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Big Data policing and its legitimacy

Master Thesis

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Abstract

Big Data policing is a quite new field within the police work and also the legitimacy aspect of the use of Big Data technologies in policing has not been fully researched by now. Consequently, as it still is an emerging and growing field, it is worth taking a closer look at it. This is why the thesis established which and to what extent Big Data technologies are used within policing and afterwards evaluated if those technologies are legitimately used. As this is an underdeveloped field, this thesis provides new knowledge about this very important aspect of policing as legitimacy is crucial when seeking the approval of the citizens.

The focus lies on the region around Enschede in the Netherlands and the Münsterland in Germany. Officers from both areas have been interviewed with the interviews being semi-structured. This enabled a comparison which showed that the Dutch police uses much more Big Data than the German and that both groups of officers mostly consider their use of those technologies as legitimate. Additionally, citizens have been questioned. Their thoughts are important as without the citizens' consent legitimacy cannot be reached. Overall, they are a bit more sceptical about Big Data policing than the officers but in both districts the trust is quite high. Still, most do not exactly know which technologies the police uses and do not know those themselves. To be able to evaluate the legitimacy aspect the Procedural Justice Approach by Tyler and theoretical additions have been used and to analyse the interviews a qualitative content analysis has been performed. According to all respondents groups there is a lack of transparency. Thus, this aspect is most important to evaluate for the police in the future to strengthen legitimacy. Overall, the officers evaluate the legitimacy aspects a bit more positively than the citizens.

The thesis aims to give new insights into Big Data policing. As most of the researchers focused on the United States it provides novel observations about different countries. Moreover, it was aimed to add in-depth information and lead to a better comprehension of the broad topic Big Data. Particularly how the opinions of the officers and citizens vary and to see what needs to happen in the future to enhance legitimacy. For future research it is crucial to include more officers and citizens to be able to say something about the whole population. This qualitative research provided a novel glimpse into the topic and a new starting point for further research.

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List of Abbreviations

BVIB	Basisvoorziening Integrale Bevraging
EU	European Union
GMS	Geintegreerde Meldkamer Systeem
LKA	Landeskriminalamt (State Criminal Police Office)
NYPD	New York Police Department
OSINT	Open Source Intelligence
USA	United States of America
VIVA	Verfahren zur integrierten Vorgangsbearbeitung und Auskunft (Process for integrated operation processing and information) – Vorgangs- und Bearbeitungssystem (Operation and processing system)

1 Introduction

The exponential growth in the volume of data and its use in almost all areas of society has led to new possibilities, like better access to and processing of data, but also challenges. A popular catchphrase in this context is *Big Data*. It is an elusive concept due to its application in multiple areas. It further extends to more than merely the increasing data generation. After the scandal with Snowden in 2013 and the surveillance disclosure, people got more sensitive about data protection and have a better idea of how Big Data can influence their lives. It is an increasingly important part of everyday life, as a great deal of data is collected just by using smartphones. The internet, the new possibilities created by algorithms and new techniques provide new opportunities for several different industries. But of course, there are also drawbacks, like possible threats to privacy and data protection. For instance, it has been discovered that with Facebook likes sensible information like sexual orientation, political opinions and much more can be precisely anticipated (Kshetri, 2014). This is why transparency is very important, so that one knows how certain information have been processed (Weichert, 2013), as well as the legitimate use.

Nowadays almost everyone is in some way connected to Big Data, whether knowingly or not. Additionally, people are the ones who create Big Data and they leave tracks everywhere. They use social media sites like *Facebook*, *Twitter* and Co., upload videos and photos on *Instagram*, *TikTok* and *WhatsApp* but not all of them are aware that they leave very valuable information for many different actors behind. The inevitability of affectedness for almost all people is a legitimate reason why it is worth scrutinizing the usage of Big Data further. The data volume of the world is rising every year (Statista, n.d.). Big Data is thus related to this vast amount of data not only by the mere data creation but also by the analysis of data and the extraction of valuable information that can be used to guide individuals, policymakers or businesses. Further, it is a quite new phenomenon and is used more and more in different areas such as the smart city sector (see e.g. Batty, 2013) or the healthcare where e.g. diseases can be discovered faster (see e.g. Cheng et al., 2017). Thus, Big Data becomes increasingly important for more sectors and people and is a tool which can and should no longer be ignored.

Big Data also plays an increasingly important role in the police sector, e.g. to predict crimes or to record and retrieve data on individuals more quickly which helps police departments allocate their personnel more efficiently. The thesis will focus on Big Data policing and since this primarily affects citizens its legitimacy will also be assessed. Only a few studies analysed this topic in depth but it is crucial to study as it intervenes in private spheres. In the United States (USA) Big Data techniques are e.g. used more and more by the police to predict and therefore

prevent crimes (e.g. Ferguson, 2017a). This is called a shift from reactive to predictive policing (Brayne, 2017). Places can be analysed according to their threat grade. Certain persons can be evaluated, e.g. it can be estimated if they are likely to get involved in a crime. More accurate information can be made available for officers and faster proceedings are possible. Big Data is believed to enhance the police work e.g. by providing more accurate information about places and persons (Ferguson, 2017b). By making the police work faster, more objective and more efficient, Big Data seems to be promising for the police sector. Of course, some problems exist, e.g. that the data which are used to predict something are inaccurate or biased or that an algorithm itself has some bugs. Those disadvantages have been analysed in depth (see e.g. Ferguson, 2017b; Selbst, 2017 or Vogiatzoglou, 2019) and the authors warn against disregarding them as those can lead to severe problems e.g. regarding the integrity of those who use the data.

Many scientists have already done research on these topics, like Ferguson (2017b) or Ridgeway (2018). Amongst other things they analysed relevant aspects of possibilities Big Data provides for policing but also problems. Big Data e.g. allows faster processing of data (advantage) but also discrimination against certain population groups (disadvantage). Therefore, it is crucial to analyse this topic from a different angle and provide knowledge about *real life* examples which can lead to a better understanding of the topic and more tangibility. Additionally, if it is shown which Big Data technologies are already used in daily police work, it may help to address these issues. This is crucial as Big Data itself is not that easy to grasp. As stated before, it is a quite new phenomenon and within policing it is not yet fully analysed. However, some aspects have been examined in depth. Many scientists have studied predictive tools (e.g. Ridgeway, 2018; Joh, 2017 & van Brakel, 2016) which are used to predict and therefore prevent crimes and elaborated on their advantages and disadvantages. Ferguson (2017b) is one of the pioneers in this field. He states e.g. that those technologies can lead to discrimination of certain society groups namely the black community in the USA. Additionally, he mentions another crucial point of Big Data policing, the so called *blue data,* which is the practise of collecting data from officers during their shifts, and thus improving their work e.g. through allocating personnel more efficiently. He presents predictive policing and other technologies which are applied to improve the police work and explains why it is appreciated. The use of social media as data sources (e.g. Williams et al., 2017 & Dencik et al., 2018), hot spot policing (areas of concern) (e.g. Ferguson, 2017b) and specific tools like *Beware*, which is a program that gives specific persons a threat score (e.g. Joh, 2017), have been studied and evaluated as well. Most research

which exist took place in the USA as there Big Data is developed further and used more widely than in other areas and maybe because the access is less limited.

1.1 What is Big Data?

It is important to have a closer look at the term *Big Data* as this is one of the key concepts used and aspects of the police work looked at. Big Data is a broad concept. No standardised definition exists (De Mauro et al., 2016) as it is a quite new phenomenon which develops constantly. It is important to understand at the beginning that it is not just about the tremendous size of the data (Jain & Bhatnagar, 2016). Big Data emerged because nowadays, through the internet alone, more information is available and it is possible to save huge amounts of data and analyse them (De Mauro et al., 2016). Additionally, it allows working with and extracting data in real-time (Villars et al., 2011). Generally it can be defined as an information asset which is indicated by a high *volume*, *velocity* and *variety* so that specific technologies are needed to convert the information into *value* (De Mauro et al., 2016). Another features is *veracity* which is about the quality and accuracy of the chaotic data (Williams et al., 2017). It concerns collecting, processing, analysing and visualising large datasets (Emmanuel & Stanier, 2016).

In this thesis Big Data is thus defined as the collection, use and analysis of large datasets containing many different types of information with the aim of disclosing hidden patterns or insights (Ferguson, 2017b). Thus the 4 Vs volume, velocity, variety and value are most relevant. It is an interesting but also quite difficult topic to assess. As those techniques/technologies are new, they bring new possibilities with them as well as problems. As some data are quite sensitive, one e.g. needs to think of data protection and needs to treat those carefully. Thus, additionally transparency plays a very important role when dealing with Big Data technologies (Weichert, 2013). The Big Data usage cannot be measured in the normal sense, as it can only be stated whether particular types are used within the objects of my research or not. Still, the technologies should fulfil the aspects of the definition of Big Data which is used within the thesis and explained in this section. Those dimensions are the collection of huge datasets, the analysis of huge datasets and the disclosure of hidden patterns or insights. Thus, one can evaluate if the technologies the officers mentioned are Big Data technologies in this sense.

1.2 Why is the topic relevant?

The clear benefits of Big Data in fighting crime must answer to potential problems that arise when collecting large amounts of data from individuals. Legitimacy in this respect is a substantial fact to look at too, as Big Data technologies are strongly intervening in individual lives

(privacy). For legitimacy people are the key factor, as without their consent it cannot be reached. Thus, without legitimacy the police cannot do their job as the citizens will then not inform nor obey the police. This is why the thesis will assess the legitimacy of Big Data policing, according to police officers themselves and citizens. There has been extensive research concerning police legitimacy, especially procedural justice has been analysed by different scholars. Most prominently, Tyler (2004) is to be mentioned here. Other scientists have also studied this topic like Bradford et al. (2013) who worked on the question on what basis police legitimacy is established, maintained and undermined. They explain why legitimacy is important for the police and their functionality also regarding their relationship with the citizens. They put an emphasis on procedural justice, police practices and the relevance of this for police legitimacy. Terpstra & Trommel (2009) focused on police forces in the Netherlands and they defined legitimacy as goals and procedures that are desirable or appropriate within a system of norms. What is most important to refer to here is that legitimacy can only be gained through people (e.g. Terpstra & Trommel, 2009). Thus, it is crucial to elucidate the topic further, as those technologies develop extensively and in a rapid manner. Further, it is advantageous to examine countries other than the USA to gain a wider understanding of this topic.

The legitimacy aspect of Big Data policing has also not yet been fully and explicitly elaborated on, thus, the thesis will look for new insights about Big Data policing. Some scholars illustrated the accountability aspect of Big Data technologies (e.g. Joh, 2016 & Ferguson, 2018) but legitimacy is an underrepresented phenomenon in this context. Thus, after the research within this thesis, it will be clearer, if the usage of Big Data technologies is legitimate or if in some aspects deficits exist. In the future this can help the police see where they need to think further in order to increase the legitimacy of their work. The core question of the thesis is:

To what extent are Big Data technologies used in daily police work considered legitimate by German and Dutch police officers themselves and by German and Dutch citizens?

German and Dutch police officers have been interviewed to get a closer look at how they work, if and to what extent they use Big Data and what they think about the legitimacy. Because the legitimacy aspect concerns in particular the people who are treated by the police, citizens have been questioned as well.[1] This allows for an evaluation of the legitimacy of Big Data policing as two important actor groups can be analysed. Further, it is possible to compare the two coun-

[1] For the list of respondents see Appendix 4.

tries and see where similarities and differences exist. Thus, it is focused on empirical components. It is worth taking a closer look at this topic, as legitimacy is important for the acceptance of the police in society. If the police is not accepted their work becomes much harder. Additionally, because the police is a fundamental organization within the society and as Big Data technologies constitute a new form of policing, it must be shown if these new technologies are legitimate and appropriate tools for policing. Further, it is relevant to see what the officers think about the legitimacy of those technologies and compare their views with those of the citizens.

A comparison between the Dutch and German police is a suitable means of analysing this because both forces do not use the same range of technologies. It additionally shows where the two police forces work similarly with Big Data and where not. Moreover, it will add to the research of Big Data policing, as most of the research was conducted in the USA, which makes it more interesting to see what other countries are adding to the topic. But those countries have not only been chosen because of the possible differences in the usage of technologies, additionally it is crucial to see if in different countries the topic generally is important and how legitimacy of Big Data use is perceived by the police. It can thus help to analyse more than just one country to see which aspects are important for perceiving legitimacy. Further, the Netherlands are a melting pot between Anglo-Saxon and Germanic cultural influences and they have a more liberal constitutional culture but are more progressive in technology than Germany. This leads to a tension between technology-friendliness and freedom rights appreciation. Thus, those two countries can provide rich insights into the legitimacy of Big Data technologies and through their differences can add various aspects which might have been missed if only one country would have been looked at. Still, as the two countries are close to each other, sometimes even work together, it is alluring to see if similarities, additionally to the differences, are seen in the way how Big Data technologies are used and how the legitimacy is evaluated.

1.3 What is new about it?

Big Data is a new phenomenon and within the police work it is not yet fully analysed. Thus, it is important to illuminate it further, as those technologies develop extensively and in a very rapid manner. Thus, citizens will be affected progressively which makes the legitimacy aspect even more crucial. The research questions firstly focus on the comparison of the Dutch and German police and their Big Data usage. This is yet to be analysed in depth and will give new insights into the police work. There are not enough information available on which technologies are used. Further, it will illuminate if differences in their usage of those exist. This is not fully

known by now and will provide another glimpse into the topic. Thus, it can be seen where the police might need to change something since it works better in the neighbouring country.

Secondly, answering the research questions will show if the usage of Big Data in the police work is legitimate. Thus, afterwards it will be clearer, if the usage of Big Data policing is legitimate or if in some aspects deficits exists. This can help the police in the future to identify where they need to think further. This is important as without legitimacy the police cannot be fully accepted by the citizens which makes it harder for them to carry out their work.

1.4 Research questions and procedure

Ultimately, it will be apparent what the status quo of Big Data policing is and additionally the legitimacy aspect can be understood better. The following research questions will be answered:

To what extent is the current use of Big Data technologies in daily police work in Enschede and the Münsterland legitimate?

a. How and to what extent are Big Data technologies used by the police in the two districts?
b. Do police officers in both districts consider the use of Big Data legitimate?
c. To what extent are citizens in both districts aware of Big Data technology usage by the police?
d. To what extent do citizens consider the use of Big Data legitimate?

Firstly, the theoretical framework (chapter 2) will be introduced so that the conceptualization and the different dimensions are evident and what is meant with legitimacy, Big Data and Big Data policing within this thesis. Secondly, the methodology (chapter 3) will be presented so that it is clear how the research has been conducted. Thirdly, the results (chapters 4 - 7) of the interviews will be presented to be able to finally come to a discussion and conclusion (chapter 8).

2 Theoretical Framework

This chapter discusses the theoretical underpinnings and the conceptualization within this thesis.

2.1 Conceptualization and Dimensions

This sub-chapter will make clear how the several concepts/dimensions are understood and defined. The meaning of the central concepts of the research will be clarified.

2.1.1 Big Data

The dimension of Big Data which have been introduced in the introduction (chapter 1) are now explained further. The first aspect of Big Data technologies, *volume*, is relatively self-explanatory. It is about a huge amount of Data (Witt, 2015) which are permanently growing (Ylijoki & Porras, 2016) because of the digitization of almost all parts of everyday life (Fritz, 2020). *Variety* in this sense means that those datasets are comprised of diverse data (Witt, 2015). Such as social media posts (personal data) or videos (Ylijoki & Porras, 2016), but one can also distinguish between structured, numeric data or unstructured data like mails or audio data (Kshetri, 2014). *Velocity* is about the high speed with which the information is processed (Witt, 2015), stored, analysed (Kshetri, 2014) and produced. The last aspect *value* is about the intelligent analysis of those datasets so that relevant information can be abstracted (Fritz, 2020).

2.1.2 Legitimacy

Police Legitimacy is a broad concept too. Generally legitimacy can be defined as trust in persons or institutions and the perceived obligation to obey (Gau, 2011). It makes citizens believe that the institution/authority is to be obeyed (Mazerolle et al., 2013b). It entails an acceptance of rules and laws (Gau, 2014) and the authority. The police need legitimacy so that they and their actions are accepted as trustworthy (Bradford et al., 2013) and thus followed. It is crucial for the relationship between police and citizens (Bradford et al., 2013). As police legitimacy is often based on *procedural justice* and this concept is believed to enhance legitimacy (e.g. Tyler, 2004 & Mazerolle et al., 2013b), this will be used within the thesis to be able to identify the legitimacy of the police practices. This theory has been chosen as it is widely accepted among scholars and Tyler is one of the pioneers when it comes to police legitimacy. Further, it focuses on the citizens and their perceptions which is very important for the analysed topic.

Tyler (2004) distinguishes between procedural justice and the effectiveness/fairness of the outcomes of police work. So, he differentiates between process-based vs. outcome-based contentment (Gau, 2011). Additionally, he and other scholars found procedural justice to be more important to people than e.g. the effectiveness of police work (Tyler, 2004; Bradford et al., 2013) or the police performance (Mazerolle et al., 2013a). "*In other words, […] the quality of the treatment received […] is more important than the objective outcome*" (Hough et al., 2010, p. 205). This has something to do with the internalised values of the citizens, if they believe in the legitimacy of the police, they will support it as well and comply with what they say (Tyler, 2004). Procedural justice is more closely linked to police legitimacy than police performance (Mazerolle et al., 2013a). The citizens do not bother as much about the outcome of the police

actions, like a fine, but for them it is more important that the police act in accordance with the rules and that they are correct in their procedures. If the citizens deem the police to be legitimate they are prepared to accept decisions and authority and accept that they need to change their behaviour sometimes also against their own interest. Further, they give the police information. If this is not the case the citizens do not obey them and thus their work gets more difficult. The focus within this thesis will be on procedural justice to be able to say something about the legitimacy of the police practices according Big Data. It is already obvious that citizens play an important role for police legitimacy, as without their support it is challenging to achieve it. Police legitimacy is reached "[…] when they act in a positive way towards those with whom they have contact" (Gau, 2014, p. 190), it is about "[…] fair treatment and high-quality decision making" (Gau, 2014, p. 190). The procedural justice approach is the most appropriate choice for the analysis within this thesis, since Big Data technologies are actual procedures of the police and this theory can best be applied to the chosen topic as a huge emphasis is put on the position of the citizens. Additionally, citizens might be able to better grasp the different dimensions as they directly concern their welfare and perceptions. Also, as the procedural justice approach directly concerns police actions.

Procedural justice can be defined as follows: it is an impartial service to the law, includes fair and respectful treatment and an even-handed wielding of power (Bradford et al., 2013). It is about trust and obedience (Gau, 2014). Tyler (2004, p. 84) states that it is important for the police to gain support and cooperation from the public and that the evaluation of the police actions by the citizens is crucial. Only if they see the police as a 'legitimate legal authority', they support and obey it (Tyler, 2004, p. 84). If the police act in a procedurally just manner, greater trust in and satisfaction with the police follow (Gau, 2014), which then leads to more obedience. Tyler (2004) formulated four dimensions of procedural justice which are largely accepted: 1. Participation (input of citizens), 2. Neutrality (objectivity, transparency), 3. Dignity, respect, fairness (treatment) and 4. Trust of citizens in motives of police. Thus, those four dimensions are most important when evaluating police legitimacy. The more of these are fulfilled, the more citizens see the police, and in this case the usage of Big Data technologies, as legitimate. Thus, within the thesis it will be evaluated, if those dimensions are fulfilled and if those are even applicable to use within the studied subject. To be able to state to what extent the usage is legitimate, as asked in the main question, it will be analysed how many of those dimension are fulfilled.

The first dimension is about the possibility for citizens to be able to explain certain circumstances and express their opinion about a specific situation to the authority (Tyler, 2004). Citizens want to be seen and heard and feel like their input is acknowledged by those who make decisions (Tyler, 2004). This means that it is important for this dimension how decision-makers come to conclusions and if they consider the citizens (Gau, 2011).

The second dimension stresses the importance of objective and unbiased decision-making which leads to enhanced perceived fairness (Tyler, 2004). For citizens it is important that nobody is wrongfully advantaged or disadvantaged, this is why they look at the fairness of decision making which can be enhanced by transparency so that citizens can see how decisions are made and evaluate the fairness (Tyler, 2004). Decisions need to be consistent (Tyler & Wakslak, 2004). Ferguson (2017b) states that a deficiency in transparency can slow down the process for accountability. This can be translated as an obstacle for the police to gain legitimacy.

The third dimension is about the (interpersonal) treatment and that this is done with dignity, respect and that involved people are affable and respect each other's rights (Tyler, 2004). Further, citizens evaluate to which extent they think the treatment by the police is respectful (Gau, 2011). If the police do not honour the dignity and rights, people easily feel offended (Sunshine & Tyler, 2003). If citizens think that the police acts fairly and suitably then they also believe more in their legitimacy (Kochel et al., 2013).

The fourth dimension deals with the citizens' trust in the motives of the police (Tyler, 2004). If citizens believe that they care about their welfare, needs and concerns then they consider police actions to be fairer (Tyler, 2004). Citizens must believe that the decisions are good for the society as a whole (Kochel et al., 2013). Trust is crucial because without it, citizens accept actions of the police less (Sunshine & Tyler, 2003). It is about confidence in the police actions (Tyler et al., 2014).

Other alternatives would have been to use legitimacy theories developed for other institutions such as the European Union (EU) (e.g. Schmidt, 2013) and try to apply those to the specific topic, but this would have been too difficult. For instance the theory by Schmidt (2013) is precisely tailored to the EU, its supranational structure and possible actions. Of course, here too the citizens play a role as e.g. the 'input legitimacy' concerns possible 'political participation' for the citizens (Schmidt, 2013, p. 4) and legitimacy is not defined totally differently. But those theories are used in very specific contexts. As the police is not exactly comparable to the EU or

other political institutions and their specific circumstances, those theories are not the ideal option for this topic. Another possibility would have been to work with *Distributive Justice*, which is about the fairness of police actions and "[…] the distribution of police services and activities between different […]" (Mazerolle et al., 2013a, p. 19) social groups. Of course, this is crucial for legitimacy as well but this theory has not been chosen, as it is too specific and focusses on a very particular aspect, discrimination and unequal distribution of police actions, which is not the main subject within this thesis. *Legal Legitimacy* however, is about the perceived legitimacy of the legal system which the police is guided by which can influence the procedural justice perceived by the people (Mazerolle et al., 2013a). Those laws and regulations can be seen as illegitimate while the police itself could be viewed as legitimate. This theory, and legal aspects in general, have not been chosen because the procedural justice approach by Tyler seems to be more applicable for the theme which is analysed within this thesis as Big Data policing is not just about legal aspects but about actual proceedings and citizens play an important role too. This theory sets another focus which is very relevant and should be looked at in the future as well when evaluating the legitimacy of the Big Data usage, but for this thesis another approach has been chosen which focuses more on the actual actions by the police. A further option would have been to take a more general approach and discuss how authorities are accepted as legitimate like David Beetham did (e.g. Beetham, 1993 or Beetham, 2001). However, this would not suit the approach within this thesis as it does not only want to analyse if the police itself is seen as legitimate but if their actions are. Thus, this theory puts the emphasis on another aspect of legitimacy and this would have been the wrong focus for the analysed subject also because the citizens and their perceptions are crucial as well. Thus, it was decided not to delve into these theories, as it would lead to neglecting other important elements and a lack of depth.

Tbl. 1: Tyler's Theory

Theoretical Dimensions	***Participation*** – ***Input of the citizens***	***Neutrality*** – ***Objectivity and Transparency***	***Treatment*** – ***Fairness and Respectfulness***	***Trust***
Explanation	This is about the opportunity for the citizens to give their input. Citizens want to be heard.	The decisions of the police need to be fair and their actions should not be subjective. This can be enhanced through transparency as citizens can then evaluate the fairness of specific decisions.	The actions and the treatment by the police need to be respectful, fair and dignified.	Citizens must trust in the motives of the police and must feel like the officers do care about them and their welfare.

⇨ The more of these dimensions are fulfilled, the more legitimate the police and their actions are.

2.1.3 Big Data Policing

As a closer look is taken at the usage of Big Data within policing it has to be clarified what is meant with this concept. Within Big Data policing several kinds of technologies are known, such as predictive policing, the use of social media data from sites like *Facebook* or *Twitter* or the use of special police phones. Most of the research on Big Data policing was conducted in the USA, thus it is worth looking at the Netherlands and Germany in more detail to see if those technologies used in the USA are being adopted in those two countries or if differences exist.

Big Data policing usually has something to do with data and a computer system or specialised people which analyse those datasets and transform it into valuable information for the officers. To conclude with Ferguson (2017b, p. 22): "The tools of big data are the tools of surveillance, and law enforcement relies on surveillance to solve and prevent crime". It needs to be kept in mind that in the USA, where many techniques are known, the police has other opportunities and the laws differ from those within the Netherlands and Germany. The privacy of single persons e.g. is not as strongly protected in the USA as in the other two countries. Further, in Germany bureaucracy often times hinders technology development and application.

2.2 Operationalisation

Of course, it is more difficult to evaluate and measure Big Data technologies and their legitimacy with the theory of Tyler than other operations of officers like stopping citizen who drive too fast or give cyclists a fine who ride their bikes using a phone. Those actions are visible and citizens directly experience what the officers are doing and why they treat them in a certain way. With Big Data technologies it is different. Citizens cannot directly see what the officers are doing and cannot directly evaluate if those techniques are justified. Most Big Data operations run in the dark. As the citizens do play an important role when evaluating the police legitimacy, it is important to keep that in mind when evaluating/measuring police legitimacy.

For the first theoretical dimension *participation*, Big Data policing might pose a problem. As those techniques are normally not open for an input of citizens. Thus, the different Big Data technologies which will be evaluated upon their legitimacy need to be looked at closer regarding participation. Maybe there are ways for citizens to give some input. The second dimension might be problematic because of the *transparency* aspect as most of the measures taken are happening covertly. This makes it difficult for citizens to judge the fairness of the treatment. It needs to be assessed, whether the transparency aspect is met by the different technologies and if citizens are able to comprehend why certain actions were taken, or if it needs to be improved.

Dignity, respect and fairness can be evaluated when asking people whether they believe that when one has a direct encounter with Big Data policing that they are treated rightly or not. Additionally, it can be gauged whether those elements are considered by the police or if something needs to change to meet those standards. The fourth dimension *trust* seems to be the easiest one to evaluate when dealing with Big Data technologies as citizens can directly be asked if they trust in the police's motives.

Big Data technologies can change policing and add elements which can lead to more efficiency and in the end to enhanced police legitimacy. Thus, in the following some own elaborations (theoretical additions), also using existing literature, on what influences Big Data can have on policing will be added to the theory by Tyler and additionally used to evaluate the legitimacy.

One may say that it gets *faster*, e.g. that a fine can be dealt with in a few days and the whole investigation can get quicker and in some way *more efficient* as well, e.g. more arrests in less time are possible. As more data in less time are available and can be used one may say that the observations become *more objective*, also because it is supported by machines and not solely based on human evaluations. Thus, one may think that subjective evaluations are less likely. This could then e.g. be seen when officers need to assess whether a particular person is a threat or not. Further, decisions can be *more accurate and fair* (Ferguson, 2017b). Big Data technologies can make it easier for the officers to come to conclusions and *establish a way of proceeding* (Ylijoki & Porras, 2016). Additionally, one may believe that Big Data contributes more useful data (Villars et al., 2011) so that decision makers get better information and can decide in a superior way. For example, when they need to decide how many officers need to be at a demonstration or where it might be good to place a patrol car. As Ferguson (2018, p. 503) would put it, it can make policing 'smarter'. Of course, there are also downsides and negative consequences, thus possible concerns will additionally be evaluated such as privacy concerns.

It needs to be analysed how Big Data changes policing and if the four Vs and their advantages exist and how they are valued by the police and citizens. Afterwards, one needs to evaluate whether those changes lead to more police legitimacy. Thus, it is important to tell citizens something about the possible changes and ask them if they would consider the police work as more legitimate because of those or not. Those elements need to be added to the procedural justice approach, as Big Data is something completely new and the theory does not include every important element for assessing the legitimacy of Big Data technologies. Thus, Big Data itself can be able to add crucial aspects to police legitimacy as the ones described above.

With all that said, it can be seen that Big Data can have influences on policing e.g. on the way how officers figure out where to go during daily patrols or make their work more efficient as less time is needed and more accurate information is available (Ferguson, 2017b). It can help the officers to approach certain places and persons with more information and if necessary more caution (Ylijoki & Porras, 2016). If all those aspect mentioned before exist and thus improve police work, it might also influence police legitimacy in a positive way as citizens can recognize that Big Data policing makes their lives better. Citizens most likely prefer the police work to be faster, more objective and efficient. Those are favourable outcomes as in a broader perspective it also improves the quality of live. Thus, citizens need to be asked if they think that those new qualities would improve the police legitimacy. This is crucial as most of those elements are seen by the police but not directly by the citizens. Hence, within the thesis the aspects of policing described above will be looked at and an analysis whether the improvements which are promised exist and thus strengthen police legitimacy will be conducted.

2.3 Expectations/Hypotheses

In the following expectations of how officers and citizens will probably evaluate the legitimacy of the Big Data usage will be formulated using the theory of Tyler and the theoretical additions described above. This can provide preliminary answers to the research questions which have been introduced in the introduction. Those are drawn from the different perspectives of the officers and citizens with which they are looking at the topic.[2]

2.3.1 Officers

First it has to be looked at the first dimension of Tyler's theory: participation. The question which needs to be answered is: *Do officers still think that citizens have the chance to provide them with information when Big Data technologies are used?* This is important as by answering this question the possible perceptions of the officers can be seen and compared to their actual answers in the end. This will help to answer the research question. Generally, it is expected that officer think that the citizens' input is almost always important and that it does not matter which technologies are used as this is part of their job and a basic requirement. They do work *for* the citizens but also *with* them, thus it is presumed that the officers do not neglect this requirement, no matter which technologies they are using. With the smartphones e.g., this might be easier to fulfil than with predictive policing. The smartphones can help them find important information about persons and places and they can additionally save information on those (e.g. Ministerium

[2] Note: Not all technologies have been known from the beginning. Thus, just for the ones which have been expected hypotheses have been formulated.

des Innern des Landes Nordrhein-Westfalen, n.d.). Thus, the officers presumably think that these still allow for the citizens to express their opinion as they additionally collect information with those and as those are used at direct encounters with the citizens. Predictive policing however, is a tool with which officers can see where future crimes might happen and then try to prevent them (Vogiatzoglou, 2019). Here the officers are probably of the opinion, that the citizens' input might not be that relevant as existing data is used and thus does not play a role at first. Still, in later steps when citizens are involved it is expected that the officer still give them the opportunity to express their opinions.

The second question concerns the second dimension of Tyler's theory: neutrality. *Do officers still consider the police actions as objective and transparent?* This question is crucial to answer as it can help to answer the research question in the end as officers need to articulate their perceptions about the different legitimacy dimensions. All in all, it is assumed that officers think that those tools are as transparent as they can be so as to not harm their job but that they always try to be objective. Transparency might sometimes be seen as difficult to provide as citizens might not be allowed to know everything about a specific technology. However, the officers presumably say that objectivity is always important as otherwise they would be failing their job as neutrality is probably seen as a basic requirement which is not dependent on specific tools. The smartphones e.g., are most likely deemed as transparent by the officers as citizens can directly see when those are used but this might not be the case with the smart cars as here the officers might admit that citizens are not able to recognize when those are utilized. For both technologies they presumably say that it makes their work more objective as both citizens and officers can implement information and as they try to use as many information as possible which can prevent subjectivity and biases. Open source intelligence (OSINT) is about using information which are openly available e.g. on social media sites, print media or videos and then used to draw conclusions on specific matters (Trottier, 2015). This might be seen as transparent by the officers as it only contains data which everyone can access and see. They possibly acknowledge that the information obtained are not as objective as from other sources, as information could be altered, which might pose problems. Thus, this technology alone cannot lead to more objectivity but could even decrease it.

The next question concerns the third dimension of Tyler's theory: treatment. *Do officers think that they still treat citizens fairly and respectfully?* It is expected that the officers think that it is important that they *always* treat citizens fairly and respectfully as that is a basic quality and is not dependent on different tools. They might further say, that the treatment does not suffer from

those tools and might lead to fairer and more respectful treatment as they know more about certain circumstances and can act accordingly. Further, citizens' rights are not neglected and if it comes to interpersonal encounters in the end, officers might be better prepared and then act more fairly. The smartphones e.g. could lead to more respectful and fairer treatment as those support the interactions between citizens and the police which shows that their opinions matter.

The last question is: *Do officers think that citizens still trust a police that uses big data?* This is about the last dimension of Tyler's theory: trust. It is important as without the citizens' trust the police cannot act fully legitimately. Here it is expected that the officers think that generally those technologies might not lead to more trust as they cannot always be transparent about the usage. This might lead to the citizens having less trust as they do not always know how and with which tools they do their work. Still, the smartphones are supposedly seen to enable more trust in the police as citizens are able to see that they use those and can interact with the officers and give their opinions. Predictive policing might be seen as helping to gain the citizens' trust as it shows that they are thinking about the citizens' safety and well-being and try to act before something happens. Still, officers could acknowledge that citizens do not necessarily need to be aware that this technology is used, which could lead to decreasing trust. With OSINT however, officers might say that the trust could decrease if the citizens think that they do not use those information with care as those do not always have to be correct.

Some of the possible advantages (chapter 2.2) like helpfulness and that it is easier for them to establish a way of proceeding are possibly seen by all officers for all different technologies. This is because they can access more information, in less time and then better assess the situations. With the smartphones and cars e.g. they possibly can retrieve information more quickly and do not need to ask the control room anymore. Additionally, they might think that those make the police work more accurate and fairer as a lot of information can be compared and thus they have a better insight of what they need to do. This saves time and resources. For OSINT however, they possibly think that their work does not get more accurate and fairer as the accuracy of information gained from open sources is not guaranteed and officers could be biased because of the information. Leading to both, less accuracy and fairness. All in all, it is assumed that the officers appreciate those tools because of the possible advantages of being faster, more accurate etc. Thus, they probably also deem those legitimate.

2.3.2 Citizens

Not only the officers and their perceptions need to be looked at but also that of the citizens. The first question which needs to be asked is again about the first dimension of Tyler's theory: participation. *Do citizens still think that they have the chance to provide the police with information when Big Data technologies are used?* This is important as by answering this question the possible perceptions of the citizens can be seen and compared to their actual answers in the end. This will make it easier to answer the research question. Generally it is assumed, that citizens think that their input is always relevant, also when Big Data is used because that is a general requirement. Still, as they probably do not know all technologies and if they are not able to recognize that certain ones are used then they might believe that their opinions are not considered. Further, that their potential participation is not realized by the officers. But e.g. with the smartphones, which are normally used when officers are on patrol and thus citizens can directly interact with them and explain their situation, they might see that there are better opportunities for them to interact with officers. For instance, when field interviews are taken. On the other hand, OSINT might lead to citizens feeling that they cannot explain themselves as the officers might believe the information within those sources more and then the citizens might feel that they do not give them the opportunity to say something. Also because this is probably not used during a direct encounter. Citizens possibly believe as well, that they cannot express their opinion when predictive policing is used, as they do not even know *when* it is used and as it probably is more about data and not about the citizens' input.

For the next dimension, neutrality, this question needs to be answered: *Do citizens still consider the police actions as objective and transparent?* Without presumed neutrality of the citizens the police and their actions cannot be seen as fully legitimate. Generally it is assumed that citizens think that the usage of such technologies is not transparent as they are mostly used in the dark, as they do not know *how* those are used and as they are not able to see how decisions are made. This would lead to less transparency. Still, the objectivity might be thought of more positively, as citizens might see that the officers try to use as much information as possible which would make their actions more objective. This requires that citizens know that those technologies are used. When smartphones are used the citizens presumably think that the work gets more transparent as they can directly see when those are worked with and more objective as officers probably also consider their views and not only believe the information they get on those phones. Additionally, because they can directly see how decisions are made and how data is imple-

mented, when e.g. personal information is collected. On the other side, citizens probably assume that predictive policing makes the police work less transparent as they possibly cannot see how and when this technology is used. Further, the objectivity is not met as predictions are used which could be built on prejudices which would lead to more subjectivity. The citizens assumedly agree to the statement that one cannot solely rely on information gained from OSINT and thus view it cautiously as in open sources information could be altered or incorrect, but officers build their opinions based on those. This might lead to the citizens feeling that it leads to more subjectivity. Still, they might believe it is transparent as they can access the information from those openly available sources themselves.

The third question which needs to be looked at is: *Do citizens still feel that they are treated fairly and respectfully?* This concerns the third dimension: treatment. It is expected that citizens generally think that those technologies lead to less respectful and fair treatment, as they predominantly cannot recognize that those are used and thus they feel overlooked. For example, they might think that the treatment is less fair when the smart cars are used as they do not know which information is implemented into the systems and as they cannot always see that those are used. Further, they might say that when officers base their actions on OSINT that the reaction can be biased because of the sometimes incorrect information within those sources. Thus, they might feel treated incorrectly. This could be different with the smartphones as they might believe that the usage of those shows that the police treats them more respectfully and fairly as they presumably listen to what the citizens have to say and thus include them as well.

The last dimension again is: trust. *Do citizens still trust a police that uses big data?* This is important as without their trust it is difficult for the police or their usage of technologies to be seen as legitimate. Generally it is expected, that their trust might not rise because they might not be able to recognize all technologies which are used and then could feel neglected. Thus, those technologies probably lead to less trust as citizens are not able to understand how those work and maybe do not know all of them. Still, if they have the chance to get to know the technologies, understand them and see the advantages then their trust might rise again. This is e.g. the case with the smartphones, when those are used they probably trust the police more as they can directly express their concerns and needs when officers are using those e.g. to implement information and they can directly observe how those are used. When the smart cars and predictive policing are used however, their trust probably decreases as they do not know that those are used or cannot comprehend how they function.

If citizens can see some of the advantages which are presented in chapter 2.2 (theoretical additions), they probably will think that those technologies are good for the police work and consequently their perceived legitimacy might rise. Additionally, their general attitude towards Big Data might get more positive as better police work is also beneficial for them. This again requires that the citizens are able to recognize that Big Data technologies are used. It is expected that citizens are more sceptical and critical about the technologies than the officers and that it additionally depends on the different technologies how they might evaluate the legitimacy.

2.3.3 General Expectations

Generally it is expected that officers will be more confident about the legitimacy of the Big Data usage and will probably mostly see advantages. While citizens are expected to be more critical and more concerned about possible disadvantages e.g. related to privacy issues. Maybe also because they might not know all technologies or even Big Data generally. Additionally, that officers are better able to assess the whole topic, while citizens might know less about Big Data and might have more problems to grasp the subject. Moreover, with almost all technologies it seems challenging to evaluate the dimension of the citizens being able to express themselves in certain situations. Thus, it is expected that citizens do not always see this to be possible while the officers might say that it is always important to hear what citizens have to say. Further, it is anticipated that the Dutch police uses more Big Data technologies than the German police as in Germany such developments are normally progressing quite slowly due to the existing bureaucracy. This is assumed to be less of a problem in the Netherlands. It is expected that Dutch citizens are more likely to accept the technologies than the German ones. Moreover, it is believed that other technologies are mentioned by the officers which are not discussed here as they probably use more of those which are not known to common people.

3 Methodology

In this chapter the research method, research design, data collection, data analysis, the validity and the reliability aspect for this thesis will be explained.

3.1 Research Method and Design

The cases have been selected due to their proximity. The region around Enschede and the Münsterland, are not only geographically close but additionally cooperate on police matters, e.g. during the Christmas market in Münster or generally at the shared border. Here the cross border police team (*Grenzüberschreitendes Polizeiteam*) is to be mentioned, where Dutch and German

officers cooperate.[3] Thus, it is interesting to see if such close partners act similarly regarding Big Data policing. Since the Dutch and German police work together, one might expect them to work uniformly. Their cooperation might show, even if this is not based on Big Data, that they found a way to collaborate and thus most likely work similarly. Moreover, analysing the two countries as a whole would have been too broad and not feasible within this master thesis.

The police in the two countries is structured differently. In the Netherlands they have one national police force which is led by a Commissioner (Government of the Netherlands, Police, n.d.). The force comprises ten regional units and one central unit (ibid.). These structures have grown historically over a long period of time. The police is centrally lead. The most important values of the Dutch police are "courageous, reliable, unifying and honest" (Politie, n.d.). The citizens are most important to them and providing an environment within which everyone is satisfied. In Germany the structure differs. There is not one national police force. The sixteen federal states each have their own police which e.g. vary in their legal guidelines (Groß, 2012). The tasks of the police are to embody the acting state in daily life and situations of conflict (ibid.). This structure is defined by Germany's history. The system of injustice under National Socialism (Deutsche Hochschule der Polizei, n.d.) had a strong impact on people's demands on the police after that time. During this time, the police was a *state within the state* and, with the support of the state leadership, ignored laws by their own discretion if it served to enforce their own interests. In the period after 1949 until today, law and justice became the essential basis of the police's self-image and thus *the state within the state* has perished. This means: "[The police] respect human dignity, they protect the existence of the state and its ability to function and the fundamental rights of individuals" (Polizei, Rolle und Selbstverständis, n.d.). Basically, this corresponds to what most citizens expect of the police in Germany. From my point of view, the cooperation between the population and the police is partly more intensive in the Netherlands, as an example *Burgernet*, a citizens' network whose primary goal is to support the police, can be mentioned: "In close cooperation with the ICT department of the Dutch police and the Burgernet organisation, an integral system was created for participating citizens, municipalities and the police" (CGI, 2015, p. 1). Hence, it is alluring to see if those differences are seen in the way the Dutch and German police work with Big Data or if the similarities prevail.

The research is a qualitative one. This ensures that an in-depth and profound understanding of the topic can be reached. The theory by Tyler has been used and tested against the views of a

[3] See information about a conversation with one of those officers in Appendix 6.

limited number of respondents. The Big Data usage and its legitimacy will be examined but no numerical measurement is carried out. Of course, in the end generalizations are impossible and as the researcher is deeply involved in the data creation, a recreation of it is also not that simple (McLeod, 2019). Still, this is not the aim of the research. In the end the topic should be understood better and the thesis will provide a new starting point for more conclusive and quantitative research. Further, the research will give new insights, better understanding of the topic as more detailed information is available and further the interviews allow to delve into the 'why'.

To find out which, how and to what extent Big Data technologies are used, officers from each district have been interviewed. Further, citizens have been questioned from both areas to figure out their knowledge about Big Data policing and whether they consider it as legitimate. This is important as the citizens' trust in the evaluated organization (here the police) is crucial for legitimacy. The units of analysis are the police in Enschede and the Münsterland, as their practices regarding Big Data technologies and its legitimacy will be compared. Those are the relevant objects of analysis as the thesis wants to make a statement regarding their work. The individual officers, who have been interviewed are the units of observations. Moreover, as citizens have also been questioned, they additionally represent units of observations. Those two groups will provide the relevant information to be able to answer the research questions which have been formulated (see chapter 1). The current status quo of the usage of Big Data technologies will be analysed. Thus, the police can improve their strategies if e.g. legitimacy deficits exist.

3.2 Data Collection and Analysis

The research was conducted using face-to-face interviews. Before there has been performed one pre-test for each interview guideline to fine-tune the questions and see if those are understood correctly by the interviewees. Due to the current COVID-19 situation some interviews have been carried out by video calls or telephone. The restrictions in the two countries due to the pandemic did not allow otherwise and some of the respondents did not want to meet in person. To find out, what the status quo of the Big Data use is, five officers of both areas have been interviewed. It was focused on the police in general and the officers have been selected randomly. An attempt was made to select them as diversely as possible, e.g. in terms of where they work, in which department and how old they are. There was no focus on specific departments within the police units. This is also due to the fact, that I was dependent on which officers were available and willing to conduct an interview. Once this was known, it was tried to choose the officers so as little biases as possible occur. In the Münsterland it was attempted to select them from different police units and not just from Münster to be able to cover the Münsterland

better. Thus, some officers work in Coesfeld and one in the Kreis Steinfurt. In Enschede one officer helped to find officers from different ages and genders who have been willing to conduct an interview. Of course, those samples are not representative for the whole regions and one was not able to select the officers as heterogeneously as wished and planned. Still, one needs to keep in mind that the thesis is planned as a qualitative research to provide thorough information. Additionally, it was tried to get a first understanding of the topic and see which technologies and aspects have to be considered when dealing with this topic. Therefore, these small respondent groups and the possible random selection are sufficient enough for the research which has been carried out.[4]

Of course, face-to-face interviews have some advantages and disadvantages. One advantage is that the interviewer can see the interview partner and thus social signals like body language, the tone of the voice, which can additionally tell something about what the interviewee is thinking (Opdenakker, 2006). As with the interviews it was tried to find out what the officers and citizens personally think about the topic, these signals could offer some clues. This was also possible when the interviews have been conducted using video calls but of course, via telephone this advantage was not present. Another advantage is that the interviewee needs to answer the questions directly and thus is unprepared (Opdenakker, 2006). This might provide more authentic answers. This was also the case when video calls or telephone calls have been utilized. The recording of the interviews have the advantage that the transcript is more accurate than when only notes would have been taken but leads to the risk of not taking any notes (Opdenakker, 2006). This has been taken into consideration and additionally notes with important facts have been taken which helped to analyse those in a later step. A disadvantage is the amount of time it takes to conduct the interviews and the costs involved (Opdenakker, 2006) when transcribing them in the end. As only the researcher herself conducted the interviews the costs have not been a problem. It was possible to allocate the time precisely and no additional costs for other researchers had to be thought of. The amount of time it took was quite extensive but manageable. One disadvantage which has been thought of is the so called interview bias which is about the fact that the interviewer can influence the responses of the interviewee (Schröder, 2016). It can be assured that the interviewer always kept a neutral voice during the interviews and tried to not influence the respondents with any biased comments or body language. Just interposed questions have been asked if something was not fully understood. Moreover, not

[4] For more information about the selection see Appendix 7.

every single bias can be fully eliminated. Thus, this possible bias does not lead to a fully fruitless outcome. The interview situations have been standardised as good as possible.

Time-wise the interviews with the officers comprised of 30 – 60 minute units so one was able to extract in-depth information. Questions have been asked about officer's actual Big Data usage in their daily work and if they think that the usage is legitimate. The order of the questions has always been the same to make the answers better comparable. Further, as the different types of big data policing are compared along the dimension which have been introduced in the theory chapter (chapter 2), those have been asked for each technology. These interviews are most suitable as they made it possible to collect first-hand information. The officers themselves can best tell what technologies they are using and their thoughts about the legitimacy aspects are relevant for being able to answer the research questions.

Further, five citizens from both districts have been interviewed as for legitimacy their opinions are crucial. Those took about 20 - 30 minutes. What they know about Big Data policing has been analysed or if they even know what it is. The order of the questions has been randomised so that the chances of order effects are smaller. Further, the different types of big data policing are compared along the dimensions which have been introduced in the theory chapter (chapter 2), those have been asked for each technology. They have been asked if they have any concerns, to get an idea if they think some technologies are more intrusive than others. The random selection of the citizens has some consequences, as e.g. the circumstances of when and where those are selected can influence the results. Due to the COVID-19 situation some changes from the planned selection had to be made. Originally it was planned to go on the streets in the region around Enschede and the Münsterland and select them as randomly as possible. Again, due to the restrictions and as most people want to keep their distance, this was not feasible. Thus, the further circle of acquaintances of the researcher have been asked if they know people who would want to conduct an interview. Thus, it was tried to keep it as random as possible. For the Dutch citizens it was also attempted to choose as arbitrary as possible by also asking people on market places if they personally would be available to conduct an interview or know someone who would. Thus, with this approach no inclusive representation of the whole population within the two regions could be gained. Nevertheless, the citizens have been selected with care. This selection is sufficient for the conducted research, as no generalizable and overall impression of the whole population of citizens is tried to be gained.

As just a few police units are analysed generalizations are limited and the sample group sizes are quite small. This poses the problem that no projection can be made about the whole population in both areas. The counter argument on the police side is that it was believed that the police's tools themselves are rather homogenous thus including more of the same to the sample would not lead to a drastic difference in results. For this research five different opinions are sufficient as in-depth information is intended to be collected. It was aimed to engage with the respondents in an intensive way to gain a thorough understanding of the topic. Within the scope of a master thesis and the time constraints this would not have been possible with more respondents. Certainly, this has some disadvantages which have already been mentioned but with this approach deeper insights and a better comprehension may result. The research can provide new findings from another angle and thus work out additionally important aspects.

Specific but open ended questions have been formulated for the interviews but there has been room for interposed questions if during the interviews one aspect seemed to be worth looking at closer. Thus, follow-up questions have been used if it seemed applicable. Hence, the interviews are semi-structured. This had the advantage of being able to delve deeper into the topic if something was not understood and thus, allowed for a two-way communication. To be able to answer the research questions the interviews have been analysed. A qualitative content analysis has been performed[5] to find out which and how Big Data technologies are used and what differences and similarities exist within the two districts. Additionally, to see what categories of legitimacy are met and fulfilled according both, the officers and citizens, and to see if citizens are aware of the Big Data technologies used by the police. Thus, a comparison with the theory of procedural justice and the theoretical additions has taken place to evaluate the legitimacy of the Big Data usage and see if the theory can be applied and used.

The interviews have been recorded, as all respondents agreed to that, and after that those have been transcribed to be able to analyse them further. The interviews have been coded manually. This enabled a more accurate analysis than the automated coding, but it also had to be thought of biases. As e.g., the person who is coding the interviews can have cognitive bias and thus influence the findings (Medelyan, 2019). Hence, it was ensured, that the coding instructions have been clear and used precisely. A deductive coding has been applied, as the theoretical framework was used to formulate the different categories (Medelyan, 2019). It was important to keep in mind that other crucial thoughts could exist and to not overlook these through the

[5] For more detailed information about the exact procedure, the content analysis and the coding see Appendix 5.

predefined codes (Medelyan, 2019). Thus, one was open for other aspects. It has been differentiated between Big Data and legitimacy elements. First, to find out which Big Data technologies have been used and then to see if the legitimacy aspects are met. The respondents' answers have been ordered and put into those different categories. After that one was able to see whether those gave similar/divergent answers and it was easier to compare them across the two districts.

3.3 Validity and Reliability

As the research within the thesis dealt with qualitative data and analysis, the validity and reliability aspects cannot be evaluated upon that easily. No generalizations are possible in the end because the units of observation are limited and no standardized surveys or interviews have been used. But this is not the aim of the research. Rather an in-depth understanding of the topic is intended. Thus, it provides a new starting point for further and possible quantitative research.

The officers have been selected randomly. Still it depended on which officers were available and willing to cooperate. The same applies to the citizens. Of course, this does not ensure full representativeness and sample bias is possible but as stated before the intention of the research is to find out what aspects are crucial or rather worth looking at. Thus, for this research it is acceptable how the respondents have been chosen. Again, it has to be acknowledged that the unique circumstance caused by the pandemic did not allow to select the respondents as randomly as wished and to conduct the interviews all face-to-face. As the research had already been started, this could not have been changed in the ongoing process.

The respondents themselves can lead to biases when those are not telling the truth, as they could want to correct or deteriorate certain matters (Brink, 1993). It was tried to limit this bias as much as possible e.g. by comparing the answers of the different respondents. Further, the respondents have been told in detail what the research is about and what is intended to be found out in the end. Thus, it was ensured that respondents themselves lead to as less biases as possible and thus ensure reliability.

For both groups of respondents the set-up with the same questions for the different forms of big data technologies has been selected. This helped the respondents recognize the structure and is positive for the validity of the answers. Further, the questions have been carefully prepared and selected. To ensure the correctness of the findings everything has been documented fully and provided in the end. From the selection of the participants, over the formulation of the questions to the analysis of the content. Every step has been evaluated critically also according possible biases. Additionally, the interviews have been anonymised so that no individual identification

is possible and the respondents have been informed what will be done with their interviews and that they could ask questions at any time and stop the interview, if they wish so. All this ensured that possible biases are thought of and puts the findings into perspective. It helps to understand why certain decisions within this research have been made and all research steps are transparent enough so that everyone, with a little work, may understand it properly. As data from individual persons have been collected, the approval of the Ethics Committee BMS was requested and approved.

4 Results - Big Data usage in the two districts

In the next chapters the results of the interviews will be presented. It is structured according to the sub-questions. The first sub-question is about the Big Data usage within the two districts: *How and to what extent are Big Data technologies used by the police in the two districts?* The purpose of this question is to find out which kind of technologies are used and in which quantity. This may show how widely spread these are and if differences in the two regions exist.

To have a better idea about the different technologies some are explained first: One example of Big Data policing which is most popular is the before mentioned *predictive policing.* Here historical crime data are evaluated with the help of a computer program to predict and therefore prevent crimes (Ali, 2015). A huge amount of different datasets can be used to evaluate where crimes are most likely to happen, past crime data and other data like potential escape routes can be implemented as well (Ali, 2015). *PredPol* is an example for a system which makes geospatial and temporal information, about places where future crimes might happen, available to officers (Sanders and Sheptycki, 2017). This is the so called *Hot spot policing* and computers are used in the USA which electronically guide the officers to those hot spots (Ferguson, 2017b). Another example is the use of social media data "[…] in order to identify likely criminality based on the role of individual plays within a social network" (Ali, 2015, p. 50). This is called *predictive targeting* (Ferguson, 2017b). Person-based technologies exist as well, which can be classified as predictive. Such as the *Heat List* which singles out persons who are likely to be involved in a crime either as a perpetrator or victim (Joh, 2017). It is like a strategic suspects list (Ferguson, 2017a). A system which is known for this kind of Big Data use is *Beware* (Joh, 2017). Another technology which is more about the collection and use of information for ongoing investigations is the *Domain Awareness System* (Ridgeway, 2018). This is e.g. used by the New York Police Department (NYPD), it uses a lot of data and makes it accessible to the frontline officers so they can work out their tactics and crime prevention strategies (Ridgeway,

2018). The officers can e.g. directly talk to 911-callers and retrieve historical data about different locations (Ridgeway, 2018). *OSINT* however, concerns the usage of data which is openly available for any institution or person (Trottier, 2015). "[…] OSINT relies on publicly available information appearing in print or electronic form" (Trottier, 2015, p. 531), such as newspapers, television or social media sites. Thus, the police does not need any special clearances to use such information (Trottier, 2015). The aim of the usage of OSINT is to get a better idea of persons/places and collect more data. Even "[…] tools [exist] such as search engines and web crawlers [which] will then automatically retrieve these data" (Trottier, 2015, p. 533). Those are just a few examples of Big Data policing in order for one to get an impression on what this thesis is looking at. It is not a complete list as many more technologies exist and it has to be kept in mind that the two areas which are analysed might not use these technologies at all.

4.1 The Netherlands

At the beginning it has to be mentioned that all Dutch officers knew what the term Big Data means. Further, that the officers on the streets also get information by talking to people (O9): "We ask less, then we get less as well" (O6), meaning that it is crucial to listen to citizens and questioning them. Additionally, they get information from the control room (O10). The analysts work together with different partners (O7) and get information by mail or calls (O8). The **police smartphones** have been mentioned by three officers (O6, O9, O10) and two of them also mentioned the **smart police cars** (O6, O10). Those can e.g. be used to check license plates, ID cards etc. (O6) and the cars have a monitor on board (O6). Further, information can be implemented (O10). Thus, those are information tools. Another tool which was mentioned by all officers is **OSINT**. They e.g. search on social media sites for information and Google Maps to get a better idea about a place (O6, O7). Some officers said that they search for their own (O6), while others stated that additionally specialised teams exists which they ask for help (O7, O9). Further, they got fake accounts on different platforms (O7, O8), so they work undercover. Thus, this technology is quite heterogeneously used and the usage depends on where the officers work.

Another technology was mentioned by four officers (O7, O8, O9, O10) but is only used by one of them (O9): **predictive policing**. Two stated that the same tools they already mentioned are used for it but that another team is working on it (O7, O8). Others said that it was tried to implement predictive policing in the past but that it did not deliver the results hoped for (O9, O10). One however told that they get a weekly report which is based on regional incidents so they can see what is happening, where hot spots are, what the hot times are and it mostly concerns burglaries (O9). Thus, they can see patterns and act accordingly.

The next technology was mentioned by three officers and is called **BVIB** (Basisvoorziening Integrale Bevraging). This system gives officers every information available about specific persons. “It is like *Google* for the police” (O6). One did not say anything more (O7) and the other one summarized it under ***internal police systems***, here he includes **Cognos**, a system where officers can get an *Excel* list of every topic they want (O9). **GMS** (Geintegreerde Meldkamer Systeem) is another technology which was mentioned by one officer and is connected to BVIB (O6). It is a system on the computers/smartphones which shows officers what is happening at the moment and indicates different priorities. Another technology was mentioned by a single officer: **Blue Spot Monitor** (O6). This can be used for predictive policing as they can look at burglaries and try to figure out patterns. It is installed on the smartphones/computers.

Summit is a tool where all available police information is searchable and was mentioned by one officer (O7). It is a source and the analysts use other tools like Palantir etc. to process that data. It can be called an “investigation database” (O7). Another tool which was named by one officer is a **camera system** (O10). Cameras are installed above all roads that can read number plates of all cars passing by and send notifications to the police if a car of interest is captured.

The last three technologies are the **analytical tools** (I Base, Mind Manager, Palantir) and have been mentioned by two officers (O7, O8). With ***I Base*** all relevant sources and Big Data can be implemented and analysed (O7). ***Mind Manager*** is used to structure information in a mind map to visualize different scenarios (O7, O8). ***Palantir*** is utilized to combine all police information within the whole country (O7) and to visualize or search for information (O8).

Three officers ***use*** all technologies they mentioned ***frequently*** and say that those are very important (O6, O7, O9). Another officer states that those Big Data technologies are their main sources and used on an hourly basis (O8). “It is the main part of our work as an analyst” (O8). OSINT and the camera system are not used daily but weekly by another officer (O10). The systems are important and play a major role for their work (O10).

4.2 Germany

First, one has to mention that all German officers knew what the term Big Data means. Further, it is crucial to say that they still get information in paper form and not only through (new) technologies (O1, O3, O4). One officer even said that most information is gained by talking to people (O1). One tool that all officers mentioned are the **police smartphones**. One said that he only knows but does not use those (O3). The phones can be used to look up different information by using apps, e.g. resident’s registration offices data, they can scan identity cards and

use an internal messenger. They exist so the control room does not get overwhelmed (O1, O3, O5) but the radio is still important (O1, O2, O4, O5). Thus, they can retrieve information with the issued mobile phones. These phones are ***used daily***.

OSINT was mentioned by four officers. It is striking that not all define this equally. One said they use telephone directories as information sources (O1). He and others who are working in the *Wach- und Wechesldienst* (Guard and change service) also said that they use their private accounts to look at *Facebook*, *Instagram* (O1, O2, O4) and other social media sites. The officer at the Criminal Investigation Department mentioned that he always requests the specialized department for information as only then it can be used before court (O3). They think that other officers or the *Landeskriminalamt* (LKA) (State Criminal Police Office) might need those sources more and have other systems (O1, O2, O3, O4). Thus, it depends on their department which tools they can use. OSINT is ***not used that often***. One officer only uses it monthly (O3).

Another tool is the **Vorgangs- und Bearbeitungssystem VIVA** (Process for integrated operation processing and information - operation and processing system) which was introduced by three officers (O1, O4, O5), but only two considered it as a separate tool and as Big Data (O1, O5). This demonstrates, that Big Data policing is not understood uniformly. It is a system with which they can retrieve various police information from all North Rhine-Westphalia and write criminal charges (O1). It is installed on the phones as well. This system is ***used daily***.

The last technology which was named is **predictive policing**. This is about predicting where a crime might happen and then prevent it from happening. All officers heard of it but only one said that he used it already, but ***rarely***, and then mostly for burglaries (O5). Two said that it does not exist in their region (O1, O4). Some add that it does exist in another areas, namely in Düsseldorf and at the LKA (O1, O2). Further, that in the Münsterland predictive policing is if at all a manual evaluation (O3) or that specific places are patrolled more often just “out of common sense” (O4). Sometimes predictive policing was understood as *preventive policing* which is not about data but about education e.g. on social media (O1, O5). This shows that this technology is not that widely spread in the area around the Münsterland.

4.3 Conclusion

Thus, the first sub-question can be answered as follows: As it was expected, the Dutch officers mentioned a lot more technologies and seemed to be more familiar with the topic *Big Data* than

the German ones. The Dutch officers named thirteen and the German ones four different technologies.[6] This was assumed as in Germany technological development always takes some time, which was also mentioned by them. Further, the police work is a state matter there, which complicates implementing new technologies. Additionally, it could be recognized in both areas that officers who work in different departments use different technologies as well. In the Netherlands all technologies are used frequently, while in Germany this is not the case.

[6] *Analyst Notebook* was mentioned by two Dutch officers (O7; O8). But one officer did not go into detail about it (O7). Thus, it seems to not play a major role within her work. The other one put it together with other analytical tools (O8). Thus it was decided to not analyse it more deeply.

Tbl. 2: Which technologies are used in the two regions?

Country ---------- **Technologies**	***The Netherlands***	***Germany***
Special Smartphones	Used by three officers	Mentioned by all officers and used by four
Smart Police Cars	Used by two officers	Not used
OSINT – *Open Source Intelligence*	Used by all officers	Used by four officers
VIVA – *Vorgangs- und Bearbeitungssystem*	Not used	Mentioned by three officers and considered as Big Data by two of those
Predictive Policing	Mentioned by four officers but only used by one	Known by all officers but only used by one
BVIB - *Basisvoorziening Integrale Bevraging*	Mentioned by three officers but only considered as Big Data by two	Not used
Cognos	Used by one officer	Not used
GMS – *Geintegreerde Meldkamer Systeem*	Used by one officer	Not used
Blue Spot Monitor	Used by one officer	Not used
Summit	Used by one officer	Not used
Camera System	Used by one officer	Not used
Analytical tools:		
- ***I Base***	Used by two officers	Not used
- ***Mind Manager***	Used by two officers	Not used
- ***Palantir***	Used by two officers	Not used

5 Results - Legitimacy from the perspective of the police officers

The second sub-question concerns the legitimacy of the different Big Data technologies which are used by the officers: *Do police officers in both districts consider the use of Big Data legitimate?* This question aims to find out how different officers evaluate the various Big Data technologies in terms of their legitimacy. This is important because in a later step it can be recognized if they evaluate it similar to the citizens or not. As described in the theory chapter (2.1.2 Legitimacy) according to Tyler legitimacy can be gained when citizens have the chance to explain themselves and when the decisions are carried out fairly. Further, the police needs to treat them with respect and the citizens need to be able to trust in the motives of the police.

5.1 The Netherlands

In the following I will outline for each of the Big Data technologies how the interviewed officers valued their legitimacy. I start with the smartphones and the smart cars where various police date files can be consulted on the spot at screens. The Dutch officers agree that the citizens still have the chance to ***explain themselves*** and that their work gets more ***objective*** as e.g. the information is based on facts, when they use the **smartphones and cars**. For two of them it is additionally ***transparent*** as e.g. citizens can see them using those (O6). One says it is not transparent as they mostly cannot share everything with the citizens (O10). Two officers agree that it neither gets more nor less ***respectful*** as this characteristic is always important (O9, O10). For one it does not necessarily get ***fairer*** (O9) but for the other one it does (O10). The last one says that it is more respectful and fairer as it gives them an "objective point of where to start" (O6). All of them hope that it helps to gain ***trust***. Still, they say that they should explain to citizens what they are doing. This implies that all officers explain what they are doing and this might not always be done or even possible. All see the phones/cars as ***helpful***. Additionally, those are generally seen to make their work ***faster*** as they can e.g. look up information quicker (O6, O9, O10). That is good as: "The faster information comes to us […], the better it is" (O6). Moreover, they agree that their work gets more ***accurate*** as e.g. they have more information available and can directly implement information. Two state it is ***fairer*** as they can better evaluate situations (O6, O10). The last one says that the fairness is not based on the technology and should always be present (O9). The phones/cars can help to establish a ***way of proceeding*** (O6, O9, O10). The officers who mentioned both the cars and phones say that they ***appreciate*** both because of all the advantages (O6, O10) but that the phones are more important (O6). Another appreciates the phones as they give them a lot of possibilities (O9). All in all, those are viewed as ***legitimate*** as

one officer thinks the citizens want them to use those to do their job (O6), as they can explain where information come from (O9) and they can make better and fairer decisions (O10).

OSINT

With OSINT openly available sources like social media sites are consulted. All officers state that citizens still have the chance to ***explain themselves*** when OSINT is used. For instance, because this gives them a cause to ask citizens: "We ask and we listen and then we decide […] which values more" (O6). Another officer says that their input is relevant as citizens are the ones who put those information online (O7). It is not clear, if this meets the criteria properly as it is not known from this officer if citizens afterwards still have the chance to explain their version. One officer however states that those sources are used for investigative matters and thus citizens are not always questioned (O10). All officers think that their decision making is not ***transparent*** "because of the secrete nature of our work" (O8). This shows that it might not always be possible to be transparent as an officer. Still, they need to be able to reproduce their steps and citizens can get information when they are involved (O7, O8, O10). Thus in a way the information themselves are transparent. For most of them it was not easy to state if the usage is ***objective***. It can be subjective as they do not know if they are true (O6, O7) but are looked at objectively (O10). However, it ensures that no tunnel vision exists and provides more objectivity (O8). Still, one officer says that OSINT can lead to more *or* less objectivity (O9). It is not sure if they all understood the term in the same way and how the theory suggested. Nevertheless, this dimensions seems to be met. Four officers state that it neither leads to more nor less ***respectful*** and ***fair*** behaviour (O7, O8, O9, O10) as "that is the basis of our legitimacy" (O9). Another assumed that it is not respectful but that "there is always respect till a certain point" (O6). This shows that the treatment is crucial for all officers. Three claim that it is difficult to gain ***trust*** as they do not tell citizens that they use these sources (O6, O8, O9). "People do not know what we do with OSINT [and] we do not talk with citizens" (O8). Additionally, sometimes it would not be good if the citizens knew that they are using it for the sake of their job (O6, O9). Two others say that it helps them gain trust (O7, O10). This shows that citizen's trust might rise when they know of it but stays the same when they do not know. All officers agree that this technology is ***helpful*** as they can get more information. Three officer state that it makes their work ***faster*** in some cases (O6, O7, O10). One says that it gets slower as an additional source takes more time (O8) and the last one could not give an answer (O9). One officer thinks the police work gets ***fairer*** but the ***accuracy*** depends on other information as well (O6). For another it is fairer as you can triangulate but not more accurate as those information do not need

to be correct (O8). For one however it is more accurate as they have more information but he does not know if it is fairer as the information is normally quite subjective (O9). The last two say that those two features do not change (O10) and that they depend on the specific cases (O7). Again the answers are quite heterogeneous. It can help them establish a ***way of proceeding*** (O6, O7, O10). Two say as it is not the most important source it is not that easy to answer (O8) or it would "get […] too much credit" (O9) respectively. All of them ***appreciate*** this tool. Two just said that some of the open sources are not appreciated as much as others (O7, O8). Four officers claim that OSINT is ***legitimate*** (O6, O8, O9, O10), as e.g. citizens themselves put it there. One says: "it is a yes and no" (O7). This is striking as one would expect that the officers consider all their tools legitimate as otherwise it could harm their work and legitimacy.

Predictive Policing

With this officers try to prevent crimes from happening by predicting them. The officer (O9– *in the following it will be his opinion*) says that the ***citizens' input*** is not always relevant as predictive policing is based on data "to make an operational plan" and does not "concern the individual" (O9). Further, citizens cannot see how decisions are made but the officers are ***transparent*** about the numbers of incidents. Still, this dimension is not met as the way of proceeding is not visible for citizens. Additionally, the police work does not get more ***objective***, ***respectful*** or ***fairer*** as it is used to prioritize. It can help to gain ***trust*** as current issues are addressed. This implies that citizens know that this technology is used, which apparently is not the case. The officer says it is ***helpful***, can make their work ***faster*** and more ***accurate*** and ***fairer*** as they are able to concentrate on what is important. Still, it does not help them ***establish a way of proceeding*** as this step comes after they get information. This answer is a bit confusing as predictive policing is expected to help them establish a way. Still, the answer implies that this information is the starting point for their actions. He ***appreciates*** it and views it as ***legitimate*** as they help the community with it which is "always positive" (O9).

BVIB

This section analyses what one officer said about **BVIB** (O6), which provides police information to officers, and the other one about the *internal police systems* (BVIB & Cognos, O9). Cognos is a system where officers can get information of any subject. Both say that the ***citizens' input*** is still relevant and one that it is ***transparent*** as citizens know that the government has information like date of birth or residence (O6). Still, it is not said that the process itself is transparent for the citizens. Which is stressed by the other one who says it is not transparent as citizens "do not get to glance […] inside" (O9). One states that it is more ***objective*** than e.g.

open sources (O6) and the other one hopes that it gets more objective as the internal systems "have to be based on facts and observations" (O9). It is assumed by one that it gets ***fairer*** as they can better judge someone because of their history (O6). This can also be seen as less fair as people can change and are not only defined by their past. The other one states that it neither gets more nor less ***respectful*** and fair as those are internal values (O9). One hopes that citizens ***trust*** them more when they know that they use this because the information is verified (O6). The other states that it can help them gain trust as they can explain how information is gathered (O9). This implies that citizens know about it otherwise the trust cannot change. Moreover, it is viewed as ***helpful*** as it can make their work better and ***faster*** as they e.g. do not need to ask for permission every single time (O6). They think that their work gets more ***accurate*** as a better judgement is possible and as it is more objective it is ***fairer*** as they can get the information faster (O6, O9). It is easier for them to ***establish a way of proceeding*** as they e.g. can visualize incidents (O9). All in all, it is ***appreciated*** (O6, O9) and seen as ***legitimate*** as citizens already know that they have those information (O6) and are implemented by the officers (O9). The question arises if this can also be a disadvantage as officers could make mistakes. Still, everyone is prone for mistakes thus, this might not be that big of a downside.

GMS

This system shows them incidents happening around them by priority. When they use GMS citizens still have the chance to ***explain themselves*** and it is viewed to be ***transparent*** as it is connected to BVIB (O6 – *in the following it will be her opinion*). Here the question might not be answered in the sense of the theory since the officer did not say what the citizens are able to recognize. The officer thinks that the police work gets more ***objective*** as they collect all pieces and ***fairer*** and more ***respectful*** because officers always prepare themselves and revaluate if necessary. This shows that it is fair as they do not try to jump to conclusions. Additionally, it can help gain ***trust*** as it is assumed that citizens want them to get to incidents as fast as possible and set the right priorities. Of course, for that it is necessary, that they know that the police is using this system. The officer states that it is ***helpful*** and ***faster*** as they can directly see what is happening. It makes their work more ***accurate*** and ***fairer*** as "the faster we have information the faster we can get there, the faster we can catch that guy" (O6). Because of these advantages it helps them establish a ***way of proceeding*** and is ***appreciated***. Furthermore, it is viewed as ***legitimate*** as she assumes that citizens want the police to be at high priority incidents as soon as possible. This shows that the officer thinks that legitimacy is connected to the citizens which is a good way to evaluate same as without the citizens' consent they cannot gain legitimacy.

Blue Spot Monitor

This system can help the officers to find out patterns. When Blue Spot Monitor is used citizens still have the possibility to ***explain themselves*** but she is not sure if it is ***transparent*** but thinks it is more transparent than other tools (O6 - *in the following it will be her opinion*). It is ***objective*** as police information is used. This can be seen as fulfilling the theoretical dimension, as the information provided by the police themselves are considered objective. She assumes that their work gets more ***respectful and fairer*** as citizens want them to do a good job and "by predicting we might be able to prevent something" (O6). This shows that she includes the citizens which is important for legitimacy. Still, citizens need to be able to see the usage of the technology. ***Trust*** can be gained if citizens see that they are doing a good job but still, it cannot easily be recognized as one cannot measure how many incidents have been prevented. It is ***helpful*** and makes their work ***faster*** as it can help them to set the right focus and use "the network of the pattern" (O6). It does not make it more ***accurate*** as the information can e.g. be incomplete. She cannot say if it is ***fairer*** as that depends on the specific situation. Still, it can help them establish a ***way of proceeding*** as they can focus better though it sometimes leads to false conclusions but it is still ***appreciated***. Altogether, it is viewed as ***legitimate*** as it depends on police information.

Summit

This system is a source of information. Citizens still have the chance to ***explain themselves***, when Summit is used, because everything they tell the police is implemented in this system (O7 - *in the following it will be her opinion*). The question arises, if the officers still give citizens the opportunity to say something additionally. She did not say anything about the ***transparency*** but said it gets more ***objective*** as every police action is implemented. The treatment is supposed to become ***fairer*** and more ***respectful*** as everything needs to be saved. It does not concern interpersonal treatment but it is still believed to fulfil this dimension as the treatment in general gets fairer/more respectful when a reproduction is possible. The officer states that it can help gain ***trust*** as they can show how they got to conclusions. This implies that citizens know of that system which might not be the case. It is seen to be ***helpful*** but it does not make their work ***faster*** as it is time-consuming. Their work gets ***fairer*** and more ***accurate*** for the same reason of documentation. It can help establish a ***way of proceeding*** as they do not need to look at paper work. It is ***appreciated*** and seen as ***legitimate*** as it is "the main tool for the investigator" (O7).

Camera system

The ***citizens' input*** is not as relevant, when the camera system is used, as they cannot say that they have not been at a certain place when the system tells something different (O10 – *following*

it is at his discretion). Still, when they are caught they have the chance to talk. It does not lead to more ***transparency*** as officers do not always disclose their information but they "still need to be ***objective***" (O10). This is not exactly an answer to the question as he did not say if the tool itself helps them to be objective. The ***respect*** and ***fairness*** do not change as those are always important. Still, it is fairer for the victims as it is easier to help them. ***Trust*** cannot be gained as most people do not like this system and have concerns about their privacy. It is viewed as ***helpful*** as they do not need to check every car manually which also leads to ***faster*** work. The system leads to more ***accuracy*** and ***fairness*** as every car is checked and it is not biased. The officer says that it helps them to ***establish a way of proceeding.*** Further, he ***appreciates*** it and thinks that in the way they use it, it is ***legitimate*** but that not all citizens would agree. It is good that he also thought about the citizens and acknowledges that those might see it differently.

Analytical Tools

I Base is a system where all relevant data can be implemented. The citizens still have the possibility to ***explain their version***, when I Base is used, because all information, also citizens' statements, are in the general police system BVIB and those are all imported to I Base (O7). Those analytical tools are built on information which citizens give the police thus their input is used to analyse the situation (O8). Still, the question arises if the citizens later have the chance to give their input. It is ***transparent*** as officers "have to explain every step" (O7). Thus, citizens involved can get information from their lawyers (O7). The other officer claims that it is not transparent for citizens but within the police organisation (O8). Further, they think it is ***objective*** as they need to be able to reproduce their decisions (O7, O8). One officer assumes that it gets ***fairer*** and more ***respectful*** as the information is not just in the heads of the officers (O7). One thinks it is respectful (O8). This shows that respectful behaviour does not always need a personal encounter. It might help gain the citizens' ***trust*** as they are able to reproduce, do not get a "tunnel vision" (O7) and as they are citizens themselves and try to operate with good intentions (O8). This again requires that citizens know that it is used. It is viewed as ***helpful*** and as making their work ***faster*** as they easily can connect things (O7) and can work more efficiently and only need to "write a certain question to get a result" (O8). It makes their work more ***accurate and fairer*** because of the above mentioned reasons (O7) and as the interpretations are machine based (O8). This cannot only be seen as an advantage as machines can make mistakes too. It can help them ***establish a way of proceeding*** as they e.g. can recognize connections faster (O7) and decide what to do (O8). All in all, it is ***appreciated*** and it is accepted as ***legitimate*** e.g. as not a lot of human interpretation is involved (O8).

As all sources of information are in the mind map, the citizens and ***their views*** are implemented as well (O7, O8), when using **Mind Manager**, which is used to structure information. Again, the question arises if they later have the possibility to say something. One officer thinks that it is ***transparent***, as "everything is in the mind map" (O7). The other states that it is transparent within the police organisation but not for the citizens (O8). Their work gets (more) ***objective*** as the sources are listed so it is "a legitimate tunnel vision" (O7) and they can reproduce everything (O8). The usage is ***respectful*** as it is transparent and ***fair*** (O7) and as they try to be careful when they come to conclusions (O8). It can help to gain ***trust*** as officers are less likely to arrest the wrong person (O7) and operate with good intentions (O8). It is ***helpful,*** efficient (O7, O8) and ***faster*** since not every single investigator needs to read everything (O7, O8). It leads to more ***accuracy*** and ***fairness*** (O7) as nothing is forgotten and as the decisions are machine based (O8). It can help them ***establish a way of proceeding*** (O8, O7), it is ***appreciated*** as they can have "a helicopter view" (O7) and it makes their work less complicated (O8). Additionally, it is viewed as ***legitimate*** because all sources are used (O7) and little human interpretation is involved (O8).

Palantir can be used to combine and visualize police information. When it is used citizens still have the chance to ***explain their version*** as the input is the same as within the other tools (O7, O8). Again it is not clear if they still have the chance to say something in a later step. It leads to more ***transparency*** as those involved can get information about the search (O7). The other says that it is transparent for the police but not for the citizens (O8). It leads to (more) ***objectivity*** (O7, O8) and the treatment gets ***fairer*** and more ***respectful*** (O7) or is respectful (O8) as every single information is used and combined and reproduction is compulsory. It helps the police gain ***trust*** as citizens see that they have been able to convince the court that someone is guilty (O7) and because the officers have good intentions (O8). For this it is again necessary for citizens to know that this system is used. It is ***helpful*** (O8) as "it is like *Google* search for the police" (O7). Further, it makes their work ***faster*** as it works automatically instead of manually (O7, O8). It is ***fairer*** and more ***accurate*** as everything can be reproduced (O7) and less human interpretation is necessary (O8). Further, it can help them ***establish a way of proceeding*** (O7, O8). It is ***appreciated*** (O7, O8) and seen as ***legitimate*** as they "can go back to the sources" (O7) and as it is objective and transparent (O8).

All in all, the officers see a lot of ***advantages*** when using those technologies. For instance, it makes their work faster, more accurate (O6) and easier (O7). Moreover, they can get results quicker and therefore deal with more cases which will eventually make the citizens more pleased (O8). One states that she has ***concerns*** in general what is happening with her data as a

lot of information is collected (O6). Nevertheless she has no concerns when it comes to Big Data policing as she trusts her colleagues and organisation (O6). This shows that it might be important to distinguish between Big Data in general and Big Data policing as the standards which need to be met vary. Another officer adds, that she only has concerns when it comes to the usage of some sources (O7). One says that errors are not inevitable and thus officers always have to be cautious when coming to conclusions (O8). Further, the systems need to be working well and should e.g. not discriminate (O10). This officer states that he has no concerns about the privacy as an officer but as a citizen (O10). Another has no concerns at all (O9). Mostly, they think that in the ***future*** more Big Data technologies will be used, such as drones and cameras (O6). They assume that policing will become more digital (O6, O9). One officer gave a concrete example wanting to establish a pilot project as he thinks that predictive policing can better their work (O9). Another officer claims that Big Data is the future for policing. This is also stressed by another officer who states that Big Data is a "standard component" (O8) for the planning with more and more people seeing the advantages. Companies are working on Big Data technologies and it is assumed that they will play a bigger role in the future (O10).

5.2 Germany

Clearly less Big Data technologies are used by the German police. Below I have shown how the interviewed German officers valued its legitimacy. I start with the **smartphones**. When it comes to the special police smartphones, all officers say that citizens have the chance to ***explain themselves*** when those are used. It is an officer's duty to collect both incriminating and exculpatory information (O1; *this was mentioned by another officers in another context:* O3). The transparency and objectivity was heterogeneously evaluated. Two officers say it is not ***transparent*** (O1, O5), e.g. because citizens do not have to know what they are searching for (O1). The other two officers think that it *is* transparent (O2, O4), as they *can see* that they use them and that those are helpful. Two say that it does not get more/less ***objective*** (O2, O5), one that it even gets more subjective (O1) and the last one that he cannot evaluate it (O4). Thus, it becomes clear that maybe the theory is difficult to apply as the police work is sometimes more complex than at first glance and officers not always have the same idea of what citizens can see. Two officers mentioned that citizens always have to be treated ***fairly and respectfully*** (O4, O5) and another that it neither leads to more nor to less fairness and respect (O1). One said that the information from the phone could lead to biased officers (O2). Three officers think that they can gain ***trust*** through using the phones (O1, O2, O4) e.g. because they show professionalism (O2, O4). The last one states that it does not lead to more nor less trust (O5). This demonstrates

that the theory is not always applicable as officers have different views on what trust means. Still, one need of the citizens is for officers to do a good job. However, it is somewhat inconclusive because trust can only be gained if citizens are able to see what the police is doing. All of them say that it makes their work more ***accurate and efficient*** as e.g. mistakes can be prevented and ***faster***. Two officers think that it is ***fairer*** (O1, O4), one cannot judge it (O2) and one did not say anything about it (O5). It is seen as ***helpful*** by all of them. Three say that it helps them to better assess the whole situation, e.g. for their self-protection (O2, O4, O5) but one says that it does not help ***establish a way of proceeding*** (O1). Still, all officers ***appreciate*** this tool and view it as ***legitimate***. The legitimacy was not understood in the same way by all of them but most said it is legitimate because no rights are restricted when using those.

OSINT

All officers say that citizens still have the ***possibility to explain themselves*** when they use OSINT. One states that it is ***transparent*** as he always explains the citizens what he is doing (O1). Another claimed that it depends on the different officers (O2) and yet another that it might not be transparent but that people put information on those platforms voluntarily (O4). The last one distinguishes between *prevention of danger*, where people might recognize what the officers did digitally and *criminal prosecution*, where citizens only get information from their lawyers (O3). For two officers it is not clear if OSINT leads to more or less ***objectivity*** (O1, O2) as it might lead to officers pigeonholing people (O2). Another says it does not lead to more nor less (O4) which is supported by the last one who states that the principles of neutrality and equality always apply (O3). For all of them the treatment is ***fair and respectful.*** Still, the answers given might not fit the dimension of the theory as the officers did not say anything about interpersonal treatment. However, the treatment in general needs to be fair and respectful and thus, especially when talking about technology, can still be judged within the theory. Two officers state that it can help them gain ***trust*** (O1, O4). Because it shows that citizens' concerns are addressed "fairly, comprehensively and broadly" (O4). Two say it does not increase trust (O2, O3). Still, all of them see it as ***helpful*** and as making their work ***faster***. Two officers claim that it does not get more ***accurate*** as e.g. the information do not need to be correct (O1, O4). According to two it gets more accurate (O2, O3) e.g. because not as many resources are needed (O3). It is unclear, if that is really meant with accuracy as one might also say that more resources and thus information lead to more accuracy. One cannot say if it gets ***fairer*** or not (O1). Two say that it is fair (O3, O4), e.g. because decisions need to be comprehensible (O3). The last one states that it depends on the individual officers (O2). Each of them say that it helps them to

choose a ***way of proceeding*** and that it is ***appreciated*** as it makes their work easier although it is not as important as other tools (O1, O2). All of them consider it as ***legitimate*** as those sources are publicly available (O1, O2, O4) and because no law forbids them to use it (O3).

VIVA

This system provides police information to officers. Both officers say that it is still important to ***listen to the citizens*** when they use VIVA but further that it is not ***transparent*** as citizens do not and should not know what they are doing with it (O1, O5). One says that it gets more subjective as officers might be biased by having more information (O1) but for the other it neither gets more nor less ***objective*** (O5). The police work is ***fair*** as with those systems they assure that "everyone gets what he/she deserves" (O1). The other states the fairness does not change (O5). The technology should have no influence on the ***respectful*** behaviour as citizens should always be treated like that (O1, O5). One officer states that it helps to gain ***trust*** as citizens see that the police is considering all information (O1). Because the other officer claims that citizens do not have contact with that system and thus it has no influence on the trust (O5), the question arises, if citizens can really recognize that. It becomes obvious that the officers have different opinions on what citizens are able to see. However, both say their work becomes more ***efficient***, ***faster***, more ***accurate*** and that it is ***helpful***. As mistakes are prevented, information can be copied easily and less paper work is necessary. The ***fairness*** was difficult for them to evaluate. One explaining that it is a subjective term (O1) and the other did not say anything about it. For one it does lead to a better overview and more information for their own security (O5) but for the other "the system is not that complex" (O1) and thus it does not help to ***establish a way of proceeding***. Both ***appreciate*** it and view it as ***legitimate***. One stating that it is legitimate to write their reports in there (O1) and the other one that they only search for information if something happened and then it is alright to invade someone's privacy (O5).

Predictive Policing

The officer who rarely uses predictive policing says that it is always important to ***hear what the citizens have to say*** (O5 – *it will be his opinion within this section*). Further, that it is not ***transparent***, as citizens have no insight and sometimes it would even not be good to make it public. The police work gets a bit more ***subjective*** as specific locations are targeted. ***Respect*** is a basic requirement and the technology does not change that necessity. Additionally, it is ***not unfair*** and it is justified to use such a system. It is hard to say if it helps to gain ***trust*** because citizens cannot really see when something was prevented. Further, it is ***helpful*** as it can help officers focus their attention. It does not particularly make their work ***faster*** or more ***accurate***

as they do not know if they succeed but it does make their work ***fairer*** as at places where more crimes happen also more police presence needs to be shown. Further, it helps ***establish a way of proceeding***, as officers can adjust to the offences which have been committed. It is ***appreciated*** and seen as ***legitimate*** as citizens are not restricted by this.

All in all, the officers see a lot of ***advantages*** when using those technologies, e.g. that it makes their work less error-prone, more information is available and their work gets faster. Still, it is noted that those advantages might not remain for the long run as criminals are probably able to adjust to it (O3). There are some who say that a few possible ***dangers*** exist such as data leaks or false information (O1, O2) but still Germany has good laws (O1). Others claimed that only internal police data is used and that the public is not involved (O3, O4). This information is "acquired by the administrative apparatus for the administrative apparatus" (O4). Moreover, the policy would prevent the police of abusing their possibilities (O3). Data protection problems do not exist as they treat their information with care (O4). One officer even said that he is against predictive policing as that would be against the presumption of innocence (O1). All officers presume that policing will get more digital in the ***future*** and that more technologies will be introduced. For example, that the phones will have more features and that every officer gets one (O5). Still, some technologies might not be implement as German laws and data protection prevent that and since it is costly (O1, O2, O5). What is striking is that the officer at the Criminal Investigation Department just mentioned OSINT as a Big Data tool and that all other work is done physically by using reports, criminal charges and a lot of paper work (O3). This is remarkable as it was expected that those officers need and use more Big Data technologies.

5.3 Comparison

First, it must be emphasised that all technologies mentioned by the Dutch officers can be considered as Big Data policing as with those a lot of different information is collected to then analyse how those can help. Still, it is striking that e.g. Mind Manager and Palantir are mentioned in one breath, even though these two tools are used for entirely different things. This shows that even the officers need to differentiate more as not everything can immediately and equally be considered Big Data. The officers mostly gave quite heterogeneous answers and thus a uniform answer to the question if the different technologies are legitimately used cannot be given. Theory wise, GMS is the technology which is most legitimately used as the Dutch officer who uses this is positive about all dimensions. Closely after that come the smart cars, the smartphones, Cognos, BVIB and the analytical tools where almost all legitimacy dimensions are positively evaluated. Additionally, Blue Spot Monitor, Summit and the camera system are

mostly positively assessed but a bit less than the others. OSINT is the technology which is evaluated most critically as not all Dutch officers are always sure if the dimensions are fulfilled. For instance, all agree that it is not transparent but they e.g. cannot agree if it is objective or if it makes their work faster. Predictive policing would be in the middle as some dimension are positively rated e.g. that it helps to gain trust or that it makes their work more accurate but others are negatively judged like the objectivity. All in all, helpfulness and appreciation are the dimensions which are fully fulfilled while the transparency is lacking most. Only GMS is seen to be transparent to the public. Thus, the Dutch police needs to work on this as transparency seems to threaten legitimacy the most. All other dimensions are more positively than negatively evaluated. The Dutch police should therefore think about the transparency and how they can provide that to the citizens or how they can explain them when it is not possible. It is striking that the officers agree for almost all technologies (just for OSINT one officer was not sure) that those technologies are legitimate. The officers do not think of all dimensions which are important in the theory but just assume that their technology usage is legitimate. Another aspect which is crucial is that three officers said that fair and respectful behaviour is always important (O6, O9, O10) and two that is does not depend on the technology (O9, O10). This was expected as those are seen to be basic requirements. Further, two said that the citizens' input is constantly important (O6, O9). This was expected to be more predominant among the officers. The citizens' trust is always dependent on the fact that those know that these technologies are used. Thus, as some of those are not/cannot be transparent, it is not easy to gain the citizens' trust, this seems to be overlooked by the officers.

The technologies which are mentioned by the German officers can also be considered Big Data policing as with those a lot of different information is collected to then analyse, again not all technologies can equally strongly be considered as Big Data. Sometimes no big system is behind it, but those tools are still seen to be Big Data as they are the beginning of more complex systems of the future. OSINT is the technology which seems to be most legitimate in the view of the German officers as most of the legitimacy dimensions are fulfilled. Such as the input of the citizens or the respect. Closely followed by predictive policing and VIVA. Where e.g. transparency is evaluated negatively while respectfulness and fairness positively. The smartphones are evaluated a bit more critically although the difference is not that significant. The officers cannot agree if those lead to more/less transparency or to more/less objectivity. All German officers agree that citizens always have the chance to give their input, that all technologies are helpful, that they appreciate those and see them as legitimate. The dimensions which are less

fulfilled are transparency, objectivity, trust and accuracy and fairness. Thus, the German police should work on these aspects because those threaten the legitimacy most. It is striking, that they view all technologies as legitimate, although sometimes some dimensions are not met. Thus, they do not always consider everything which they said and just think their actions are justified. This might be, because otherwise they would incriminate their own profession. Moreover, they state that transparency can or should not be given all the time. This was expected as transparency could also harm their job. Theory wise, none of the technologies would be fully legitimate.

5.4 Conclusion

Thus, the answer to the second sub-question is: Mostly, the officers appreciate the technologies and view them as legitimate, as suspected. Although, in Germany theory wise none of the technologies would be fully legitimate as never all dimensions are fulfilled and on the Dutch side only GMS would be used fully legitimately. This shows that they are confident that what they are doing is all right. As anticipated all officers say that the citizens' input is still relevant. Only the Dutch officer who uses predictive policing and the one who uses the camera system say that it is not that relevant but this was also assumed. It was expected however, that they would answer more homogeneously and that the fair and respectful behaviour would even be more advertised as a basic requirement and that the objectivity would be evaluated more positively also on the German side. However, the Dutch officers did evaluate the trust part more optimistically than anticipated. The transparency is quite similarly and negatively seen by the officers but the Dutch ones seem to rate it a little more positively. The German officers judge the possible advantages more critically than the Dutch ones. This was not expected, as it was thought that most of these are seen to be present for almost all technologies. The Dutch officers all in all not only use more Big Data technologies but additionally accept those more as more dimensions are evaluated positively. The objectivity and trust is seen more negatively by the German officers. This may be, because Dutch officers might be more used to the technologies already. The German ones judge the different dimension more critically and therefore less of those are fulfilled. Thus may be, because the Dutch officers see more of the advantages already because they use those technologies longer and are thus more used to it and the German ones are not even sure if those technologies help them e.g. to establish a way of proceeding.

Tbl. 3: How do Dutch officers evaluate the legitimacy aspects? Part 1 – Tyler[7]

Legitimacy Aspects --- Technologies	*Input of the citizens (9 positive)*	*Transparency (1 positive)*	*Objectivity (9 positive)*	*Respectfulness & Fairness (9 positive)*	*Trust (9 positive)*
Smartphones *(4 positive)*	Three officers: fulfilled; two: always important	Two officers: fulfilled; one: not transparent	All officers: more objective	Two officers: neither more nor less respectful – always important; one: more respectful; Two: fairer; one: maybe fairer	All officers: hope that it helps them gain trust
Smart Police Cars *(4 positive)*	Two officers: fulfilled; one: always important	One: transparent; one: not transparent	All officers: more objective	One: more respectful; one: neither more nor less – always important; Both: fairer	All officers: hope that it helps them gain trust
OSINT *(1 positive)*	All officers: fulfilled; one: always important	All officers: not fulfilled	Two: more subjective; two: (more) objective; one: inconclusive	Four officers: neither more nor less respect and fairness – one: always important; one: not respectful	Three: difficult to gain trust; two: can help them gain trust
Predictive Policing *(1 positive)*	One officer: input not always relevant	Citizens cannot see decision making; but transparency about number of incidents	Not more objective	Not more respectful or fairer	Can help to gain trust
BVIB *(4 positive)*	Two officers: Fulfilled – one: always important	One: transparent; one: not transparent	One: more objective than other technologies; one: hopes for more objectiveness	One: fairer; one: neither more nor less respectful and fair – always important	Both: hope that they can gain trust
Cognos *(4 positive)*	One officer: fulfilled – always important	Not transparent	Hopes for more objectiveness	Neither more nor less respectfulness/fairness – always important	It can help them gain trust
GMS *(5 positive)*	One officer: fulfilled	Transparent	More objective	Fairer and more respectful – respect: always important	It can help them gain trust
Blue Spot Monitor *(4 positive)*	One officer: fulfilled	Not sure if it is transparent	Objective	More respectful and fairer	Gain trust
Summit *(4 positive)*	One officer: fulfilled	/	More objective	More respectful and fairer	It can help them gain trust
Camera System *(2 positive)*	One officer: input is not that relevant	Not more transparency	Objective	Respect and fairness - always important	Does not help them gain trust
Analytical tools: - ***I Base*** - ***Mind Manager*** - ***Palantir*** *(4 positive)*	Two officers for all tools: fulfilled	One for first two tools: transparent and the last: more transparent; one for all tools: not transparent for citizens	One for first tool: objective; one for the other two: more objective; one for all tools: objective	One for all tools: fairer and more respectful; one for all: respectful	For all tools: It can help them gain trust

[7] For all tables: green = positive, blue = neutral, red = negative.

Tbl. 4: How do Dutch officers evaluate the legitimacy aspects? Part 2 – Theoretical Additions

Legitimacy Aspects --- Technologies	*Helpfulness (11 positive)*	*Fastness (9 positive)*	*Accuracy & Fairness (9 positive)*	*Way of proceeding (9 positive)*	*Appreciation (11 positive)*	*Legitimacy (10 positive)*
Smartphones *(6 positive)*	Three officers: fulfilled	All: faster	All: more accurate; two: fairer; one says fairness should always be present	All: it can help them establish a way of proceeding	All: appreciate it	All: legitimate
Smart Police Cars *(6 positive)*	Two officers: fulfilled	All: faster	All: more accurate and fairer	All: it can help them establish a way of proceeding	All: appreciate it	All: legitimate
OSINT *(2 positive)*	All: fulfilled	Three: faster; one: slower; one: inconclusive	Two: fairer; one; inconclusive; two: not more accurate; one: more accurate; one: not more nor less; one: it depends	Three: it can help them establish a way of proceeding; one: it does not help; one inconclusive	All: appreciate it	Four: legitimate; one: not sure
Predictive Policing *(5 positive)*	One officer: fulfilled	It can make their work faster	It can make their work fairer and more accurate	It does not help them establish a way of proceeding	Appreciated	Legitimate
BVIB *(6 positive)*	Two officers: fulfilled	All: faster	All: more accurate and fairer	All: easier to establish a way of proceeding	All: appreciate	All: legitimate
Cognos *(6 positive)*	One officer: fulfilled	Faster	More accurate and fairer	It is easier to establish a way of proceeding	Appreciated	Legitimate
GMS *(6 positive)*	One officer: fulfilled	Faster	More accurate and fairer	It helps them establish a way of proceeding	Appreciated	Legitimate
Blue Spot Monitor *(5 positive)*	One officer: fulfilled	Faster	Not more accurate and inconclusive about the fairness part	It can help them establish a way of proceeding	Appreciated	Legitimate
Summit *(5 positive)*	One officer: fulfilled	Not faster	More accurate and fairer	It helps them establish a way of proceeding	Appreciated	Legitimate
Camera System *(6 positive)*	One officer: fulfilled	Faster	More accuracy and fairness	It helps them establish a way of proceeding	Appreciated	Legitimate
Analytical tools: - ***I Base*** - ***Mind Manager*** - ***Palantir*** *(6 positive)*	Two officers for all tools: fulfilled	Two officers for all tools: faster	Two officers for all tools: more accurate and fairer	Two officers for all tools: it can help them to establish a way of proceeding	Two officers for all tools: appreciate	Two officers for all tools: legitimate

Tbl. 5: How do German officers evaluate the legitimacy aspects? Part 2 – Theoretical Additions

Legitimacy Aspects --- Technologies	*Input of the citizens* *(4 positive)*	*Transparency* *(0 positive)*	*Objectivity* *(0 positive)*	*Respectfulness & Fairness* *(3 positive)*	*Trust* *(0 positive)*
Smartphones ***(1 positive)***	Four officers: fulfilled; one: always important	Two: not transparent; two: transparent	Two: not more objective; one: more subjective; one: inconclusive	Two: citizens always have to be treated fairly and respectfully; one: neither more nor less; one: could lead to biased officers	Three: they can gain trust; one: it neither leads to more nor to less trust
OSINT ***(2 positive)***	Four: fulfilled - two: always important	One: transparent; one: it depends on the different officers; one: not transparent; One: distinguishes between prevention of danger, where it is transparent, and criminal prosecution where it is not	Two: inconclusive; one: not more nor less; one: always important	One: more respectful and fair; Two: always important – not more nor less; one: respectful and fair	Two: it can help them gain trust; two: it does not increase the trust
VIVA ***(2 positive)***	Two: fulfilled - always important	All: not transparent	One: more subjective; one: neither more nor less objective	One: fair; one: it does not change; respect: always there	One: it can help them gain trust; one: it does not have any influence on the trust
Predictive Policing ***(2 positive)***	One officer: it is always important to listen to citizens	Not transparent	It can get a bit more subjective	Respect is a basic requirement; not unfair	Not sure if it can help them gain trust

Tbl. 6: How do German officers evaluate the legitimacy aspects? Part 2 – Theoretical Additions

Legitimacy Aspects --- Technologies	*Helpfulness* *(4 positive)*	*Fastness* *(3 positive)*	*Accuracy & Fairness* *(0 positive)*	*Way of proceeding* *(2 positive)*	*Appreciation* *(4 positive)*	*Legitimacy* *(4 positive)*
Smartphones ***(4 positive)***	Four officers: fulfilled	All: faster	All: more accurate and efficient; Two: fairer; one: inconclusive about the fairness; one: did not say anything about fairness	Three: it helps them establish a way of proceeding; one: it does not	All: appreciate	All: legitimate
OSINT ***(5 positive)***	Four: fulfilled	All: faster	Two: not more accurate; two: more accurate One: inconclusive about fairness; two: fair; one: it depends on individual officers	All: it helps them establish a way of proceeding	All: appreciate	All: legitimate
VIVA ***(4 positive)***	Two: fulfilled	All: faster	All: more accurate; one: did not say anything about the fairness; one: fairness is difficult to evaluate	One: it can help them establish a way of proceeding; one: it does not help them	All: appreciate	All: legitimate
Predictive Policing ***(4 positive)***	One officer: fulfilled	Not faster	Not more accurate but fairer	It helps establish a way of proceeding	Appreciated	Legitimate

6 Results - Knowledge of the citizens about the Big Data technologies

The third sub-question indicates whether or not the various technologies are known to the citizens: *To what extent are citizens in both districts aware of Big Data technology usage by the police?* The answer to this question can help to understand whether citizens are taken into account or if the technologies need to be more advertised. This is crucial as legitimacy for the Big Data technologies can only be gained if the citizens know of them. If citizens do not know about the existence, the question of legitimacy is in that case kind of superfluous. But if they do know a technology, the amount of information affects their perceived legitimacy.

6.1 The Netherlands

The term Big Data is not commonly known among the Dutch citizens. Two do not have any idea what it is (C2, C5). One said he heard about it but does not know more (C6) and the last two guessed that it is about huge amounts of data (C7, C8). No one knows which technologies are used within the region of Enschede. One just assumed that they can listen to phones (C5). Three citizens (C2, C5, C6) would not like to know which technologies are used with one saying: “If it helps, then I say, I do not care” (C6). The last two would like to know (C7, C8).

Two citizens have an idea what the officers are able to do with the **smartphones and cars** (C5, C7). Such as, searching for information (C5) or retrieving GPS data (C7). One claims that he has an idea of what they can do with the phones but not with the cars (C6). Another assumes that they can find out almost anything (C2). Only one had no idea at all (C8). Most citizens do not know what **OSINT** is (C2, C6, C7, C8). Only one says that she thinks it is about peoples’ information from social media (C5). She was the youngest, maybe that is why she had an idea. None of them knows what **predictive policing** is. Four do not know what the police can do with the **different programs** and systems which they use (C2, C8) or just assume that they can do a lot (C6, C7). One thinks that they can retrieve personal information (C5). The last technology, the **camera system**, is known by all of them. They state that it is used to record every car and thereby detect stolen ones or persons which are wanted (C5), “that they take photos of everything” (C7) and detect terrorists and their movements (C8). This shows that this system is widely talked about and thus the citizens do know more about it.

6.2 Germany

The term Big Data seems to be known by the German citizens as four of the five interviewees had heard of it and had an idea what it might be about (C1, C3, C9, C10). Three said that it is about the collection of a huge amount of data (C1, C3, C9). Those four had a hunch on which

technologies might be used in the *Münsterland*. That data about citizens are collected for profiling (C1), that Europol plays a role (C3), that *WhatsApp* messages (C9), smartphone data and browser data can be analysed (C10). Most of them said that they do not exactly know what is used. None of those technologies which have been mentioned have been introduced by the officers. This might show that the citizens have a different perception on what is possible or that those are used in different police departments. Only one said that she has no idea what Big Data could be about (C4). Four citizens do not need or want to know which technologies are used within policing (C1, C3, C4, C10). This is striking, as one would expect that citizens would demand transparency. One cares about which technologies are used but can understand if the police does not disclose everything if it helps them doing their job (C9).

Three citizens have no idea what the police can do with their **smartphones** (C4, C9, C10). One knows that the police recently got those and that they can retrieve information without radio connection (C1) and another thinks that they can do much more with it than ordinary citizens (C3). None of them knows what **OSINT** is. This shows that the technology is not advertised by the police. Most citizens have an idea what the police can do with such a system like **VIVA** (C1, C3, C9, C10). This might be because this is better known by the citizens than other, newer, technologies. Just one said that she has no idea (C4). Four citizens have no clue what **predictive policing** is, one says that it might be about statistics to see in which areas problems arise (C10).

6.3 Conclusion

Thus the answer to the third sub-question is: As expected, the citizens in both regions only had a hunch on what might be used by the police and the technologies are not known that well by them. Only the Dutch camera system is well known by those citizens and almost all German citizens had a hunch on what the officers can do with the VIVA system. The term Big Data is more familiar to German citizens than the Dutch ones, which was not expected. It is striking that most citizens in both regions did not want to know more about the technologies as one would assume that they would demand transparency because those intervene in private spheres. This may show that citizens underestimate Big Data.

Tbl. 7: Which of the technologies are known by the citizens?

Country ---------- **Technologies**	***The Netherlands***	***Germany***
Special Smartphones	Three citizen had a hunch what the officers can do with those, one assumed that they can do a lot and one had no idea at all.	Three did not know those and two had a hunch.
Smart Police Cars	Two citizen had a hunch what the officers can do with those, one assumed that they can do a lot and two had no idea at all.	/
OSINT	Most citizens do not know what it is, only one had a hunch.	None of the citizen knew what that is.
VIVA	/	Four citizens had a hunch on what the police can do with such a system only one had no idea at all.
Predictive Policing	None of the citizen knew what that is.	Most of the citizens did not know what that is, only one had a hunch.
All different programmes: *BVIB, Cognos, GMS, Blue Spot Monitor, Summit, I Base, Mind Manager, Palantir*	Four citizens did not know what the police can do with such systems or only assumed that they can do a lot, one had a hunch.	/
Camera System	All citizens knew that this system exists and what it is.	/

7 Results - Legitimacy from the perspective of the citizens

The last sub-question again deals with the legitimacy of the different Big Data technologies but this time from the perspective of the citizens: *To what extent do citizens consider the use of Big Data legitimate?* The answer to this question is crucial since legitimacy can only be gained with the citizens' approval. Thus, if they think that some Big Data technologies are illegitimate, the police may have to change something about their usage or needs to involve the citizens more.

7.1 The Netherlands

In the following I will outline for each of the big data technologies how the interviewed citizens valued their legitimacy. I start with the **smartphones** and **smart cars**. One citizen (C5) claims that the police work gets more ***transparent***, when those use the smartphones and cars, as the officers can search for information when they have an encounter with citizens and as she can see how decisions are made. But then she states it is less transparent as citizens do not know what is on the phones. For another it is difficult, as they have to "find a balance, so that citizens know what the police is doing, one, and two that one cannot disclose everything as then it gets useless" (C6). The next states that it is not transparent but that it does not have to be (C2). The other two claim that it is not transparent (C7) or that it remains the same (C8). Thus, it can be recognized that this is not easy to evaluate for the citizens. Most claim that it gets more ***objective*** (C5, C6, C7, C8). Two say that the treatment gets ***fairer*** and more ***respectful*** (C2, C6). Because the officers are able to directly see what kind of person is in front of them (C2). This could also be seen as less respectful as prejudices might be present. Another agrees that it is fair but not respectful because citizens do not know about the technologies (C7). One says that it is less fair and respectful as citizens "cannot see what in the phone is" (C5) but also sees the advantages for the police. The last one thinks it neither decreases nor increases (C8). The ***trust*** part is again evaluated quite heterogeneously. One says that her trust decreases (C5). Two say that it helps them to gain trust or at least that trust exists (C2, C7). Two others state that their trust neither decreases nor increases (C6, C8). Most of them think that the possibility to ***explain themselves*** still exists (C2, C7, C6, C8) as "the personal must always remain" (C6). Only one assumes that citizens do not have that opportunity as they cannot change anything about the information within the phone but that such information may lead to the officers asking citizens (C5). Three do not have ***concerns*** (C2, C5, C6). One says that he has some as everything has to be registered but "you do not know" if they really adhere to the rules (C7). The last one has concerns as he does not know what data is used and how long it is saved (C8).

OSINT

Two citizens assume the police work gets more ***transparent***, when OSINT is used (C2, C5): "Because it is something you put on yourself on social media and Google" (C5). Still, the usage itself might not be transparent. The other three state that it neither decreases nor increases (C6, C7, C8). Most citizens say that it leads to more ***objectivity*** (C2, C5, C6, C7). One stating that everyone can see the information (C5) and one that the officers have less work (C2). The question arises if objectivity is understood like the theory suggests. The last one thinks that it gets less objective (C8). Three of them state that they think the treatment gets more ***respectful*** (C5, C6, C2) and two ***fairer*** as well (C5, C6). As citizens can see the information (C5). One says that is remains the same (C8) and the last one that he cannot judge it but that it is good that they try to get information on those platforms (C7). This shows that even when some dimensions are not met that the legitimacy can still be defended. For three of them the usage helps to gain ***trust*** (C2, C5, C7) and for the other two it remains the same (C6, C8). Most of them think that the police still ***listens to them*** (C2, C5, C6, C8). One states that they will only listen in case of need (C7). None of them have ***concerns*** as people put the information there on their own and "the police is not really doing anything" (C5) and that it is okay to submit data of criminals (C2). One states that it is difficult to say but he thinks that they handle the data with care (C7).

Predictive policing

Most citizens state that it gets less ***transparent*** (C5, C6, C7) or stays the same (C8), when officers use predictive policing, as citizens do not know how they are using this. One says it gets more transparent (C2). For three of them it gets more ***objective*** (C2, C6, C7). One saying because the police work gets easier (C2). The term might not be understood like the theory suggests but still the citizens' first perception is to be caught and thus it still can be evaluated. The other two say it becomes less objective (C5, C8): "You cannot always predict what is going to happen" (C5). Two assume that the police work gets more ***respectful*** (C2, C6) and one that it gets ***fairer*** but less respectful (C7). The other two say that it is neither fair nor respectful as it is a program and about predicting (C5) or that it remains the same (C8). For three of them it helps to gain ***trust*** or it even rises (C2, C7, C8). For example, because the police uses more information (C2). One states it does not help her to gain trust (C5) and the last one that it remains the same (C6). All assume that citizens have the chance to ***explain themselves***. Most of them do not have any ***concerns*** (C2, C6, C7, C8). Only one asserted that she has a few (C5).

All different programmes

Two citizens assume that the police work gets more ***transparent*** through the use of the different programs (C2, C5). With one saying that she can see everything (C5) and the other one that they can see where the police gets those information. This is striking as one would expect the citizens to say that it is not transparent, as those systems are normally *not* visible to ordinary people. This is shown by the other three who say that it gets less transparent (C6, C7, C8). "You can see with your own eyes what happens on the street but what happens somewhere behind a computer one cannot see" (C6). Four assume that it gets more ***objective*** (C2, C5, C6, C7). For instance, because prejudgement is something personal but when they use data then it gets more objective. The other one assumes that it gets less objective (C8). One citizen claims that the treatment gets less ***fair and respectful*** as citizens do not know what the police is using (C7). The question arises if this is meant by respectfulness and fairness. Still, it could be seen as respectful and fair to tell citizens what the police is doing. Another one claims that it becomes less fair (C8). Three say that it is fairer and more respectful (C2, C5, C6). It helps them gain ***trust*** (C2, C5, C7) and it even rises (C2, C7). Still, for the other two it either remains the same (C6) or decreases (C8). Most citizens believe that they still have the ***chance to explain their version*** of a certain situation (C2, C5, C6, C8). The last one doubts that: "they do not always do that" (C7). Three of them do not have any ***concerns*** (C2, C5, C6). As rules exist and the officers "cannot go very far with it" (C5). The other two have some concerns (C7, C8), e.g. one does not know if it is right or good to use such systems (C7).

Camera system

Two citizens state that the camera system is ***transparent***. One saying that citizens do not see how exactly it is used but that they know where the information come from (C5) and the other one that citizens are able to see those cameras (C6). Yet another says that he "does not need to know everything that the police is doing" (C2). The last two think that it is not transparent as they do not know how the police is using this system (C7, C8). Most of them assume that the police work either gets more ***objective*** or still is objective (C2, C5, C6, C7) as more information is available (C6). The last states that it neither gets more nor less objective (C8). Two think that the treatment neither gets more nor less ***fair*** and ***respectful*** (C2, C8) and one that it even gets less fair and respectful (C7). The other two say it becomes more as "when you are not doing something or the police is not searching you, then they are doing nothing with the camera" (C5) and when it gets more objective it also gets more respectful (C6). Most citizens claim that it helps them gain ***trust*** (C2, C5, C7, C8). For example, as the police cannot do anything when

you did nothing wrong (C5). The last one says his trust remains the same (C6). All either assume that the police still ***listens to the citizens*** (C5, C6, C7, C8) or hope that they will do this as it is always important (C2). Three do not have any ***concerns*** (C2, C5, C6). The other two have some. One stating that the police knows too much about ordinary people (C7) and the other one that it is important for him that after some time the data are deleted (C8).

Theoretical Additions

If those technologies would lead to ***faster and more efficient*** police work, to more ***useful*** and ***accurate*** information and to the fact that it is easier for the officers to figure out a ***way of proceeding*** then all Dutch citizens think those technologies are a good thing for policing. In general most citizens do not have ***concerns***. One stating that it is good as the police is able to do a better job (C5) which is additionally stressed by another one who says: "the world changed drastically" (C2) and these new methods are needed. Yet another explained that such technologies are good if the police can make the society safer (C6). The trustworthy use of data is trusted in (C7). One states that he sees the advantages of such technologies but also has concerns as he does not always know what those are used for (C8).

7.2 Germany

In the following I will present for each of the big data technologies how the German citizens valued their legitimacy. One thinks that the usage of the **smartphones** is not ***transparent*** (C1) while another says that it is intentional so that hackers cannot get access (C10). Another claims that it neither gets more nor less transparent (O3) and two think that the police work gets more transparent. Thus, again a mixed image is drawn. Four citizens say that the usage makes the police work more ***objective*** (C1, C3, C4, C9). One that it has no influence (C10). The question arises if all citizens have the same idea of what objectivity means. It may differ a bit by the meaning of the theory which has been introduced but it still fulfils the dimension as objectivity is a broad and subjective term. Two citizens assume that the treatment gets ***fairer*** and more ***respectful*** (C1, C4). Another that it gets fairer but neither more nor less respectful (C9). Yet another states that the phones do not have an influence but that it might get more respectful as the data are getting more accurate and objective (C3). The last one concludes that they do not have an influence on that (C10). For two citizens the phones do not have any influence on their ***trust*** towards the police (C1, C3) and for two more it mostly helps to gain trust (C4, C9). The last one says that it depends on how one is affected by the usage personally and says that it does not lead to more nor less trust (C10). Most citizens assume that the officers still ***listen to them*** when using such phones (C1, C3, C9, C10) but one says that it is a 50:50 situation (C4). Some

do not have any ***concerns*** (C1, C10). Still one demands that a query needs to be comprehensible (C1). One does not have concerns about data protection but that such phones could easily be stolen (C3) and another is concerned about the data collection but thinks that the usage is alright if those are used correctly (C9). The last citizen is not sure if the data are safe on those phones (C4). It can be seen that concerns vary across the different citizens. This shows that it is a subjective matter and maybe that citizens do not know enough about those phones.

OSINT

Two citizens assume that the usage of OSINT is not ***transparent*** but that it also should not be as only then it could be used reasonably (C1, C3). Two think it gets more transparent (C4, C10) with saying: "What they can access, everyone else can access too" (C10). The last one claims that it neither gets more nor less (C9). Four conclude that the police work gets more ***objective***, one less (C9). Normally, one would expect them to say that it gets more subjective as information on social media could be altered or untrue. Three citizens state that it gets ***fairer*** (C1, C3, C10) and two that they cannot tell if it leads to more or less ***respectful*** behaviour (C1, C10). One thinks that it gets less respectful as on social media sites a lot of information go around (C3). One is not sure what it leads to (C4). The last one said it gets less fair and respectful: "Because it could be interpreted differently and the information are used for purposes other than intended" (C9). This shows that those characteristics are not equally evaluated as it is a subjective feeling. Three citizens claim that their ***trust*** increases if OSINT is used (C3, C4, C10). One says her trust decreases (C9) and the other one that his trust is not dependent on this technology (C1). Four citizens assume that the officers will still ***listen to the citizens*** (C1, C3, C4, C10). One is not sure if they will believe them (C4). The last one states that she does not think that they will listen but that it depends on the situation (C9). Four citizens do not have any ***concerns*** about the usage (C1, C3, C4, C10): "It is the fault of the person who posts something" (C10). One does not support this technology and has concerns about the subjectivity but no concerns about data protection as citizens put it there voluntarily (C9). Thus, all agree that the people should know better when they are posting on openly available sources.

VIVA

Three citizens say that VIVA is not ***transparent*** (C1, C3, C10). One of them does not care (C1) and the other two state that it might be intentionally opaque. The last two say it is or gets more transparent with one saying that such a system is more tangible than other technologies (C4, C9). Again the question arises what the citizens understand by transparency. Within the theory it is about seeing how decision are made. Here, it seems to be understood differently. Still, this

is no real problem, as the perception of the citizens' counts. Most of them say that the police work gets more ***objective*** (C3, C4, C9, C10). For instance, because it gets more neutral and unemotional (C3). One states that she nevertheless has concerns that officers get biased when they get certain information (C9). The last one assumes that the implementation of the information needs to be controlled as otherwise it can lead to subjectivity (C1). This demonstrates, that objectivity is again understood in several different ways but has the same underlying principle of fairness which is in accordance with the theory. They say it becomes ***fairer*** and more ***respectful*** (C1) or only more respectful, as more data lead to better data (C3, C4). For another citizen it gets fairer but it neither gets more nor less respectful (C9). The last assumes that it depends on how one is involved (C10). Most citizens say that their ***trust*** rises when this system is used (C1, C3, C9, C10). The last one states that the trust stays the same (C4). All of them assume that they will still ***listen to the citizens*** and that "the officers are differentiated, reasonable and professional people" (C1). Most of them do not have ***concerns*** just demand that the data need to be controlled and that the system is safe. One says it is okay for the police to use it but that she does not know if the data are safe against attacks (C4). This shows that they mostly trust the police but might have reservations about the technology.

Predictive Policing

Two citizens say that predictive policing is not ***transparent*** so as to not influence the investigations (C1, C3). "I also do not think that the work of the police has to be transparent for the citizen" (C1). Two others think it is or gets more transparent, e.g. because citizens can recognize when police cars are patrolling in specific areas (C4, C10). The last one states it gets neither more nor less transparent (C9). Again it is not sure if the term transparency is always understood in the way the theory suggests. Still, it has something to do with the citizens being able to recognise how the police is working. All citizens assume that the police work becomes more ***objective*** when they use this. This is striking as predictive policing is about treating some places and hence persons who live there differently than others. Thus, one could have assumed that they think it becomes more subjective. Three citizens think the treatment gets ***fairer*** and more ***respectful*** (C3, C4, C9), e.g. because they have more information available (C3). Another says that it might lead to the officers having prejudices against some people thus leading to less fair and respectful treatment (C1). The last one assumes that it depends on how one is affected by that technology (C10). It is not sure if everyone understood fair and respectful treatment the same way. As it is not about interpersonal treatment it is difficult to evaluate if the citizens understood it the same way as the theory. Still, they evaluated if the officers act in a fair manner

and thus it can still be judged. Nearly all say that it helps them gain ***trust*** e.g. because the police can address key issues better (C1, C3, C4, C10). One is not as sure as it could lead to officers only listening to the system and not considering individual decisions (C9). But all in all she says the trust remains the same. Three assume that they will still ***listen to the citizens*** (C1, C4, C10) and two others are not sure (C3, C9). No one has ***concerns*** about using this technology.

Theoretical Additions

If those technologies would lead to ***faster and more efficient*** police work to more ***useful*** and ***accurate*** information and to the fact that it is easier for the officers to figure out a ***way of proceeding*** then all citizens think those technologies are a good thing for policing. One added that it has to lead to fairer verdicts and to the police successfully finding perpetrators (C9). One citizen has no ***concerns*** in general and would like for the police to use more technologies (C1). Still, how information is implemented has to be controlled. Another one believes that those technologies are valuable and only has concerns about hacker attacks or theft (C3). Yet another adds that in general she has great trust in the police (C4). Another says that those technologies are good if they lead to better police work but that nowadays a lot of data are collected and that in the worst case people can become transparent (C9). Thus, the police needs to find a balance between detection and transparency. The last one states that he has no concerns and that people should know when they are using specific tools that they are transparent (C10). Three citizens mentioned that ***transparency*** might not always be given for the sake of good investigations (C1, C3, C10). One thinks that it is important for the police to be transparent without exception (C4).

7.3 Comparison

The Dutch citizens all in all trust the police and in the technologies but what is striking is that when it comes to the individual technologies they sometimes articulated concerns. It is not easy to summarize a general answer as their answers are a bit varied overall and no technology is fully legitimate. This is the same with the German citizens: no technology would be fully legitimate when only using the theoretical dimensions. The opinions always varied and there was no general answer given. Further, those seem to be a bit more sceptical than the German officers. Still, generally they have no substantial concerns. In both regions, not all dimension are understood equally and not always as the theory suggested. Nonetheless, it is still possible to use the theory to evaluate the legitimacy as the presumptions do not differ drastically and maybe some dimensions are not that important.

OSINT and the camera system are most positively evaluated by the Dutch citizens and thus most legitimate in their view. They agree e.g. that the citizens still have the chance to express their opinions and that the trust remains. This is striking as the Dutch officers see OSINT as least legitimate. The officers see GMS, smart cars, smartphones, Cognos, BVIB and the analytical tools as most legitimate. The other technologies are not that positively judged by the Dutch citizens as they mostly cannot agree on how those influence the legitimacy dimensions. However, the usage of the different programs would be least legitimate as here they can only agree that those technologies would lead to better work if some expectations are met. This differs for the German citizens. Here the smartphones and VIVA, are the technologies which would be most legitimate. They e.g. trust in the motives and view those as respectfully and fairly used. The German officers however, see OSINT as most legitimate. This is remarkable, as this is viewed as least legitimate by the citizens as they can mostly not agree if the dimensions are fulfilled positively or negatively. Predictive policing would be in the middle as here the citizens can positively agree upon the objectivity, trust and theoretical additions but do not assent with each other on the other dimensions. The German officers however view the smartphones as least legitimate.

All in all, the different dimensions are mostly not evaluated positively by the Dutch citizens but also not predominantly negatively. This shows, that they cannot agree and thus also the legitimacy suffers. The transparency is the least positively evaluated dimension closely followed by the respectfulness and fairness. Therefore, the police should try to improve those e.g. by explaining the technologies to the citizens and clarify why they cannot be transparent in specific situations. Still, three of the Dutch citizens remarked that the police cannot always be transparent as that could harm their job (C2, C6, C7). Only the theoretical additions are positively agreed upon but those are only built on expectations and thus do not reveal that much. The German citizens do not rate the different dimensions mostly positively either but also not predominantly negatively. Transparency is likewise the dimension which threatens legitimacy the most as the German citizens cannot agree if it is given or not. Closely followed by the input of the citizens. Still, some of them say that for the sake of good investigation transparency does not always have to be given. The German police should work on transparency in the same way as the Dutch. Additionally, they should try to integrate the citizens more. Again, only the theoretical additions are positively agreed upon. The trust however seems to exist, as for almost all technologies this is present or not negatively influenced. All respondent groups (citizens and

officers) agree that transparency is one dimension they are most concerned about. This shows that this aspect is most important when thinking about the future.[8]

7.4 Conclusion

The fourth sub-question can thus be answered as follows: The Dutch and German citizens are equally critical about the technologies. In both groups transparency weakens the legitimacy the most, even the smartphones are not seen as predominantly transparent, although this was expected. Still, some said that the police does not always need to be transparent. It was assumed that the citizens would generally be more critical, especially the German ones. Further, the concerns have not been as prominent as expected. However, some concerns do exist. The perceived objectivity is quite high in both regions, although generally it could be evaluated more positively. It was anticipated that this would vary more among the tools. Even OSINT is not seen as predominantly subjective. It was assumed that the respectfulness and fairness would generally be more critically judged. The trust is not seen as sceptical as expected. All in all, no technology fulfils all theoretical dimensions thus, theory wise none of those would be used fully legitimately.

[8] For a comparison between the officers and citizens in general see Appendix 8.

Tbl. 8: How do Dutch citizens evaluate the legitimacy aspects?

Legitimacy Aspects --- Technologies	*Input of the citizens* *(3 positive)*	*Transparency* *(0 positive)*	*Objectivity* *(2 positive)*	*Respectfulness & Fairness* *(1 positive)*	*Trust* *(2 positive)*	*Theoretical Additions* *(5 positive)*
Smartphones and Smart Police Cars *(2 positive)*	Four citizens: they still have the chance to explain; one: they do not have the chance	Two: not transparent; one: inconclusive; one: less transparent; one: stays the same	Four: objective; one: inconclusive	Two: fairer and more respectful; one fair but not respectful; one: less fair and respectful; one: it neither decrease nor increases	One: trust decreases; one: helps gain trust; one: trust exists; two: trust does not change	If those technologies would lead to faster and more efficient police work to more useful and accurate information and to the fact that it is easier for the officers to figure out a way of proceeding then all citizens think those technologies are a good thing for policing.
OSINT *(4 positive)*	Four: they still have the chance to explain themselves; one: officers just listen in case of need	Two: more transparent; three it neither decrease nor increases	Four: more objectivity; one: less objective	Two: more respectful and fairer; one: more respectful; one: it remains the same; one: inconclusive	Three: it helps to gain trust; two: it remains the same	
Predictive Policing *(2 positive)*	All: their input is still relevant	Three: less transparent; one: not more nor less: one: more transparent	Three more objective: two: less objective	Two: more respectful; one: fairer but less respectful; one: it is neither fair nor respectful; one: it stays the same	Two: it helps gain trust; one: the trust rises; one: it does not help gain trust; one: it remains the same	
Usage of all different programs *(1 positive)* *(BVIB, GMS, Cognos, Blue Spot Monitor, Summit, Analytical tools)*	Four: they still have the chance to explain themselves; one: they do not always have the chance	Two: more transparent; three: less transparent	Four: more objective; one: less objective	Three: fairer and more respectful; one: less fair and respectful; one: less fair	One: it helps to gain trust; two: trust rises; one: it remains the same; one: it decreases	
Camera System *(4 positive)*	Four: officers still listen to them; one: hopes that they will do it	Two: transparent; one: does not need to know everything; two: not transparent	One: objective; three: more objective; one: neither more nor less	Two: fairer and more respectful; two: neither more nor less; one: less fair and respectful	Four: it helps to gain trust; one: trust remains the same	

Tbl. 9: How do German citizens evaluate the legitimacy aspects?

Legitimacy Aspects --- Technologies	*Input of the citizens* *(1 positive)*	*Transparency* *(0 positive)*	*Objectivity* *(2 positive)*	*Respectfulness & Fairness* *(2 positive)*	*Trust* *(3 positive)*	*Theoretical Additions* *(4 positive)*
Smartphones *(4 positive)*	Four citizens: officers will still listen to them; one: not sure	Two: not transparent; one: it neither gets more nor less; two: more transparent	Four: more objective; one: no influence	Three: more respectful; one: neither more nor less; one: no influence; three: fairer; two: it remains the same	Two: no influence on their trust; two: it helps gain trust; one: not more nor less trust	If those technologies would lead to faster and more efficient police work to more useful and accurate information and to the fact that it is easier for the officers to figure out a way of proceeding then all citizens think those technologies are a good thing for policing.
OSINT *(1 positive)*	Four: they still have the chance to explain themselves; one: officers will not listen to them	Two: not transparent; two: more transparent; one: it neither gets more nor less	Four: more objective; one: less	Three: fairer; one: inconclusive; one: less fair; Two: less respectful; three: inconclusive about the respect	Three: trust increases; one: it decrease; one: trust not dependent on this technology	
VIVA *(4 positive)*	All: officers will listen to them	Three: not transparent; one: transparent; one: more transparent	Four: more objective; one: can lead to more subjectivity	Two: fairer; three: more respectful; one: neither more nor less respectful; one: it depends on how one is involved	Four: trust rises; one: it remains the same	
Predictive Policing *(3 positive)*	Three: officers will still listen to them; two: not sure	Two: not transparent; one: more transparent; one: transparent; one: it neither gets more nor less	All: more objective	Three: fairer and more respectful; one: less fairness and respect; one: it depends on how one is affected	Four: it helps to gain trust; one: it remains the same	

8 Discussion and Conclusion

This qualitative research examined to what extent Big Data technologies are used by the police in Enschede and the Münsterland and to what extent those are deemed legitimate by both the officers and citizens in those two regions. The procedural justice approach by Tyler was used to evaluate the legitimacy and to be able to compare the answers of the interviewed officers and citizens. Till now the literature mainly focussed on the Big Data technologies themselves examined their advantages and disadvantages and how those could change the police work. This thesis however focussed more on the actual usage and its legitimacy and adds knowledge about countries other than the USA. The officers and citizens are important for that evaluation and thus the procedural justice approach allowed for new insights.

The research shows that not *one* definition of Big Data exists as not all interviewees understood it the same way. Further, that those technologies are differently developed within the two regions, e.g. it seems that in the Netherlands Big Data is used more professionally. Theory wise none of the technologies would be fully legitimate according to the officers on the German side as never *all* dimensions are met and only one on the Dutch side. Still, one cannot just strictly apply the theory to evaluate legitimacy as the police work is much more complex and diverse. One would not do justice to the police work and its different facets. Moreover, the technologies at least meet some of the dimension and are not fully illegitimate. All officers in both regions think that their usage of those technologies is legitimate but only a few officers took into account the citizens and what they might think. Mostly, they thought of laws, regulations and their work when evaluating legitimacy. Officers should include the perceptions of the citizens more. Theory wise the officers did not consider the different technologies equally legitimate. Citizens on both sides have some more concerns. Although, in both regions they stated that the police cannot always fully disclose what they are doing, as their work could suffer from revealing information. Further, their trust and legitimacy is not completely absent. Some dimensions of the theory were comprehend differently by the citizens, e.g. the transparency. Some citizens just stated that they are able to see certain things but it was not always clear why they would think so. No strong conclusion is possible as no citizen had direct encounters with Big Data policing. But the results which have been accomplished give rich insights into the topic and the conclusions which *are* possible to draw add crucial information to the topic as e.g. it can be seen that almost all technologies are not fully legitimate.

As expected, the Dutch police uses much more Big Data technologies and those are very important for their daily work and used frequently. This shows that the police work in the region

around Enschede cannot be done without Big Data anymore. The Dutch officers consider the usage of those technologies/tools as legitimate although not all dimension are met. The German police does use much less Big Data tools and they stressed that e.g. paper work and radio communication still play a big role. They do appreciate the tools but stressed a few more concerns than the Dutch ones. Nevertheless, they consider those as legitimate, although again not all dimensions are met. Officers in both regions seem to be confident that what they do is all right, w.r.t. the law, and do not always consider their answers to the different questions based on the theory and what citizens percept. On the Dutch side legitimacy seems to be generally higher as more dimensions are fulfilled for the different technologies and the German officers are somewhat more critical. This might be as the Dutch officers are more used to the technologies and the advantages in general are stronger arguments for them than the acceptance of the citizens.

The Dutch citizens do not really know that Big Data technologies are used by the police, they mostly do not know those and none of the technologies meets all dimensions. Still, their trust in the police is quite strong and some e.g. see that they cannot always disclose everything. Further, they mostly believe that they have a chance to explain themselves. Thus, although not all dimensions are met, legitimacy is still existent. However, the police could articulate more and try to explain their work when possible. Generally, the Dutch police judges the technologies as far more legitimate than the citizens and they are less critical. The German citizens had a hunch on which technologies the police in the Münsterland uses and most of them knew the term Big Data a bit better than the Dutch ones but nearly all technologies are not known. They only guessed what the police might be able to do but did not think that these technologies are transparent. No technology meets all dimensions. Still, the trust among them is equally high as on the Dutch side. They articulate concerns and are not always sure if the officers take their views into account. Some claim that the police cannot always be transparent about their operations. The German citizens are critical but the German officers are not as obviously less critical than them, as officers on the Dutch side. According to the citizens legitimacy is neither lower nor higher in one of the regions and not totally absent. As anticipated, if the theoretical additions are fulfilled by the technologies, which is mostly confirmed by the officers, and the citizens could see that those make the police work better, then legitimacy could be enhanced. It is once again clear, that the police should try to integrate the citizens more, disclose their techniques when possible and articulate when they are not able to disclose everything.

In general, in both regions officers have a better idea what Big Data policing is than the citizens. It is difficult for citizens to grasp this topic and they should be educated about it more wherever

possible. Transparency is the dimensions that is lacking in all the different groups, so both police forces should work on this dimension first. It was anticipated that citizens would not know the differences between the several technologies. Still, the officers not differentiating enough between the technologies and their various purposes shows that the understanding among the users *also* needs to be sensitised so that no technologies are compared which actually cannot be compared. The Dutch officers are the ones who evaluate the Big Data technologies most positively regarding legitimacy while the German ones are a bit more critical and comparable to the judgements of the Dutch and German citizens. Although all in all, the officers are less critical than the citizens.

For future research it is important that more officers and citizens are interviewed so that it is possible to conduct a quantitative analysis and therefore be able to generalize the findings to get an even better idea of the legitimacy of Big Data technologies and its distribution. This qualitative research provided a first glimpse of the topic and showed that it might be interesting to look further into the comparison between the Dutch and German police, within the police between the different departments and maybe also regarding cross boarder cooperation. This could even better show how widely spread Big Data policing is and where differences occur, as this study already showed that some of those exist. The results further reveal, that Tyler's theory might not be fully applicable as some dimensions are too narrow and the specific police tasks sometimes do not fit and then they have no chance to meet those. Participation was one problem for the operationalisation as interpersonal treatment is not always given. Further, as Big Data is mostly run in the dark, transparency was also a complication. The different steps within an investigation cannot always be disclosed as their work and consequently the safety of the society could suffer. Further, everything depends on the fact that citizens are able to recognize the technologies. The citizens' trust can only change, because of specific technologies, if they *know* that those are used. But if the police cannot be transparent about it then trust cannot be gained. Maybe not all dimensions need to be met to reach legitimacy. In future research the theory should thus be altered so that the police has the possibility to fulfil those standards.

It has to be mentioned that no uniform answer to the question which Big Data technologies are used exists. This depends on the officer's department and in which region they work. Thus, it might be interesting to select officers from different departments and from various regions so that it is possible to even better recognize the distributions and differences as here only a few police units have been analysed. Some aspects, like possible dangers, e.g. that the algorithms used are biased or that specific society groups could be discriminated against by those tools,

have not been delved into as those have not been the subject of this master thesis. Still, those should be examined in the future besides the analysis used within this thesis. Further, it would be crucial to have a closer look at OSINT as most officers and citizens said that the people who put information on those openly available sources have only themselves to blame if those are used. But, the systems of OSINT can do much more than just use information which are directly put there. Thus, the intended purpose is altered and people do not know that with those data even more can be found out about them.

The researched topic should be investigated in more depth e.g. to see the reasons why in the Netherlands more Big Data is used. Further, the results might differ within the whole countries, especially in Germany where different states with different police units exist. Moreover, officers might not be allowed to talk about all their technologies and this might lead to different results than it is shown in reality. This topic is crucial to investigate further, as in the future more Big Data policing will exist and thus the legitimacy aspect becomes even more important. It is relevant for the society as the police constitutes an important role within it and the success and acceptance of their work depends on the consent of the citizens.

The thesis shows that legitimacy is a complex phenomenon and a subjective perception, as mostly the officers and citizens cannot agree on the different dimensions. Thus, one cannot only use a theory, see if all dimensions are met and if that is not the case just state that legitimacy is non-existent. Thus, legitimacy must be viewed differentiated, evaluated case by case and it has to be acknowledged that possibly not all dimension of the theory are equally important in each case. Still, as the theory by Tyler was used in this thesis to evaluate the legitimacy no technology is legitimate in all respects. This needs to be acknowledged by the police in both regions to be able to enhance legitimacy as the perceptions of the officers and citizens differ.

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Appendix

Appendix 1 - Questionnaire police officers

First of all thank you for your time and cooperation. I am working on a Master thesis concerning the topic police using Big Data technologies. That is: all information you collect apart from the verbal instructions of your boss and the telephone call by the control room. So basically the information you get from your computer or your smart phone. I want to compare the police in Enschede and the Münsterland. For this I will interview 5 officers from each district.

Within this interview I will ask you questions regarding this topic. If you do not understand something feel free to interrupt and ask me. It is about Big Data policing which is about the collection, use and analysis of large datasets with the aim to disclose hidden patterns. I hope you understand what is meant by the term.

If it is okay for you I will record the interview so it will be easier for me to analyse it afterwards. Of course the interview will be anonymised to ensure that no individual identification will be possible. If you have question during the interview just say so and I will try to answer those and if you want to stop the interview at any time just let me know and we will do so.

Let's begin.

I want to start with this general question:

1. How do you generally get information during your daily work, physically and digitally? What tools/technologies do you use? And where do you search?

2. What are the most important digital sources of information during your daily work? Or put differently: What are the most important Big Data technologies you are using in your daily work? (E.g. predictive policing, smart phones, Open Source Intelligence, place based/person-based tools or smart police cars)

   From the following questions (3 – 7) only those will be asked which relate to the answer of question 2. If other technologies are mentioned the sub-questions will be asked for those. ("If no" are backup questions, if the officers are not able to think of any Big Data technologies. This is quite unlikely, but just to make sure, those are added):

3. So you said that you receive information that predicts where to go or what to look for during patrolling like an application for the computer which is modelling historical crime data to predict future criminal activity, right? (predictive policing)

   3a) When you are using this tool do citizens still have the *possibility to explain their version* of a certain situation to you? That their input is also relevant?

   3b) Does this technology make your work *more transparent* (So that citizens can see how decision are made) and *objective*?

3c) Would you say that it leads to a treatment by you which is *fairer and more respectful?*

3d) Do you think that it helps to *gain the trust from the citizens* in the police? So that they believe that you have their needs and concerns in mind?

3e) Would you say that this tool is *helpful*? Like that it makes your work easier/better? (e.g. more efficient?)

3f) Does it make your work *faster*?

3g) Does it make your work *more accurate and fair*?

3h) Would you say that this technology helps you *to establish a way of proceeding* more easily?

3i) Do you *appreciate* this tool?

3j) After all this said, would you personally consider this tool as legitimate?

(If no:
Ask them if they think those tools would affect their work in a positive way.)

4. You said that you use *special smart phones*, with which you can look up different information, right?

   4a) When you are using this tool do citizens still have the *possibility to explain their version* of a certain situation to you? That their input is also relevant?

   4b) Do these phones lead to a *more transparent* (So that citizens can see how decision are made) and *objective* police work?

   4c) Would you say that it leads to a treatment by you which is *fairer and more respectful?*

   4d) Do you think that it helps to *gain the trust from the citizens* in the police? So that they believe that you have their needs and concerns in mind?

   4e) Would you say that this tool is *helpful*? Like that it makes your work easier/better? (e.g. more efficient?)

   4f) Does it make your work *faster*?

4g) Does it make your work *more accurate and fair*?

4h) Would you say that this technology helps you to establish a way of proceeding more easily?

4i) Do you *appreciate* this tool?

4j) After all this said, would you personally consider this tool as legitimate?

(If no:
Ask them if they think those tools would affect their work in a positive way.)

5. So you said that you use *Open Source Intelligence*. Where information are extracted from free available sources such as social media platforms, the internet in general or print media, right?

   5a) When you are using this tool do citizens still have the *possibility to explain their version* of a certain situation to you? That their input is also relevant?

   5b) Does this technology make your work more *transparent* (So that citizens can see how decision are made) and *objective*?

   5c) Would you say that it leads to a treatment by you which is *fairer and more respect-ful*?

   5d) Do you think that it helps to *gain the trust from the citizens* in the police? So that they believe that you have their needs and concerns in mind?

   5e) Would you say that this tool is *helpful*? Like that it makes your work easier/better? (e.g. more efficient?)

   5f) Does it make your work *faster*?

   5g) Does it make your work *more accurate and fair*?

   5h) Would you say that this technology helps you to *establish a way of proceeding more easily*?

   5i) Do you *appreciate* this tool?

   5j) After all this said, would you personally consider this tool as legitimate?

   (If no:
   Ask them if they think those tools would affect their work in a positive way.)

6. So you said that you used *place-based or person-based tools* which assign a threat score to specific people or respectively targets spaces of trouble, right?

   6a) When you are using this tool do citizens still have the *possibility to explain their version* of a certain situation to you? That their input is also relevant?

   6b) Do those technologies make your work more *transparent* (So that citizens can see how decision are made) and *objective*?

   6c) Would you say that it leads to a treatment by you which is *fairer and more respectful*?

   6d) Do you think that it helps to *gain the trust from the citizens* in the police? So that they believe that you have their needs and concerns in mind?

   6e) Would you say that these tools are *helpful*? Like that it makes your work easier/better? (e.g. more efficient?)

   6f) Does it make your work *faster*?

   6g) Does it make your work *more accurate and fair*?

   6h) Would you say that these technologies help you to *establish a way of proceeding more easily*?

   6i) Do you *appreciate* this tool?

   6j) After all this said, would you personally consider this tool as legitimate?

   (If no:
   Ask them if they think those tools would affect their work in a positive way.)

7. So you said that you have *smart police cars*. So that you can retrieve a lot of information from different sources while being on patrol, right? (So you have special computers in your cars with which you can search for information and which can lead you e.g. to hot spots)

   7a) When you are using this tool do citizens still have the *possibility to explain their version* of a certain situation to you? That their input is also relevant?

   7b) Does this technology make your work more *transparent* (So that citizens can see how decision are made) and objective?

7c) Would you say that it leads to a treatment by you which is *fairer and more respectful*?

7d) Do you think that it helps to *gain the trust from the citizens* in the police? So that they believe that you have their needs and concerns in mind?

7e) Would you say that this tool is *helpful*? Like that it makes your work easier/better? (e.g. more efficient?)

7f) Does it make your work *faster*?

7g) Does it make your work *more accurate and fair*?

7h) Would you say that this technology helps you to *establish a way of proceeding more easily*?

7i) Do you *appreciate* this tool?

7j) After all this said, would you personally consider this tool as legitimate?

(If no:
Ask them if they think those tools would affect their work in a positive way.)

8. How often do you use Big Data technologies in your daily work? Do those play a major role in your work?

9. Do you notice a shift from reactive to predictive policing?

10. How do you feel about using Big Data technologies (concerns, praise etc.)?

11. Do you think that in the future more Big Data technologies will be used in police work? Are there any plans for the future?

    11a) If yes, which ones?
    11b) If not, why not?

12. Do you have any further questions or do you want to add something which you did not mention before?

Thank you very much for your time and participation.

Appendix 2 - Questionnaire citizens: Region of Enschede

Currently I am writing my master thesis. The police uses different Big Data technologies to gain information and to analyse certain situations/incidents. For example, they use special smartphone with which they can search for information about places and persons. Within my thesis I want to find out which technologies they are using and if it is a good thing or right that they use those technologies. The last part concerns legitimacy and therefore the views and opinions of the citizens are crucial. Thus, you can help me get the information I need to be able to analyse the topic in a proper way.

If it is okay with you I will record the interview to make it easier for me to analyse it afterwards. Of course the interview will be anonymised to ensure that no individual identification will be possible. If you have questions during the interview just say so and I will try to answer those and if you want to stop the interview at any time just let me know and we will do so.

So let us begin.

1. Do you know what *Big Data* is? Have you ever heard of the term?

   1a) If they have no idea: My definition of Big Data is:

   Big Data is defined as the collection, use and analysis of large datasets containing many different types of information with the aim of disclosing hidden patterns or insights. One general example would be that firms want to find out how consumers are behaving and therefore collect data e.g. through shopping cards.

   Do you now understand what it is? (If not, explain it further.)

2. Do you know which Big Data technologies are used within the police work in the region of Enschede?

   2a) If yes. About which technologies do you know?

   2b) If not. Would you want to know?

The police in the region of Enschede is using some Big Data tools which I would like to discuss further with you.

The following questions are be based on the Big Data technologies which have been mentioned during the interviews with the police officers. Important: The order will always be different.

3. *Open Source Intelligence*:

   Do you know what Open Source Intelligence is?

If not:

With that, information are extracted from freely available sources such as social media platforms, the internet in general or print media. Such as information on Twitter, Instagram or on Google in general. So the police officers use those open tools to get information.

3a) Do you think that this technology makes the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

3b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

3c) Does it help you *gain trust* in the police? So that you believe that the police has your needs and concerns in mind?

3d) When the police is using this tool do you think that citizens still have the *possibility to explain their version* of a certain situation to them? That your input is also relevant?

3e) Do you have any *concern* about the usage of this technologies? For example about privacy?

4. *Special Smart Phones and Smart Police Cars:*

Do you know what the police officers can do with such phones and cars?

If not: With those phones they can look up different information and can also input information. They can for example use it for field interviews and can use it during a personal encounter with citizens like you. Further, they can look up information about a car holder or where a person lives. The cars have technology on board that allows officers to retrieve a lot of information from different sources while they are on patrol. For example, special computers that can guide officers directly to hot-spot areas. Those are similar to the smart phones.

4a) Do you think that these tools make the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

4b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

4c) Does it help you *gain trust* in the police? So that you believe that the police has your needs and concerns in mind?

4d) When the police is using these tools do you think that citizens still have the *possibility to explain their version* of a certain situation to them? That your input is also relevant?

4e) Do you have any *concern* about the usage of this technologies? For example about privacy?

5. *Predictive policing*:

Do you know what predictive policing is?

If not:

When the police receives information that predicts where to go or what to look for during patrolling it is called predictive policing. For example, it can be an application for the computer which is modelling historical crime data to predict future criminal activity. Here historical crime data are evaluated with the help of a computer program to predict and therefore prevent future crimes. This can for example be used for domestic burglaries.

5a) Do you think that this tool makes the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

5b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

5c) Does this tool help you *gain trust* in the police? So that you believe that the police has your needs and concerns in mind?

5d) When the police is using this tool do you think that citizens still have the *possibility to explain their version* of a certain situation to them? That your input is also relevant?

5e) Do you have any *concern* about the usage of this technologies? For example about privacy?

6. *Usage of different programmes to gain information and structure/analyse information*

Do you have any idea which kind of information the police can gain with the different search tools and systems the police officers have available? And what they can do with it?

If not:
They can e.g. find out who you are, where you live, who you are related to, if you have a car or a criminal past. Further, they can see what is happening at the moment in the district/city (incidents). Additionally, they can use certain programmes to structure their information so that they can see at once where they are within the investigation and can see which information are still missing. Further, the officers input every single information they get, from their searches, conversations with citizen etc. With the internal police systems they can access all information available to the police. Examples would be Palantir, Mind Manager, Summit or Blue Spot Monitor.

6a) Do you think that this technology makes the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

6b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

6c) Does it help you *gain trust* in the police? So that you believe that the police has your needs and concerns in mind?

6d) When the police is using this tool do you think that citizens still have the *possibility to explain their version* of a certain situation to them? That your input is also relevant?

6e) Do you have any *concern* about the usage of this technologies? For example about privacy?

7. *Usage of a camera system which recognizes all license plates of all the cars which are driving by*

Do you know for what the police is using this system?

If not: The system sends the police an alert when a car is recognized which is stolen or where the vehicle keeper is searched for. Further, the officers can check for certain cars if those went a certain way. Every car which is passing by is recorded.

7a) Do you think that this technology makes the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

7b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

7c) Does it help you gain trust in the police? So that you believe that the police has your needs and concerns in mind?

7d) When the police is using this tool do you think that citizens still have the possibility to explain their version of a certain situation to them? That your input is also relevant?

7e) Do you have any *concern* about the usage of this technologies? For example about privacy?

8. If those Big Data technologies we just discussed would lead to *faster* proceedings and *better and efficient* police work. Would you then consider the Big Data usage as a good thing for the police work?

9. And if those technologies could provide the officers with *more useful and accurate* information with which they could *also establish a way of proceeding more easily*. Would you then consider the Big Data usage as a good thing for the police work?

10. How do you feel about the Big Data usage of the police in general? Do you have any concerns or praise?

11. Do you have any further questions or do you want to add something which you did not mention before?

The interview data will be safely stored and anonymised so your name will not appear. I will transcribe the recording and will delete it immediately when it is no longer needed. Thank you very much for your time and participation! Your answers will help me a lot for my thesis.

Appendix 3 - Questionnaire citizens: Münsterland

Currently I am writing my master thesis. The police uses different Big Data technologies to gain information and to analyse certain situations/incidents. For example, they use special smartphone with which they can search for information about places and persons. Within my thesis I want to find out which technologies they are using and if it is a good thing or right that they use those technologies. The last part concerns legitimacy and therefore the views and opinions of the citizens are crucial. Thus, you can help me get the information I need to be able to analyse the topic in a proper way.

If it is okay with you I will record the interview to make it easier for me to analyse it afterwards. Of course the interview will be anonymised to ensure that no individual identification will be possible. If you have questions during the interview just say so and I will try to answer those and if you want to stop the interview at any time just let me know and we will do so.

So let us begin.

1. Do you know what *Big Data* is? Have you ever heard of the term?

   1a) If they have no idea: My definition of Big Data is:

   Big Data is defined as the collection, use and analysis of large datasets containing many different types of information with the aim of disclosing hidden patterns or insights. One general example would be that firms want to find out how consumers are behaving and therefore collect data e.g. through shopping cards.

   Do you now understand what it is? (If not, explain it further.)

2. Do you know which Big Data technologies are used within the police work in the Münsterland?

   2a) If yes. About which technologies do you know?

   2b) If not. Would you want to know?

The police in the Münsterland is using some Big Data tools which I would like to discuss further with you.

The following questions are be based on the Big Data technologies which have been mentioned during the interviews with the police officers. Important: The order will always be different.

3. *Open Source Intelligence*:

   Do you know what Open Source Intelligence is?

If not:

With that, information are extracted from freely available sources such as social media platforms, the internet in general or print media. Such as information on Twitter, Instagram or on Google in general. So the police officers use those open tools to get information.

3a) Do you think that this technology makes the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

3b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

3c) Does it help you *gain trust* in the police? So that you believe that the police has your needs and concerns in mind?

3d) When the police is using this tool do you think that citizens still have the *possibility to explain their version* of a certain situation to them? That your input is also relevant?

3e) Do you have any *concern* about the usage of this technologies? For example about privacy?

4. *Special Smart Phones:*

Do you know what the police officers can do with such phones?

If not: With those they can look up different information and can also input information. They can for example use it for field interviews and can use it during a personal encounter with citizens like you. Further, they can look up information about a car holder or where a person lives.

4a) Do you think that these tools make the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

4b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

4c) Does it help you *gain trust* in the police? So that you believe that the police has your needs and concerns in mind?

4d) When the police is using these tools do you think that citizens still have the *possibility to explain their version* of a certain situation to them? That your input is also relevant?

4e) Do you have any *concern* about the usage of this technologies? For example about privacy?

5. *Usage of a police system/programme with which the officers can look up different information*

Do you have any idea which kind of information the police can gain/look up with this kind of *cloud*?

If not: They can see criminal charges, can search for persons and get information about them. For example, where someone is living. They can retrieve all information which they have about a person/place also when it is from a few years ago. It is possible to retrieve information from whole North-Rhine Westphalia. Additionally, they can implement new information and write reports.

5a) Do you think that this tool makes the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

5b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

5c) Does this tool help you *gain trust* in the police? So that you believe that the police has your needs and concerns in mind?

5d) When the police is using this tool do you think that citizens still have the *possibility to explain their version* of a certain situation to them? That your input is also relevant?

5e) Do you have any *concern* about the usage of this technologies? For example about privacy?

6. *Predictive policing*:

Do you know what predictive policing is?

If not:

When the police receives information that predicts where to go or what to look for during patrolling it is called predictive policing. For example, it can be an application for the computer which is modelling historical crime data to predict future criminal activity.

Here historical crime data are evaluated for example with the help of a computer program to predict and therefore prevent future crimes. It is not that common in the Münsterland, not used frequently and mostly used for domestic burglary.

6a) Do you think that this technology makes the work of the police *more transparent or less transparent* (So that you as a citizen can see how decision are made) and *more objective or less*?

6b) Would you say that it leads to a treatment by the police which is *fairer and more respectful or less fair and respectful?*

6c) Does it help you *gain trust* in the police? So that you believe that the police has your needs and concerns in mind?

6d) When the police is using this tool do you think that citizens still have the *possibility to explain their version* of a certain situation to them? That your input is also relevant?

6e) Do you have any *concern* about the usage of this technologies? For example about privacy?

7. If those Big Data technologies we just discussed would lead to *faster* proceedings and *better and efficient* police work. Would you then consider the Big Data usage as a good thing for the police work?

8. And if those technologies could provide the officers with *more useful and accurate* information with which they could *also establish a way of proceeding more easily*. Would you then consider the Big Data usage as a good thing for the police work?

9. How do you feel about the Big Data usage of the police in general? Do you have any concerns or praise?

10. Do you have any further questions or do you want to add something which you did not mention before?

The interview data will be safely stored and anonymised so your name will not appear. I will transcribe the recording and will delete it immediately when it is no longer needed. Thank you very much for your time and participation! Your answers will help me a lot for my thesis.

Appendix 4 - List of respondents

Tbl. 10: List of respondents

Respondents	*Characteristics*
Officers	
O1	German officer, male, Coesfeld, does not want to disclose his age, *Wach- und Wechseldienst* (Guard and change service) – face to face
O2	German officer, male, Kreis Steinfurt, 26 years old, *Wach- und Wechseldienst* (Guard and change service) – face to face
O3	German officer, male, Münster, does not want to disclose his age, Criminal Investigation Department – face to face
O4	German officers, male, Coesfeld, 25 years old, *Wach- und Wechseldienst* (Guard and change service) – face to face
O5	German officer, male, Münster, 26 years old, *Bereitschaftspolizei/Hundertschaft* (riot police) – face to face
O6	Dutch officer, female, Oldenzaal (whole region), 27 years old, *Hoofagent* (constable) – face to face
O7	Dutch officer, female, Enschede & Appeldorn, Eenheid Oost, 37 years old, Team chef, criminal intelligence analyst - face to face
O8	Dutch officer, male, Enschede, 31 years old, criminal intelligence analyst - video call
O9	Dutch officer, male, Oldenzaal, Noord-Oost-Twente, 39 years old, operational expert focused on community policing – video call
O10	Dutch officer, male, Enschede, 27 years old, Emergency (Noodhulp) – video call
Citizens	
C1	German citizen, male, Münster, 56 years old – face to face
C2	Dutch citizen, male, Losser, 67 years old – face to face
C3	German citizen, male, Nottuln (Darup), 49 years old – face to face
C4	German citizen, female, Nottuln, 67 years old – telephone
C5	Dutch citizen, female, Enschede, 20 years old – telephone
C6	Dutch citizen, male, Losser, 39 years old – telephone
C7	Dutch citizen, male, Losser, 48 years old – video call
C8	Dutch citizen, male, Enschede, 39 years old – telephone
C9	German citizen, Münster, female, 25 years old – face to face
C10	German citizen, Coesfeld/Münster, male, 27 years old – video call

Appendix 5 - Way of proceeding: Analysing and coding the interviews

First of all it was looked at the interviews of the German police officers and everything was marked that was thought to be important. Then a closer look was put at the Big Data technologies which they mentioned. After that, the German citizens have been evaluated and it was looked at the different dimensions and how they evaluate those. Thereafter, the same procedures have been performed with the Dutch officers and citizens.

1. **Officers:**
   - Look what Big Data technologies they are using: mark in red and bold
   - Look what they say about the different dimension introduced in the theory section: mark in red (bold) -> mark in the following what they say about those dimensions (black - bold)
   - Look if there are other interesting statements: mark in blue (bold)
   - If interesting statements are not seen to be important for the thesis: mark in yellow (bold)

2. **Citizens:**
   - Look what they say about the different dimensions introduced in the theory section: mark in red (bold) -> mark in the following what they say about those dimensions (black - bold)
   - Look if there are other interesting statements: mark in blue (bold)
   - If interesting statements are not seen to be important for the thesis: mark in yellow (bold)

3. **Dimensions:**
   - Big Data technologies: all which have been mentioned by the officers
   - Legitimacy:
     → Input of the citizens: possibility to explain themselves
     → Transparency
     → Objectivity
     → Fair and respectful treatment
     → Trust
     → Helpfulness
     → Speed
     → Accuracy and fairness
     → Establish a way of proceeding: gets easier through the technology
     → Appreciation
     → Legitimacy

Appendix 6 - Grenzüberschreitendes Polizeiteam (Cross border police team)

At the beginning of the research for the master thesis I also visited a police officer in Bad Bentheim at the police station for the Cross Border police team (*Grenzüberschreitendes Polizeiteam*) in Bad Bentheim. It was thought to be interesting to get information of how the German and Dutch police officers work together. In every team there is always a Dutch and a German officer so that they do not have problems, e.g. when they need to cross a boarder. The officer I talked to gave me a good insight into how they cooperate. He said that he was not a Big Data expert and could not say anything about it. Nevertheless, it was apparent that the Dutch officers have more possibilities and that even their radio connection is better than that of the Germans. Thus, for the future it might also be interesting to interview a few officers from that team to be able to make an even better comparison and have an actual example of a cooperation between German and Dutch police officers.

Appendix 7 – Selection of the officers

What needs to be mentioned is that for the police in Enschede the contact person who was available asked what kind of research was planned and then it was discussed what the best procedure was. He was very helpful and eventually it was possible to interview five officers. In the Münsterland however, it was a bit more difficult as the police in Münster and Coesfeld said that they cannot help due to time constraints and the workload of the officers. Thus, it was more challenging to find officers who were willing to conduct an interview. Luckily in the end, also here five officers have been found. This again shows the different structures of the police in the two countries.

Appendix 8 – Comparison officers and citizens

Tbl. 11: Comparison officers and citizens

Groups --- Legitimacy Aspects	*Officers*	*Citizens*
Input of Citizens	**Mostly positive (13/15)** Negative (2/15)	**Mostly neutral (5/9)** Positive (4/9)
Transparency	**Mostly neutral (8/15)** Negative (5/15) Positive (1/15) One did not mention it	**Mostly neutral (9/9)**
Objectivity	**Mostly positive (9/15)** Neutral (4/15) Negative (2/15)	**Mostly neutral (5/9)** Positive (4/9)
Respectfulness & Fairness	**Mostly positive (12/15)** Neutral (2/15) Negative (1/15)	**Mostly neutral (6/9)** Positive (3/9)
Trust	**Mostly positive (9/15)** Neutral (5/15) Negative (1/15)	**Mostly positive (5/9)** Neutral (4/9)
Theoretical additions	**Mostly positive (47/60)** Neutral (10/60) Negative (3/60)	**Mostly positive (9/9)**
Appreciation	**Mostly positive (15/15)**	/
Legitimacy (own perception)	**Mostly positive (14/15)** **Neutral (1/15)**	/

This table shows that all in all the officers evaluate the different legitimacy dimensions more positively than the citizens, which are generally more critically. Both groups agree positively about the theoretical additions. This shows that if the Big Data technologies lead to all these advantages and the citizens are able to recognize those, then legitimacy could be strengthened. Additionally, the trust part is evaluated mostly positively in both groups which shows that trust does exist and thus it might be easier to gain legitimacy if the other dimensions are fulfilled as well. Transparency is the dimension which is lacking support the most. This shows that this is most important to work on as even the officers recognize and acknowledge that this is not always given. The officers appreciate all the technologies and agree that they are legitimate, just for one technology they cannot all positively agree.

Author's Declaration

I hereby assure that I have written the presented master thesis with the title*, "Big Data policing and its legitimacy"*, independently. I have not used any other sources and tools than those which are indicated. Those parts of the thesis which I have taken from publications - including electronic media - in terms of wording or sense, have been marked by me in each case as borrowed, with the source being indicated.

Name: Leiendecker, Laura Josefa Student number: s2461943

(Signature) Münster, 19.05.2021