgefälle. Ein codisiertes...”	“[AMAS] is power imbalance. A coded [power imbalance]” (Interview 6)
“Das Problem bei einem Algorithmus ist, kein Mensch traut sich dem zu widersprechen.”	“[t]he problem with an algorithm is, that nobody dares to disagree with it.” (Interview 2)
“Das AMS auch so ein bisschen eine Blackbox ist, so wie der Algorithmus an sich “	“The AMS is also a bit of a black box, like the algorithm itself” (Interview 7)
“frisst sich dann in Köpfe von Arbeitslosen fest.”	“eats itself into the heads of the job-seekers” (Interview 3)
“Das AMS sagt ja, wir verwalten und managen Arbeitslose und wir schauen, das was weiß ich was, das heißt, die greifen also sehr tief in die Privatsphäre der Menschen ein und in diesem Spannungsfeld ist natürlich alles, was sich da irgendwo ändert... sorgt immer für Nervosität”	“The AMS says, we administer and manage jobless and [...] that means they reach really deep into the privacy of people and in this area of tension is, naturally, everything that changes there, always leads to nervousness.” (Interview 2)
“das möchte man zumindest hoffen.”	“one would at least hope”(Interview 5)
“Das ist sozusagen der große Berg AMS. Da oben ist, der Sachbearbeiter, der oben auf seinem entfernten Balkon sitzt [...] und sind die davon abhängigen, die am Boden liegen”	“That is so to speak the big mountain AMS. Up above, there is the case-worker, that sits on a distant balcony [...] and those, that are dependent on [him], lay on the floor.” (Interview 2)
“der ist so distanziert, so weit weg. Es ist ein Weg vorgezeichnet, den niemand gehen kann und er ist oben am Thron. Und tut dem Volk unten sagen, was richtig und falsch ist. “	“[the case-worker] simply is so distant, so far away. It is a predefined way, which no one can walk, and he is up there on the throne and tells the people

	what is wrong and what is right.” (Interview 2)
“es ist hochpolitisch die ganze Kiste.”	“It is highly political the whole thing.”(Interview 7)
“mit Türkis-Blau hat das dann wieder neue Energie bekommen”	“With turquoise-blue it got new energy again.” (Interview 3)
“Und ich glaube schon auch ein bisschen deswegen, weil die politische Gemengelage gerade so war, dass man der Regierung ohnehin sehr genau auf die Finger geschaut hat.”	“And I think the reason for this was a little bit because the political [situation] was that one kept one's eye closely on the government.” (Interview 4)
“Wenn das ein SPÖ Arbeitsminister in Auftrag gegeben hätte und umgesetzt hätte, glaube ich, dann wäre zumindest bei uns der Widerstand nicht sofort so groß gewesen.”	“If an SPÖ labour minister would have commissioned and implemented [AMAS], I think that the resistance, at least from us, would not have been as big.” (Interview 4)
“Das ist ethnische Profiling.”	“ethnic profiling” (Interview 2)
“es ist völlig wurscht welche Partei”	“it does not matter which party” (Interview 2)
“es ist Ausdruck des AMS.”	“expression of the AMS” (Interview 6)
“dass politisch eingegriffen wurde. In ein Algorithmus. Das heißt, hier wird eine Maschine manipuliert, um ein politisches Ziel zu erreichen.”	“There was political intervention. In an algorithm. That means, here is a machine, which gets manipulated, to achieve political goals.” (Interview 2)
“Es ist ein Ausfluss dieses Systems”	“the outflow of the [political] system” (Interview 6)
“Es ist eine politische Totgeburt, auf jeden Fall.”	“political stillbirth” (Interview 7)
“Erwerbsarbeitsfetisch”	“gainful labour fetish” (Interview 4)
“was ist eigentlich der Arbeitsmarkt? Das ist ja auch schon ein Konstrukt, ja. Im Sinne Markt, da steckt also da kann man wirklich weit hineingehen, und im Endeffekt bedient es ein gewisses Setting. Und dieses Setting ist, würde ich nicht wirklich sagen, zum Vorteil der Erwerbsarbeitslosen.”	“What is the labour market? That already is a construct. Within the meaning of market, [...] and ultimately it serves a certain setting. And this setting, I would not say, is in the benefit of jobless”(Interview 6)
“den sogenannten Drehtür-Effekt.”	“revolving door effect” (Interview 6)
"eigentlich ja, es geht so um ein selbstbezügliches System. Da haben wir was. Schwupps, Blups. Blubs... Es bedient sich sozusagen selbst.”	“It is about a self-referencing system [...] it serves itself, so to speak.” (Interview 6)
" Also die Leute werden vom System bearbeitet und kommen wieder ins System und so. [...] Es gibt den sogenannten Drehtüreffekt. Das Leute kurz arbeiten und so weiter. Ja das ganze Ding ist das System.”	“So, the people which get processed by the system, come back into the system. [...] There is the so-called revolving door-effect, that people work shortly and so on. Yes, this whole thing is the system.” (Interview 6)
“Und eben, für mich ist der AMS Algorithmus eigentlich der Kulminationspunkt eines	“For me, the AMS algorithm is a culmination point of a dysfunctional system” (Interview 6)

dysfunktionalen Systems. “	
“Und eben, für mich ist der AMS Algorithmus eigentlich der Kulminationspunkt eines dysfunktionalen Systems.”	“culmination point of a dysfunctional system” (Interview 6)
“Da bleibt eher diese bissl Befriedigung, dass wir schon... ja, getraut hat da einen Stein aufzuheben, “	“The satisfaction that we [dared] to lift a stone” Interview 5)
“ich ich kann mir vorstellen, dass man solche Systeme unterstützend zum Menschen einsetzt. Und Bedarfe zu ermitteln, und dann noch die Bedarfe abzudecken.”	“I can imagine, that one can use such systems in support to humans. [To] detect needs and then to cover needs.” (Interview 1)

Appendix III - Abstract (English)

In 2019, the Austrian Public Employment service AMS (*Arbeitsmarktservice*) trialled the integration of a statistical profiling system in their day-to-day activities. The goal of the system, also called AMAS (*Arbeitsmarktchancen-Assistenzsystems*), was to automatise the process of grouping job-seekers according to their need for help to find employment. However, through this test run, problems of the system quickly became known which led to public criticism. After this outcry, the implementation of the system had to be postponed indefinitely. As it was shown, the supposed function of enabling job seekers to get better chances on the labour market could lead to the opposite and could have the effect of reproducing social discrimination of already marginalised groups.

While the use of algorithmic profiling systems in the public sector by now is common, the Austrian example offers an interesting way in understanding these systems. It shows how the problems of such systems were discussed on a public stage. Due to its specific nature of being a postponed technology, meaning that the decision on it is still up in the open, it is an interesting case of understanding its imaginaries.

Apart from the Austrian example, algorithmic profiling systems in the public sector are oftentimes criticised. While in the academic world, this issue has already become important, there is not much activism in the general public. As pointed out by some scholars, the problem here lies in a lack of understanding how these systems get enacted by affected publics. The question to ask is thus, how does the public think and create meaning about these systems?

Through analysing the question “*Which imaginaries around algorithmic decision-making and profiling tools exist in affected publics?*” this thesis aims to offer an understanding on how first and foremost AMAS is understood and conceptualised, but also what these imaginaries mean for the broad field of algorithmic decision-making and profiling tools.

In using the concept of sociotechnical- and algorithmic imaginaries, this thesis analyses which imaginaries about a public employment profiling system, such as AMAS, are circulating in affected publics. The method used for this thesis is that of interviewing affected publics, meaning stakeholder in the discourse surrounding the systems but also job-seekers. Incorporated in the interviews was the method of rich pictures, a method where the interviewees are invited to draw oftentimes abstract concepts. These then too were used to grasp an oftentimes intangible concept.

The thesis will show that the system itself is always understood as part of a larger sociotechnical network. It acts as accountabilia, an object which shifts the accountability of actor-networks onto the technical system. Through disentangling this accountabilia, it will be shown that AMAS is a concept, which is used as a signifier for prevalent societal and political problems. At the same time, however, it is an amalgamation of these problems it signifies to.

Appendix IV - Abstract (German)

Im Jahr 2019 testete der österreichische Arbeitsmarktservice (AMS) die Integration eines statistischen Profiling-Systems. Ziel des auch AMAS (Arbeitsmarktchancen-Assistenzsystems) genannten Systems war es, den Prozess der Gruppierung von Arbeitssuchenden nach ihrem Bedarf an Unterstützung bei der Arbeitssuche zu automatisieren. Durch diesen Testlauf wurden jedoch schnell Probleme des Systems bekannt, die zu öffentlicher Kritik führten. Nach diesem Aufschrei musste die Einführung des Systems auf unbestimmte Zeit verschoben werden. Es zeigte sich, dass die vermeintliche Funktion, Arbeitssuchenden bessere Chancen auf dem Arbeitsmarkt zu verschaffen, zum Gegenteil führen könnte und die soziale Diskriminierung von bereits marginalisierten Gruppen reproduzieren könnte.

Abgesehen vom österreichischen Beispiel werden algorithmische Profiling-Systeme im öffentlichen Sektor häufig kritisiert. Während dieses Thema in der akademischen Welt bereits an Bedeutung gewonnen hat, gibt es in der breiten Öffentlichkeit nicht viel Aktivismus. Einige Wissenschaftler weisen darauf hin, dass das Problem hier darin liegt, dass nicht verstanden wird, wie diese Systeme von den betroffenen Bevölkerungsgruppen aufgenommen werden. Es stellt sich also die Frage, wie die Öffentlichkeit über diese Systeme denkt und ihnen Bedeutung verleiht.

Durch die Analyse der Frage "Welche *Imagaries* über algorithmische Entscheidungsfindungs- und Profiling-Tools existieren in den betroffenen Öffentlichkeiten?" soll diese Arbeit ein Verständnis dafür bieten, wie AMAS in erster Linie verstanden und konzeptualisiert wird, aber auch, was diese Vorstellungen für das breite Feld der algorithmischen Entscheidungsfindungs- und Profiling-Tools bedeuten.

Unter Verwendung des Konzepts der soziotechnischen und algorithmischen *Imagaries* wird in dieser Arbeit analysiert, welche *Imagaries* über öffentliche Profiling-Systeme, wie AMAS, in den betroffenen Öffentlichkeiten kursieren. Die Methode, die für diese Arbeit verwendet wurde, ist die der Interviews. Hierbei wurden betroffene Personen, d.h. Stakeholder im Diskurs um die Systeme, aber auch Arbeitssuchenden, befragt. In die Interviews wurde die Methode der Rich Pictures integriert. Eine Methode, bei der die Befragten aufgefordert werden, oft abstrakte Konzepte zu zeichnen. Auch diese wurden dann verwendet, um ein oft nicht greifbares Konzept zu erfassen.

Die Arbeit wird zeigen, dass das System selbst immer als Teil eines größeren soziotechnischen Netzwerks verstanden wird. Es fungiert als Accountabilia, als ein Objekt, das die Verantwortung von Actor-Networks auf das technische System verlagert. Durch die entwirren dieser Accountabilia wird gezeigt, dass AMAS ein Konzept ist, das als Signifikant für vorherrschende gesellschaftliche und politische Probleme verwendet wird. Gleichzeitig ist es aber auch eine Verschmelzung dieser Probleme, für die es steht.