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Quantitative qualitative data collection

“The more we know, the better we can long-term plan and short term manage”
Van Vlerken, Copenhagen municipality

Agnes Ericsson

Abstract

While urban areas are predicted to expand due to population growth, new approaches towards smart solutions in urban infrastructure and transportation are on the rise. With access to new technology, data has been given much attention from municipalities and decision makers. This thesis is interested in how the public sector will utilize the untapped potential of data collection, and what effects that might have on physical planning, congestion, pollution, dialog and accessibility.

By discussing the level of participation of data collection and GIS, this thesis aim is to discuss what added value data collection might have in urban planning, what complications might occur and what the perspective of PPGIS could add to the method.

The body of research consists out of an introduction to why data collection is becoming an important method in planning, and why dialog needs to be complemented with other methods. A more theoretical approach to planning and the public-private partnership that has emerged in post-industrial cities is also presented. Theory and background is complemented with qualitative interviews with both public and private actors in order to get some practical insight of project using data collection, and new methods emerging due to technical progress.

This thesis has shown that there are several areas where detailed data collection with geographical components could add information to the process of physical planning. A few areas identified by practitioners are short term management of transport systems, long term planning, and evaluation. This thesis also concludes that dialog could benefit from being complemented by data collection. The growing relationship between private and public actors, and the private actors increasing influence in planning is also discussed as a potential problem.

Acknowledgements

I would like to take the opportunity to say thank you to my supervisor Ola Hall for guiding me through the process of this thesis, and to the *Open Forum on Participatory Geographic Information Systems and Technologies* for helping researchers and practitioners of PPGIS to keep in touch.

I would also like to give a special thanks to ÅF, Helena Paulsson and her colleagues for lending me a chair in their office, and for surrounding me with inspiring people in this otherwise quite lonely process.

Last but not least, thank you to the people interviewed for this thesis, for taking the time and for contributing to the result.

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1. Introduction

While urban areas are predicted to expand due to population growth, new approaches towards smart solutions in urban infrastructure and transportation are on the rise. With new technology data has been given much attention from research, private actors and municipalities and decision makers. This thesis is interested in how the public sector hope to utilize the untapped potential of data collection, and what effects that might have on congestion and pollution, dialog, accessibility and other issues related to physical planning.

The increasing availability of highly detailed quantitative data of people's movements in the urban space has opened a market for private sectors to develop new tools for data collection and analysis to sell to municipalities. These new tools and services will improve the way municipalities analyze the behavior and future need of their population.

To gather information and better understand the population's travel patterns, a common used method is travel surveys, traditionally as a questionnaire. Dialogue is recommended as well, to identify local needs early in the planning process, and to complement decisions taken at the political level. However, while research indicates that citizen's participation in the planning process is becoming increasingly important due to the demanding climate related changes ahead, it has become increasingly difficult for the municipalities to get people involved in dialogue processes (SKL 2013:7). The younger generation is identified as being the most difficult to reach. Research also shows that when dialog is used, the results are often left out, or misused.

The lack of involvement of the population is believed to be due to the fact that new technology has changed the way we communicate. Dialogue and travel surveys are also costly methods that take a lot of time and resources. Traditional methods should therefore be revised, and complemented by new ones (Khakee 2006).

While new technology has changed the way we communicate, we as individuals produce copious amounts of data each day, which are stored and used by private actors to increase their profits. With the increased accessibility to information, the public sector is now investigating how to extract useful information as basis for decisions in planning. The infrastructure sector, and transportation flow is already identified as a major problem in dense cities by both private and public actors (Anonymous1), thus many tools and services available are targeting this sector.

This thesis claim that there is a two-sided spectrum of different methods for collecting detailed data of the population. One side of the spectrum is "passive data", where the user of an app, phone or similar, is not aware that their position is being logged. It is not legal to sell that type of data in Sweden today. In the US and Australia however, private actors have long bought and sold data about private users to make conclusions about how different target groups move in the urban space (Anonymous1).

The other side of the spectrum is public participatory geographical information systems (PPGIS), which is also part of this thesis theoretical framework. This method is closer to the method used in dialogue, where the user participates and defines the problem, as well as the solution.

Much of the technical development regarding data collection and geographical information systems is developed within the private sector. This has caused some concern with researchers (Sager 2009) because core features of the urban environment, such as the transport and communication systems, are expected to be integrated with components which are managed by the private sector (Viitanen; Kingston 2014). In the future, this could mean that many short-term decisions will be outsourced to the private sector as they own many of the components, and have all the skills needed to interpret the data. A scenario that could have long-term consequences. Researchers also predict that actors in charge of our internet connections and transport systems will have a major influence over the political and economic power in the future.

1.1 Aim

New technology has changed the way we communicate with each other and our surroundings. This means that planners need to adapt to new methods of communication in order to identify problems and needs of the public more efficiently. This thesis aim to discuss the perspective on data as a form of communication, could for example data collection resemble dialog? Thus examining the level of participation.

As the background shows, there is a common view among researchers that new tools, whether it is integrated GPS systems or ICT's, more knowledge and research is needed to be able to utilize their potential in the best way possible. A second aim is therefor to provide some insight in how data collection is used in planning today, and discuss the possibilities and difficulties with the emergence of new tools of data collection from practitioner's experience.

My experience researching different methods of data collection and GIS is that the major focus of most articles is on the technical history and method of GIS. Therefore, this thesis also aim to bridge the gap between theory and practice by introducing a more theoretical approach, using planning and GIS related theory as the theoretical input.

1.2 Research question

What is the added value of data collection methods emerging in today's physical planning?
What are the complications using data collection as grounds for decision-making in planning?
What could the perspective of PPGIS add to data collection?

1.3 Disposition

This thesis begins with a background chapter presenting an introduction to why data collection is becoming relevant in planning. This chapter also gives a description of dialog as a practice in planning, and why it needs to be complemented with other methods. The reader is also introduced to the concept of geographical information systems (GIS), which is the term used when analyzing and visualizing data with a geographical component, and the private sectors success in developing such tools.

Thereafter comes a description of the methods chosen for empirical and theoretical research, as well as the authors methodological approach.

After method starts the theoretical framework which contains similar themes as the background chapter does. These themes were chosen during the course of research and are connected to themes

that has emerged from the qualitative interviews. The purpose of using the themes throughout the whole essay is to be able to give a theoretical perspective on the contemporary context.

The theoretical framework is followed by the result of the qualitative interviews, which are discussed together with learnings from the theoretical framework in order to answer the research questions. The research questions are stated and answered in conclusions.

The final section recommends further research.

2. Background

This chapter aims to provide the reader with an introduction to how the urban space is becoming more digitalized and what scholars identified problematic in this process. This chapter also gives a short description of dialog as a practice in planning, why it is important, and how new technologies has affected the way we communicate.

2.1 The planning perspective

2.1.1 The digitalized urban space

As many municipalities and urban regions are expecting a higher number of inhabitants in the near future, the need to improve their infrastructure and strategies for planning increases. As scholars, public and private actors have identified, ICT (information and communication technology) infrastructure is going to play an essential role in the green economy ahead (Viitanen; Kingston 2014:807). Thus, municipalities and private actors are looking at new ways to invest in tools that can control transportation flows better, to control the CO₂ emissions, and to be able to manage traffic in a more efficient way.

Our population is already creating a sea of information of their movements, habits, interests and needs, and as technology evolves so does the ways to access this data. New technology of data collection and analysis has untapped potential that possibly could help with planning related issues, however due to the detailed information available, using data collection even on an aggregated level awakes some concerns of integrity and level of participation of the public. New tools and methods of planning are already available, and ICT services are becoming an integrated part of the urban infrastructure (Viitanen; Kingston 2014).

Kahila-Tani recently wrote her doctoral dissertation on local experiences utilized in urban planning practices thru geographical information tools and public participation (PPGIS) (Kahila-Tani 2015:101). Her main concern with the integration of ICT's in the urban space is that planning will primary revolve around the utilization of integrated smart components between actors. Thus, the role of the urban planner in the "smart city" will become similar to a facilitator who understands the ongoing development patterns, while overseeing the possibilities of enabling the implementation of new innovations locally rather than a traditional planner (Kahila-Tani 2015:21). Kahila-Tani states that the ongoing boom of the smart city infrastructure calls for more attention from researchers in order to construct a more comprehensive theoretical background that combines the technological development

we see today with the discussion of planning theory. Her research also shows that planner currently lack the skills necessary to see the possibilities that GIS tools and data collection has thru methods like PPGIS (Kahila-Tani 2015:93, 107).

2.1.2 Dialog and participation

In order to make the right planning decisions it is important for municipalities to identify the needs of the population early. One way to do that is using citizen dialogue. This method is promoted by Sveriges kommuner och Landsting (SKL 2013) and Länsstyrelsen (2007) as a method to identify needs early in the planning process. The official recommendation is that the factual knowledge gathered by the municipal officials is accompanied with public dialogue, making sure that values among the inhabitants are considered before any decisions are made. The purpose of citizen dialogues is to supplement the representative system by giving elected representatives a broader basis for decisions (SKL 2013:7).

There are no legal consequences for authorities who aren't using dialog when it is recommended. Kahila-Tani's dissertation shows that in current practice in Finland, participation in planning is most prominent during the decision-making phase which occurs late in the process (Kahila-Tani 2015:103). This step is called consultation in Sweden and is the step before an action plan is approved by Länsstyrelsen. Even if the public has the opportunity to raise issues during the consultation stage, the problem at hand is already identified. This is why citizen dialog should be introduced much earlier in the process. Unfortunately, implementation of dialog outcomes and evaluation thru dialog are rare in common participatory actions according to Kahila-Tani's dissertation (Kahila-Tani 2015:106).

In 2013 SKL released a rapport with a model to help municipalities implement dialog in their planning process. The model is very similar to Arnstein's work from 1969 which is further advised in the planning theory chapter. Despite the effort to implement dialog in planning processes, Pål Castell, doctor in sustainable urban development at Chalmers University, suggests that we are in a post-collaborative era where the complexity of challenges with participation has surfaced;

"we simultaneously see the potential of solving and obscuring problems through collaborative planning approaches, but also that the very idea of people engaging in shaping their own environments is ultimately attractive from a humanistic point of view." (Castell 2016:306).

He is of the opinion that this revelation isn't primarily an issue of whether or not we should embrace collaborative methods, which is stated as common sense, but rather about critically reflecting on its conditions, forms and outcomes in each particular situation, thus discussing participation in planning. Kahila-Tani shares this opinion. Her experience is that the involvement of the public is often rejected during the formulation of alternatives (actions) in urban planning. As Castell do not give any answers on how dialog should evolve in order to function better, Kahila-Tani's dissertation gives some interesting insights in new forms of a communicative planning approach in the early planning phase. She is an advocate of utilizing GIS and data collection methods as tools to describe people's local experiences, which then can be developed as input when making decisions (Kahila-Tani 2015:93). In a Swedish perspective, ensuring some communication early in the process could possibly provide better informed decisions leading up to the stage called consultation, just before presenting an action plan to Länsstyrelsen.

The model developed by SKL has had a great impact on Swedish municipalities, though many of the steps used in SKL's dialog model are equal to tokenism in Arnstein's original model. Scholars such as Annika Agger and Karl Löfgren, researchers in democracy and public dialog, states that any sign of tokenism is a democratic failure regardless of the symbolic values (Agger; Löfgren 2008:161). As Arnstein's model will show, collecting data of people's movements might not be the answer to the absence of dialog, but still scholars are encouraging others to carefully examine whether existing GIS tools are able to make participation more efficient in the planning process, and what effect such tools have on trust between actors (Kahila-Tani 2015:111). The analysis of this thesis thus aim to discuss GIS as a perspective on dialog and the communicational aspect of collecting information.

A project using GIS as a method of improving the physical environment is the master thesis by Susanna Kari where GIS was used to evaluate walkability based on pedestrian's experiences. By involving the actual end users of the walking environment and capturing their local knowledge, this study is one example of how walkability can be evaluated based on pedestrian experience (Kari 2016). Another project worth mentioning is AirSage, using the next generation of travel demand models, taking advantage of the growing available data produced by mobile phones via GPS tracks, transactions data, and online activity patterns of individuals. With this information AirSage can predict and evaluate how people move around a city and interact with different places in the urban space. AirSage has found an efficient way to create economic value of mobile data, by creating a new market for various businesses. The company is based in the US, and anonymously collects and analyzes wireless signaling data. According to their website, the company process more than 15 billion mobile device locations every day, turning them into "*meaningful and actionable information*" with a determined location (Airsage). There are however examples of projects that end up in the middle of these two.

One example of such a project took place in the end of 2016, where London subway commuters were asked to donate their place based data when logging in on the subway Wi-Fi. There were signs in the subway informing people that whatever device that had Wi-Fi on was automatically donating data. The purpose of collecting this data was to see what route people took to go from point A to B. Although this was just a small pilot project, the results showed how people were traveling, and how they moved within the metro stations, information that can be used for more efficient route planning and advertising (O Malley 2017).

SKL sees dialog among municipalities as a complement to the existing representative system by giving elected representatives a broader basis for making decisions (SKL 2013:3). At the same time, there is a decline in citizen's involvement in political parties, which in long term might erode the system of elected representatives in the planning process. All leads points to the younger generation. As identified in the new strategy for dialog developed by Malmö municipality (Gatukontoret Malmö 2016), and according to SKL's own rapport people's engagement in new arenas, using the internet as a communication channel, has changed the circumstances for political engagement and dialog methods (SKL 2013:7). The old infrastructure that enabled the more traditional face-to-face participation of inhabitants has taken new forms through social media and other ICT's such as web-based geographic information systems (webGIS) (Kahila-Tani 2015:20).

In the work of Khakke (2006) citizen's ability to participate in planning is described as a paradox. The paradox consists in the fact that citizen participation is decreasing in a time when research points out

that there is a greater demand for public participation, due to the actions needed to create a resilient and sustainable society, dealing with issues such as waste, energy, cars, pollution etc. These fundamental changes in planning strategies all require some form of dialogue in order to be successful (Khakee 2006:11,15).

2.2 Geographical information systems

As this thesis is interested in data with detailed information of the citizen, including information regarding when and where, the chosen theoretical framework for data collection is GIS (geographical information systems) and PPGIS (public participatory GIS). This section provides a background to GIS tools, focusing is on the development of GIS tools as they are relevant to understand the framework of PPGIS.

Even if the technical conditions have changed a lot since Dr. Snow's map of cholera outbreaks, GIS still allows us to use spatial data on any scale to analyze the result, make assumptions or visualize patterns. Data used in human geography and social planning are usually collected by organizations, scholars, the municipality or the state in order to map anything from data regarding age, income, occupation, to the number of cars in the household, or accidents on the street. However, as stated in various examples above, the private sector is gathering the same type of information, which is either sold to municipalities or stored.

The outsourcing of IT services in local governments could have more than budgetary reasons, it could be a sign of lack of technical expertise within organizations (Viitanen; Kingston 2014:815). This makes for a whole new market of data collection and analysis, and much of the technical progress is happening within the area of transportation and infrastructure. One example is Inrix, a company employed by the city of Copenhagen among others, that target urban regions that are *"evolving rapidly and have costly transportation issues, making the management of movement a key concern."* (Inrix). They, and other companies like them, offer tools to analyze the number of vehicles and increased emissions.

2.2.1 Qualitative information with quantitative methods

GPS based information has been available since the 60's when the first satellites were launched, however the production of data is much more personalized and accurate today thanks to the GPS's integrated in our everyday devices. It is even possible to argue that on an aggregated level, personalized spatial data visualized in GIS, becomes a sort of quantitative qualitative information due to the high quality and personal details.

The tradition of using quantitative methods in order to claim scientific validity within spatial science and human geography goes back to the quantitative revolution that arose in the 50's and 60's. The quantitative revolution was an attempt for the institution to become a science with law- like statements of the geographical world (Creswell 2013:81). After the 50's the more scientific concept of space got to play an important role within the theory of spatial science, which gave the scientists a way to generalize data in a more "scientific way" (Creswell 2013:81). The era of the quantitative revolution met its critique in the late 1960's by human geographers. Much of the critique came with the development of humanistic geography who protested that spatial science suffered from a positivist, also called the God-like, worldview with the main purpose to find the "objective truth" out there. Humanistic geographers

argued that there is no such thing as an objective truth and that human geography had to put the human back in the center of geography (Creswell 2013:104).

GIS was developed in the 1950s and 1960s in North America, primarily by the public sector. Canada's Geographic Information System was developed in 1963 and is an example of one of the earliest GIS's. Its purpose was to analyze the data collected by Canada Land Inventory (CLI) and to produce statistics to be used in developing land management plans (Coppock; Rhind 1991). A short but thorough introduction of the history of GIS (1991) is given in the article with the same name, written by J.T Coppock and D.W Rhind. According to them, there are four stages in which GIS has grown in speed of the development of technology. The first stage is called the pioneering age and reaches from 1960 to 1975, at this stage the methodology was new and specific people were responsible for the development of GIS. The second stage ended in the 1980's when experiments and practices within GIS became more standardized and fostered by nations. In the third phase, late 80's, Coppock and Rhinds identify a shift towards commercial dominance, closing in on GIS as we know it today. The commercial dominance continued throughout the 90's, when the article *History of GIS* was written, and is by the authors called "the era of user dominance" facilitated by competitions between companies, early standardization of open systems and an increasing participation and agreement by the users (Coppock; Rhind 1991).

2.2.2 Critique

The continuing development of GIS and its different areas of usage has become a versatile tool used in research in diverse disciplines such as urban planning, law, geography, library science, social work, landscape ecology, anthropology, agricultural economics, natural resources, and conservation biology (Sieber 2006:491), but not without critique. According to Schuurman (2000) GIS merged with the geographical institution without much disagreement until the 1990s, but that changed when several critical articles were published in a number of geographic journals. The following years GIS practitioners met persistent critique from their fellow scholars in human geography. Schuurman continues the timeline described by Coppock and D.W Rhind's with another three segments, only regarding the critique of GIS. The first wave stretches from 1990 to 1994 and was marked by the intensity of debate as well as an emphasis on positivism. By 1993, positivism had become the primary basis for critiques of GIS. Robert Lake was one of the biggest opponents of GIS at the time, arguing that GIS was fundamentally positivist and that its ethics are impossible because they will always derive from positivist assumptions. Lake's arguments all stemmed from being critical of the assumption of objectivity and value-neutrality when separating subject from an object. He saw that the only way for reconciliation between human geography and GIS was if GIS would be willing to incorporate the theoretical agendas of its critics, such as himself, in the framework (Schuurman 2000:575).

By 1995, the number of critics had grown, resulting in a decrease of GIS practitioners trying to defend their cause and the positivistic traditions. As a result, the following years meant the beginning of a greater degree of co-operation between GIS scholars and their critics (Shuurman 2000). But it wasn't until 1995 when The National Center for Geographic Information Analysis (NCGIA) started research initiative 19, *The Social Implications of How People, Space & Environment are Represented in GIS*, that scholars and GIS user's joined forces to study the social effects of GIS (Sieber 2006:493).

2.2.3 Public participation within GIS

After the NCGIA initiative many critics began to work more closely with their peers in GIS, with a larger commitment to the technology within the institution as a result. The followers of the NCGIA initiative did however struggle to frame the next generation of GIS with the ambition to ground technical advancements in a social and political context. The initiative wanted GIS practitioners to develop applications that empowered less privileged groups in the society since the first generation of GIS didn't necessarily do a good job including the public. As a result, it was declared that the next generation of GIS should be more inclusive to nonofficial voices, thus resulted in the definition of public participatory GIS, PPGIS. PPGIS's focus was to be supply-driven, to have a rational approach and to engage the public in applications of GIS with the goals of improving the transparency and influencing government policy. The original definition was "*a variety of approaches to make GIS and other spatial decision-making tools available and accessible to all those with a stake in official decisions*" (Sieber 2006:493).

The idea was that visualizing policy-related information spatially in GIS would help to raise awareness to specific ideas and include relevant stakeholders, thus leading to better policymaking. However, many scholars are still cautious promoting the method saying that using PPGIS alone won't guarantee empowerment to a decision-making process, this is still the greatest critique against using GIS and PPGIS (Sieber, Viitanen; Kingston). Rina Ghose and Sarah Elwood summarize various scholar's experience with PPGIS in their work, stating that geographic data access and PPGIS projects are strongly shaped by the local context in which they are situated and that space and place play an important role in shaping the participatory approaches to decision making (Ghose, Elwood :17). Regarding context, Michael K. McCall, the author of several articles (2003, 2004) regarding GIS and local spatial planning, is questioning why PPGIS and participatory spatial planning approaches is used in local resource management in developing south countries, and in community neighborhood planning in the urban north.

2.3 Private-public partnership

For political leaders, the pressure to find solutions to urban problems in postindustrial economies is growing with the threat of climate change. Controlling communication infrastructure will therefore become an increasingly important source of political and economic power in the future urban space. The influence of international technology firms will depend on their fundamental role of providing connection and interruption to communication networks. As the private sector is perceived as being at the cutting edge of ICTs (information and communication technology), a concern raised in the work of Viitanen and Kingston (2014) is the fact that private business interests might interfere with public interests, due to our large dependence of being connected to facilities provided by the private sector. Thus, the connected urban space will largely depend on pre-established relationships with powerful actors such as IBM, Microsoft, or Philips, sometimes by promoting green growth as the main reason (Viitanen; Kingston 2014:815). Viitanen and Kingston (2014) are concerned that the technological progress and the opportunities are growing faster than our understanding of them, saying that "*smart technologies offer no guarantee of the quality of decisions made*" (Viitanen; Kingston 2014:804).

In a Scandinavian perspective, data is being collected by both private and public actors. When it comes to aggregated data, and tools to collect data, the private sector definitely has the upper hand. Data available for purchase is provided by companies such as STRAVA, Google, Inrix, Endomondo, Bikes vs. Cars... The list could be made much longer. What all of these actors have in common is that their data collection based services are mainly targeting different types of flows in urban environments. GIS and

data collection tools available for other type of geographical information, such as the physical environment, are more commonly found as open source maps, usually provided by the municipality themselves, the state or by individuals who voluntarily edit the information.

The public sector is just in the beginning of vitalizing similar methods of integrated data collection in infrastructure as means to make better decisions in planning and managing city services, and as noted by Kahila-Tani (2015), this creates a new area of research for scholars.

2.4 Summary

There seems to be an agreement among the private and public sector that new technology is the key in solving many of the issues connected to the expected infrastructure, and that ICT's are going to play an essential role in the green economy ahead. However, in order to make the changes needed and to become resilient, the public needs to be involved somehow.

What we can conclude from the background is that much of the data needed to analyze the urban space in greater detail is already available, however in order to use this type of information there are some integrity issues that needs to be advised. Traditionally dialog has been used to identify problems and come up with possible solutions, using the local knowledge available. With new technology, the way we communicate and municipalities struggling with connecting to the younger population. Therefore, there is an opportunity to involve citizens in identifying problems, using new technologies as mean of communication, such as public participatory GIS.

There is a cautious tension, but also some hopefulness that new communication methods, if sharing information could be seen as a way of communicating, will help to identify and solve problems more efficiently in the future, and that we are in the beginning of understanding the effects that it will have on urban planning. To understand new possibilities, and perhaps negative consequences, this thesis research questions are designed to give a more comprehensive theoretical background to geographical information collection, combining the technological development we see today with the perspective of planning theory.

3. Method

3.1 Methodological approach

This thesis has used qualitative interview and literature study as method of gathering information empirically. A central concept within qualitative research is to generate hypotheses by conducting inductive research, unlike quantitative research that is associated with deductive research. Hypotheses that are generated using inductive research are based on empirical research where conclusions are drawn from observations which are translated in to general connections. Unlike deductive research, inductive research is not the result of logic and cannot realate to universal claims (Ryen 2004: 25). This thesis is not making conclusions of how all private and public actors work with data collection, or claim to know the outcomes of how data collection will affect physical planning. Rather, by gathering information of others experiences and thoughts, and analyzing the result through the wisdom of other scientist's research and theories this thesis aim to contribute to the body of research that concerns physical planning and data collection.

Furthermore, the study analyses the result in an abductive manner. Abduction is a form of multi-method research (MMR) that has emerged in recent years in empirical social scientific research. Using MMR the researcher explores different methods of gathering information in order to reach a result. Any type of mix of methods can be used, however typically qualitative research mixed with quantitative research is called mixed-method (Goertz 2016). Abduction is usually seen as an intermediate between induction and deduction, where induction is based on empirical evidence and deduction based on theory. The purpose of an abductive approach is to let the empirical material and theoretical material develop during the period of research (Alvesson; Sköldberg 2007). In the analysis of the material, the empirical material is weighed together with the theoretical material, in order to find patterns that can help create an understanding of the studied phenomenon. Like the hermeneutic approach, the abductive approach allows new information to be added and processed during the research period, which means that the understanding does not follow a linear pattern. Thus, during the study process, there is an exchange and re-examination between theory and empirical theory, which also changes the understanding of the material (Alvesson; Sköldberg 2007).

As this thesis is using qualitative interviews from different sectors in order to describe a project it has a similar methodology as the case study method. However, a case study would go more in depth of the different cases. Instead the interviews are complemented by a literature study based on literature and contemporary articles regarding dialog, the digitalized city, public participation in geographical information systems (GIS), as well as classical planning theory, and the private-public partnership.

3.2 Qualitative interview

Using qualitative interview as method of collecting material made it possible to find information about projects happening right now, as well as information of the interviewees own experiences and problems. The projects are mainly in the infrastructure sector, though the aim was originally to interview respondents with experience working with data collection on an aggregated level within planning, and that have some knowledge of new possibilities of data collection.

The method used for interviews is semi-structured qualitative interview. This method of interviewing is very flexible and questions could be adapted and changed depending on the respondent answers (Denscombe 2009:117). Since the interviewees for this thesis all have different backgrounds and represent both private and public sectors all interviews differed from each other. The semi-structured interview was a good way to handle the unknown outcome of each interview. The interviewees were all chosen by me based on their professional experiences, or by recommendations by others. Some of the interviewees knew each other through work or seminars as they all work with data collection and analysis in different ways, which made it easier to get recommendations of new people to interview, that were known to work with interesting projects. Even though, it could take a while to get in touch with a person who had the right experience, and that was willing to give an interview.

It is important to note that interviews, in contrast to questionnaires, involve social interaction which can influence the interview and affect the final results, the unstructured interviews allowed the researcher to gain deep insight into people's opinions and experiences which a more structured interview or questionnaire would not. Semi- or unstructured interviews are rather a dialogue between the interviewer and the interviewed and more open for guidance of individual, specific interests,

experiences and views of participants (Denscombe 2009:117). When choosing the interview questions, it can be difficult to ask questions that address the topic of interest without suggesting a direction of the answer. Therefore, the interviews in this thesis used open questions, letting the interviewee decide what was relevant. If the interviewed didn't bring up important subjects such as aggregated data, thoughts of GPS surveillance, participation and integrity, those topics were addressed in the very end of the conversation. If the answers in the beginning of the interview session were extensive from the start, questions addressing similar topics were never asked. This way the interviewee could continue their story from their own perspective without the interference of my perspectives as researcher.

As this thesis does not claim to give a thorough review of what projects that are happening in Sweden right now, but merely some insights in new methods of data collection and discussing these methods through other actors learnings, the result is lacking in representation. However, given the timeframe of this project the aim was always to find representatives from both private and public sectors, working within the field of data collection and GIS, strategically or more hands-on.

Some of the interviews were held via phone, however when possible in person. The interviews made in person tended to be a bit longer than the interviews by phone, partly because an interview in person also includes some sort of social interaction, but also because there is no definite finish due to the semi-structured interview's approach of being more conversation like. In general, the interviews took about one hour each.

Seven of the eight interviews were held in Swedish, therefore the responses had to be translated when used as empirical material in this thesis. As I am aware that the translation of the answers could cause misunderstandings it is important to underline that none of the quotes or references to the interviewees answer are by any means exact quotes. However, when quotations are used the respondent's own (with at most small modifications) words are used but translated.

All interviews were transcribed live during the interview sessions which made my role as an interviewer more active than a recorded interview would have. There are pros and cons with this method. I prefer being an active interviewer since it allows me to be more involved during the interview, however exact quotes are difficult to write down fast. If the respondent says something important that could be used as a quote I would repeat it loud when writing it, or asking the respondent to repeat it if needed.

3.2.1 Interviewees selection

Appendix 1 shows a table describing all interviewees, dates, their occupation and a short description of their project and relevance. The interviewees consist of four municipal employees, three private, and one with Trafikverket which represents the national level in Sweden.

3.3 Literature

As a master's student within the institution of human geography passed learnings and project experiences has guided me when searching for articles and literature. Google Scholar has been a big help in identifying important articles as many articles written about geographical information systems, big data and similar themes are quite new, which made it difficult to rate their legitimacy.

In order to find relevant articles that discussed the outcomes of new projects I joined a network called Open Forum on Participatory Geographic Information Systems and Technologies (ppgis network). The network allows active practitioners to submit questions to the members of the forum, after being approved by its admin. This was very helpful as I got emails from researcher all over the world, giving me recommendations of articles and projects. The amount of answers made it difficult to read them all but it was a good experience to be able to have a dialog with some of the scholars who wrote the articles, even if much of the material described all kinds of projects around the world and were difficult to include in this easy.

When working with qualitative research methods within social science, it sometimes becomes difficult to decide when enough information and theory is reviewed. Research based on quantitative data often has a predetermined amount of data on order to get a result, though in qualitative research the outcome of the research is difficult to predict. The goal is to apply enough theories on the material in order to reach theoretical saturation, which means that further gathering of data is not possible if the goal is to discover something new (Denscombe 2009:139). Unfortunately, this would be difficult in the amount of time given this thesis. There are several more theories that would have been interesting to advise in order to give the analysis a wider and deeper perspective. I also wish there would have been more room to look at the technological progress of data collection by using more projects as base of analysis, however since this thesis is part of the human geographical institution I chose to focus on geographical theory, dialog and theories of planning. Due to the amount of words we are assigned in this master's thesis, there was no space to include the majority of different projects which I have read about when researching data collection in planning. Projects presented in this thesis is merely a scratch on the surface of the projects happening globally, and of what's to come.

3.4 Analysis method

The empirical material is analyzed by using a method called thematic analysis approach. Thematic analysis is a phenomenological approach which has a primary aim of describing the experiences and perceptions of research participants. Phenomenology within social science is usually described as an alternative to positivism and underlines subjectivity rather than objectivity, describing rather than analyzing, interpreting rather than measuring and cooperation rather than structure (Denscombe 2009:109). Similar to grounded theory, the researchers approach is inductive, content-driven, and searches for themes within textual data by identifying, examining, and recognizing patterns within the collected data (Guest 2012: 11).

There are six phases of the analysis process within thematic analysis approach in order to create established, meaningful patterns. These phases are: familiarization with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and producing the final report (Guest 2012:275).

The themes discovered in the interviews were then compared to the theoretical "tool box" found in the following chapter. It was however a bit difficult to find obvious themes with a natural connection between the two bodies of work since the interviewees are practitioners and not theorists. Using the abductive method, it is allowed to change the direction of theory during the gathering of empirical information. As such both theory and the interview result has guided the themes used in background, theory and the discussion.

3.5 Positionality and ethics

The position of the interviewer plays an important role since he/she will be in direct contact with the interviewee and their interaction will be influential on the outcome of the interview. I as an interviewer am aware of my position as a university student within the institution of human geography, and the affect that might have on the answers of the respondent, as well as my interpretation of the answers. Researchers using a phenomenological approach must try to be honest about their own interpretation of the world, trying to avoid interference with how others see the world (Denscombe 2009:116).

As the respondents were contacted as representation of a private or public actor it was important to make them feel comfortable to give out information of their own experiences and details about projects. This thesis aim to discuss the methods in a critical way, however without trying to evaluate them or frame an actor or organization as good or bad. It is also important to note that some of the questions asked were referring to the respondents own thoughts and experiences, not the companies or the organizations. When the respondent expressed uncertainty regarding a subject he or she had the opportunity to rephrase themselves in a way that they felt comfortable. The interviewee also had the opportunity to read the summary of the interview afterwards in order to correct mistakes or change quotes if necessary. Even if the majority declined this opportunity it was important for me to show them that I as a researcher didn't have any alternative motives.

One of the interviewees wanted to be anonymous due to the sensitiveness of the project the respondent was involved in, working for a large telephone company at the time. This however should not affect the importance of the responses, it is the experience and expertise of the respondent that is interesting, not the brand of the employee. This person is referred to as Anonymous1.

The unstructured interview approach has both the advantage and disadvantage that the participants have the possibility to steer the interview in the direction of issues that they "want" to talk about, rather than answering fixed questions. In this sense one might consider the approach to be more "ethical", as it gives the respondents a more active role in designing the outcome of the interview in collaboration with the researcher, rather than answering for example yes or no questions.

3.5.2 Reliability, generalizability and validity

Since the research sample is far from representative of all private and public organization, the result of the qualitative interviews are not in any way generalizable. When researching projects and networking for possible interviewees it became clear that many of the projects that I came in contact with were happening in the infrastructure and mobility sector, both private and public. This, and the utbud online, has led me to believe that the mobility sector is in the forefront of developing new tools of data collection, however this could be a coincidence. One of the interviews did give a possible reason for the extra activity in the infrastructure and mobility sector, saying that a lot of money can be made there, as well as being a sector with great socio-economic winnings (Anonymous1). Many articles also points out the transport sector as having the most challenges currently, and in growing regions in the future.

The approach of an unstructured interview does have a high validity of the result because it gives the interviewer the opportunity to ask for clarification and allows the interviewee to steer the direction of the interview.

3.6 Critique

Common critique against methods based on the phenomenological approach is that it lacks a scientific structure. Focus on describing the subjects experience and its conscious distance to the positivistic tradition makes the approach vulnerable. However, since the number of interviewees in this thesis are too few to make any statistical assumptions the phenomenological approach ought to be appropriate. The approach is also criticized for being too descriptive, and not analytical enough. Denscombe does not share this opinion, stating that research using methods associated with phenomenology aims to analyze and make assumptions using descriptive material. However, there is always a risk of attracting critique when research is based on trying to describe a subject's experience (Denscombe 2009:121).

Making generalizations based on phenomenological assumptions are always risky due to the lack of representation in the material. As addressed earlier it is important to acknowledge that there is not enough data to make any general assumptions of how every municipality is using data collection on an aggregated level, and possible outcomes of this.

Objectivity is another subject of critique saying that scientist can't shut of their own interests and interpretations of an interviewees answers. However, by trying to be aware of this fact the researchers own senses are hopefully kept in track (Denscombe 2009:122). It is my opinion that being objective is a problem within every scientific methodological approach. By merely choosing a theme or a research question the researchers interest is already making an impact on the research.

4. Theoretical framework

This chapter mirrors the themes used in the background chapter and were chosen during the course of research. The purpose of using the same themes throughout the whole essay is to be able to give a theoretical perspective on contemporary situations discussed in the introduction of this thesis.

This chapter aims to create a toolbox from which theoretical assumptions can be made, when analyzing the empirical material. Though my interest lies in the potential of data in physical planning, I have chosen a broader perspective on planning theory, including dialog, the framework of PPGIS and private-public partnership, to broaden the discussion that comes after.

4.1 The planning perspective

The perception of urban planning has changed over time, as well as the view of citizen's participation in urban development. There are many planning theories describing how to best conduct urban planning, however two themes can be distinguished within planning theory research; rational planning with its origin in the positivistic approach, and communicative planning that emerged during the postmodernist era. This chapter describes the components of these two planning traditions, and how they differ.

4.1.1 Rationalization: The rational planning method

The concept of rationalization was developed by Adam Smith (1723-1790) and John Stuart Mills (1806-1873) as an important building block in economic theory. Rationality means that an actor, before a decision, choose the option that best meets the decision maker's material interests, or demonstrates

the most benefits. Within national economic theory the concept of rationality discuss the location of activities in the city, regarding both individuals and companies (Nyström; Tonell 2012:90).

Rational planning is based on instrumental rationality and modernism in the development of master plans. The planning process is defined by top-down planning methods where decision makers formulate planning goals, and professional planners formulate plans in order to reach them, while ignoring the role of the public and the collaborative approach to plan making. Rational planning is often characterized as being "value-free" and using logical structure, though ignoring power relations and implementation issues, which tends to make the process less appealing to the public. The instrumental rationality of the process require that specific goals are reached with minimal use of resources. Advocates of the rational planning approach use evaluation to optimize the procedure, thus generating new knowledge where the process can be tightened, and assumptions eliminated (Khakee 2003:346).

There are two kinds of rationalities in rational planning, the social and the market. Market rationality only cater to the self-interest of individuals and businesses as long as a person or company can avoid affecting their environment negatively, which is the ideal case. The idea is that all decisions will help the society to grow. This is called the pursuit of Pareto-effectiveness. In reality, these conditions rarely apply. In other words, the market's rationality can have devastating consequences on, for example, segregation and unemployment (Nyström; Tonell 2012:93).

Social rationality is based on the fact that each individual is part of a social group that is believed to have collective interests that are more important than individual interests. Pareto-efficiency is thus no longer interesting. Instead, the collective's interests have to be the starting point when taking measures to correct the negative social effects of market behavior. In other words, conflicts might appear between social and market rationality from a societal perspective (Nyström; Tonell 2012:94).

Sahlin-Andersson argues that the rational planning model is a myth and that the decision-making process isn't carried out in the way the model describes. The rational planning decisions are merely a facade where decisions are built up with rational arguments in order to create a sense of security, but decisions are actually taken on other than perfectly rational and informed grounds. Rational planning had a major backlash in the 60s due to talk of a more democratic and transparent planning process (Nyström; Tonell 2012:95).

The rational planning model has its origin in Patrick Geddes (1854-1932) theories of the society, where he translated the traditions of natural science in to the sociological practice (Livingstone 1992:271). He encouraged close observation as method to discover the relationships between place, work and people by introducing the "diagnostic survey" and "conservative surgery", both terms borrowed from medicine. The idea was to, in a way, state a diagnose before treating the problem. Geddes survey-analysis-plan (SAP) concept has similarities to rational planning due to its linear approach and emphasizing evidence-based information. Geddes method was not only a political planning approach; it was also a way to foster awareness and participation. According to Geddes, the true city could only be if people where governing themselves according to their own needs and spiritual ideas (Livingstone 1992:277). Geddes ideas are incorporated in rational planning as evidence is gathered before defining the problem, though much of his activist spirit was compromised by his successors where the professionals and experts took the lead role as planner (Livingstone 1992:278).

4.1.2 Post modernity: Communicative planning method

There is an established idea within the postmodern geography that space has been neglected in social theory and treated as fixed space without any dialectic, or “*a dead stage for history*” as Creswell calls it (Creswell 2013:181). Postmodern geography therefore positioned the concept of *place* back in center of the discussion, building on such as Foucault’s statement that the postmodern epoch is the epoch of space, and that the present (1986) was a time where “*our experience of the world is less that of a long life developing through time than that of a network that connects points and intersects with its own skein.*” (Creswell 2013:181). In other words, space is not dead but rather an active and dynamic component in the constitution of society.

Communicative planning has its origin in “social learning” and is usually associated with postmodernist planning when participation emerged as a reaction to the instrumental rational planning tradition. The communicative planning theory and method derives from Habermas’s theory of communication action which uses qualitative and interpreting-styled research and generalization, rather than logic (Fainstein 2000:545).

Communicative planning and its methodology emphasizes dialog, interactive social processes, reflection and critical analysis as well as the attempt to understand the different actor’s objectives and contribution to identify issues and conflicts (Nyström; Tonell 2012:100). The difference between communicative planning as a method and Habermas’s theory is that Habermas exaggerated communication as the goal, while the communicative planning theory and practice sees communication as a step towards knowledge that can be used in planning (Nyström; Tonell 2012:101). Evaluation is also identified as an important part of the method, and focuses on the quality of the planning process, its effectiveness, legitimacy, and the level of integrity and mutual understanding (Khakee 2003:346-347).

There are two kinds of participation in communicative planning; participation as individual participation, and being in a group, collective participation. The problem of being an individual in participation is that the strength is in the numbers of people participating. Collective participation in the forms of a social movement may easier achieve qualitative participation “*because a more specialized movement has more opportunities to influence decision-making in planning related issues*” (Khakee 2006:15). Collective participation means that one or a few talks at the behalf of a movement. Opinions are usually founded in consensus of the group or using expertise, and usually engaged in lobbying activities to develop appropriate advocacy channels. In individual participation, the individual need to express an opinion in other ways (Khakee 2006:15), usually using channels provided by the municipality, as in the case of Sweden.

There has been critique raised against communicative rational theory regarding the basic idea of the ideal way of speech, which should enable all of the participants to express their opinions and viewpoints in a manner which is supposedly free of their own personal interests and value premises (Kahila-Tani 2015:40). Susan Fainstein, a political theorist and scholar of urban planning, is critical of the communicative paradigm within planning. She is concerned that when ideal speech becomes the objective of planning, there is a problematic assumption that if only people were reasonable, deep structural conflict would disappear, forgetting social and economic forces behind the process (Fainstein 2000:545). Another argument raised against communicative theory is one of the fundamental issues of,

what Fainstein calls, pluralist methods, specifically saying that communicative theorists avoid dealing with the consequences of open processes that produce unfair results (Fainstein 2000:547).

4.1.3 Private-public partnership

Private organizations handling and selling data goes under the term “knowledge-business intensive services” (KIBS). The core practice of such actors is described as providing a service of combining universal knowledge of technologies and applications with local knowledge of specific problems issues and contexts of their clients (Muller; Doloreux 2009:64). The principal characteristics of KIBS is that they heavily rely on professional knowledge, and they either are themselves the primary sources of information and knowledge, or they use knowledge to produce services for their clients (Muller; Doloreux 2009:65). Muller and Doloreux (2009) describes these services as activities intended to result in the creation, accumulation or distribution of knowledge. The concern with involving private actors in the public sphere is here seen as two-sided. One side of the problem is the fact that the production of data and knowledge itself is no longer coming from public institutions and universities, and if they are they could still be using privately owned information as a source. If the knowledge produced by universities is commodified, it could undermine the credibility of the university as an institution and weakened its capacity to make useful changes to society (Mohan 1994:390).

The other side is, as the private sector is getting a hold on important sectors such as urban development and the provision of internet based telecommunications, hidden agendas might surface as power relations change. According to Tom Sager the communicative planning tradition is being replaced by new public management. Sager is a professor civil and transport engineering who in his later work has studied the tensions between communicative planning theory and neo-liberalism. Drawing on some of David Harvey’s work on entrepreneurialism (1989), Sager states that an overly economic ideology threatens the values of communicative planning (Sager 2009:67). The neo-liberal shift in decision structures, with the public-private partnership in its core, is part of a de-politicization process where the political character of decision-making is removed. New public management is part of the neo-liberal paradigm and will, according to Sager, profoundly change the role of the planner. The role of the communicative planner was primarily to facilitate and involve public interests and marginalized groups. The neoliberal planner see their role primarily as providing expertise in practical, technical and legal matters, rather than promoting participation and empowerment of marginalized groups. Planned solutions need to be in consent with the market, leaving less room for politics (Sager 2009:66).

Sager is convinced that the typical Nordic planner is traditionally closer to communicative planning theory than to new public management. Thus, the planner’s role is under pressure from conflicting values promoted by politicians and administrators promoting new public management. However, he also sees some common ground in concerns regarding user influence, service quality, and client satisfaction. New public management is, like in communicative planning, offering a universal economic model of governance where the public interest is the same as the private corporate, thus accentuating the similarities between the interest of the public and private sectors. This includes more attention on results in the public sector, competition, and more customer-focus. With such focus, privatization, and outsourcing of political and administrative functions is advised in order to become competitive. In general, more weight is put on economic indicators of the effectiveness of the political management system, and less weight is put on indicators measuring the democratic aspects of politics (Sager 2009:70).

New public management is an interesting perspective on planning as it seems to have some similarities of the positivistic tradition, however with more of a humanistic approach since the customer, the public, is put in the center of it. The public private partnership also includes the buying of services from the private sector, though the partner ventures differ from the conventional subsidy relationship involving a one-way flow of money, tax incentives. Instead, the form of partnership is more of a co-operation between public government and private business that enable both actors to develop products and services jointly. As such, the private sector increases its holdings in the public sector.

Viitanen and Kingston see the outsourced production of knowledge as an opportunity. They think that the transition to the digitalized city can utilize Habermas theory of “communicative rationality”, where the Scandinavian tradition of participation is revisited. The authors hope that changes in the design of the Scandinavian philosophy of participation, where technology is partnering with its users, can ultimately change the power balance between ‘experts’ and users (Viitanen; Kingston 2014:813). Habermas’s is however not exclusively positive towards the modern world, saying that the relationship between technology and science is changing, and becoming increasingly interdependent as knowledge is being exploited by the rapid changes in technology (Habermas 1968). According to some theorists (Anderson 2008) the upcoming era of big data will even be the “End of theory”, meaning that computers, algorithms, and big data can potentially generate more insightful, accurate and true results than scientists or experts who traditionally worked with hypotheses and research strategies. The question is how to make sense of this new type of data, delivered straight from the source (the public), to a computer (the analyst). Will it be a step closer to the truth or merely another trick played by the persuasion of numbers?

4.2 Participation

4.2.1 Public dialog

Fainstein describes participation in public decision making as part of the ideal of the just city, both because it is a worthy goal in itself, and because “benevolent authoritarianism is unlikely” (Fainstein 2000:468). As mentioned in the introduction dialog is promoted by SKL and Länsstyrelsen, however the rapport by SKL also states that dialog should produce direct democracy (SKL 2013:17). This section describes different levels of participation in planning, and why it is important.

4.2.2 The ladder of participation

Sherry Arnstein wrote a much influential article in 1969 about citizen’s involvement in the planning processes in the United States. Her opening statement captures the idea of dialog as a necessary evil *“The idea of citizen participation is a little like eating spinach: no one is against it in principle because it is good for you. Participation of the governed in their government is, in theory, the cornerstone of democracy—a revered idea that is vigorously applauded by virtually everyone.”* (Arnstein 1969:216).

The quote gives hints of some skepticism regarding theory versus reality. The essence of her critique is that there is a difference between going through *“the empty ritual of participation and having the real power needed to affect the outcome of the process.”* (Arnstein 1969:216). Arnstein saw public participation in local governance as a potential means of empowering marginalized urban communities and that participatory governance potentially could contribute to sustainable local development if

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performed correctly (Castell 2016:306). Her biggest contribution to the discourse are the different types of participation she saw. She created a ladder of participation, which made it easier to see who has the power when important decisions are being made, and it is still relevant today (SKL 2013, Malmö stad 2016).

Arnstein's ladder of participation (Arnstein 1969:217)

1 Manipulation and 2 Therapy.

The first two levels are both "non-participative" that have been manufactured to substitute for genuine participation. The purpose is not to enable people to participate in planning or conducting programs, but to enable power holders to educate the participants, or to achieve public support through public relations.

3 Informing.

Even if informing is part of the dialog process, this step has emphasis is on one way communication and not dialog. Therefore, there is no way of the citizens to participate in this stage.

4 Consultation.

Another step in the right direction where attitude surveys, neighborhood meetings and public enquiries are used by the planners. Under these conditions the public lack the power to ensure that their views will be noted by the people in charge. When participation is restricted to this level, there is no assurance for the participants of changing the status quo. Step 3 and 4 are levels of "tokenism" that allow economic disadvantaged people to hear and to have a voice, however without having the power to actually effect their environment.

5 Placation.

Placation means a higher level of participation, however is also tokenism because it only allows economically disadvantaged people to advise, and for stake holders the continued right to decide. The levels further up the ladder are the levels of citizen power with increasing degrees of decision-making power.

6 Partnership.

This step enables participants to negotiate and engage in trade-offs with traditional power holders. Joint committees redistribute power between participants and power holders.

7 Delegation and 8 Citizen Control

In the last two steps of the ladder economically disadvantaged people obtain the majority of decision-making seats, or have full managerial power. Citizens are in charge of planning, policy making and so on.

The underlying issue is essentially that economically disadvantaged people in several arenas are trying to become "somebodies" with enough power to make the stakeholder open to their views, aspirations, and needs (Arnstein 1969:217). In short, the purpose of participation is to lead to some form of empowerment, how much depends on the amount of power a political system is willing to grant the citizens. Arnstein summarizes her participation review stating that though it is a simplification, it might

help to illustrate the point that so many have missed, that there are significant degrees of citizen participation.

Castell is critical of how participatory governance practices are formed in Sweden today as they are not addressing issues of social exclusion and empowerment of stigmatized urban communities enough. Rather, he says, the focus is on developing methods for facilitating public consultations within a traditional rational planning framework. By comparing the stages of involvement by SKL mentioned in the background chapter, which is widely used among Swedish communities, with the original Arnstein's ladder of citizen participation, it's easy to see that Castell is on to something. The two models might look the same but were created to fulfil different purposes. Arnstein's ladder was originally meant as a critique of the method of participation, however SKL's similar stairs of participation are simply used as showing different examples of involvement. Castell points out that the participatory tools developed in Sweden today mainly correspond to what Arnstein calls tokenism in her theory, which is far from her principles of power (Castell 2016).

4.2.3 Participation in data collection, PPGIS

Changes in the way we communicate and a higher acceptance of data sharing by the public will force planners to look to data as a source of information of their citizen's behavior. However, participation in data collection need to be advised in order to legitimize the process. This section goes more in to depth of what the framework of participation in GIS looks like.

Public participatory mapping combines the tools of modern cartography with participatory methods to represent spatial knowledge of local communities. The method includes terms such as public participation GIS (PPGIS), participatory GIS (PGIS), volunteered geographic information systems (VGI), and participatory 3-D modeling (P3DM). PPGIS is considered by some scholars as part of Critical GIS which has become an umbrella that includes all research on the societal effects of GIS and social processes modeled by GIS, as well as the representation, ontology, and epistemology of GIS. With that being said there are not one pure definition of PPGIS but various definitions depending on the level of participation and type of project. McCall even states that a strict definition would have little value to the method since it would be interpreted differently anyway depending on the project. What matters is participation and coproduction of GIS (McCall 2004:3).

The essence of PPGIS is that it is a reflective and critical praxis in itself. Its users are not to accept existing representations or territories beforehand, but rather challenge the status quo by producing maps that represent what the participatory group wants it to represent. Maps that challenge the status quo through PPGIS are called counter maps (Sieber 2006:49) (McCall 2003:555). Counter maps are explicitly intended to display the needs and requirements of groups who tend to be excluded scientifically, as well as socially-institutionally. An example of a counter map is to "re-label" the standard land use. Command over space is a fundamental source of social power, limited access to space disempowers groups of people, most commonly women. Therefore, PPGIS can be used to reflect how women uses space locally, in contrast with how men use that same space. McCall describes the counter map as an "*alternative representation for the marginalized, dispossessed, unseen, or inarticulate, which 'counter' the views and voices of the powerful*" (McCall 2004:8).

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The number of participants in any participatory project can vary from a few individuals to thousands of people, what is more important is the approach to engage the public in the decision-making process. There are several ways to use PPGIS but there should be some degree of incorporating local knowledge, integrate and contextualize spatial information, allow participants to dynamically interact with input, analyze alternatives, and ultimately empower local individuals and groups (Sieber 2006:503). By seeing participation as two sides of a spectrum of methods, one can look at the level of participation of one's project. On the one end PPGIS is a form of participatory planning, which makes use of maps and other geographic data as output. On the other end, PPGIS becomes more technical with a high or low degree of public participation. It can be as simple as participating in the data collection, or much more fundamentally, it could mean influence in the choice of data inputs, layers, analysis and presentation. The core activity is the data collection and output (McCall 2004: 2). At this end of the spectrum there are several different stages as to what level the participants actually have power over the data produces, and to what purpose it's going to be used.

From lowest to highest, McCall categorize the different stages of a participation when using technical PPGIS (McCall 2004:5). The categories are stated below:

Information Sharing

One-, or two- way communication between outsiders and local people, involving primarily technical information, such as reference points. This level requires a low degree of participation and all topics are pre-determined by outside agencies.

Consultation

External agents have previously defined the problems before consultation with local stakeholders.

Involvement in Decision-making by all actors

Interaction between local and external actors who jointly identify priorities, analyze current status, select alternatives, and implement the process. Participation is seen as a right, not just as the means to achieve a project's goals.

Initiating Actions

Independent initiative from local residents. If full participation is construed at all stages, this is an indicator of empowerment and implies control of the whole process – from problem prioritization, geodata collection, spatial analysis, to deciding what is being presented and represented in the and consequent decision-making from start to finish.

In either process it is essential to discuss the intention of the actors who are promoting participation in the project. When participation works however, it will promote and reinforce local decision-making, which can lead to more equitable social redistribution and empowering of weak groups (McCall 2004:6).

When looking at a project, it is essential to ask these question:

- Who is participating? Who handles data and decisions? Who controls the process? Who uses the outputs?
- Who has accessibility to GIS tools and techniques? Is there 'open access to the device'? Who has accessibility to the outputs?

- How are the GI tools behaving in terms of the intensities, and the purposes, of 'participation'? (McCall 2003:561)

To summarize McCall's work, the cornerstone in PPGIS as a method is for the governed public to feel ownership of the process by participating. Ownership as a totality implies owning the sources of data and information, the processes of making the product, as well as the final products itself. However, the method can also establish an element of trust between the governed and the governing (McCall 2004:9).

4.2.4 Critique of PPGIS

As mentioned regarding context, there is a slight difference in how PPGIS methods are used globally. In North societies PPGIS methods are widely used in urban community neighborhood identification, problems with prioritization, and participatory planning. In South countries applications are at a larger extent used in natural resource identification and management and environmental hazard mapping. Native populations in both the north and south part of the globe use PPGIS for legitimizing customary land and claim resources (McCall 2004:2).

Landscape has a strong cultural value as well as spiritual values for many indigenous communities with long historical bounds to their specific locations. In order to move the power of defining the landscape to the governed, PPGIS is designed to help disadvantaged communities to own the output of the map, thus producing a counter map that challenge the spatial views of the current majority opinion (McCall 2004:555). However, this method can be problematic when dealing with indigenous communities due to the nature of making the map itself. McCall gives an example of a project in New Zealand that challenged the usability of PPGIS. The project was trying to define the Maori landscape as an economic commodity placed in the narrow categories of a legend with categories such as high value, marginal, or wastelands. The Maori population saw that their land units had other characteristics; tapu (respect for resources), mana (authority), and mauri (life force, energy). Mapping areas, no matter with what method, will always promote and produce particular identities. McCall reminds us that drawing boundaries are as much a cultural exercise as a political and economic one (McCall 2004:560).

As the cartographic scale increases, so does the number of people linked to the issues of the output map (Sieber 2006:495). Jake Kosek, a professor in geography at Burkley, is like Sieber critical of scholars who are too uncritical of how GIS is used. It is important to see that the map itself is not a product of one's community, but is one of the things that produces a community. Kosek's article is a comment on a debate within PPGIS where one side is of the opinion that spatial information technologies have facilitated the exploration of spatial relationships between cultures and their landscapes, and helped indigenous groups protect their land and resources from competing claims. Kosek is critical of this standpoint. He thinks that we need to see the map as a reflection of social relations, thus re-enforcing them. The process of mapping helps naturalizes and communicate a dominant idea of who belongs within particular boundaries and who does not, who may make decisions on behalf of the community and who may not (Kosek 1998:4).

Mapping is a political action in itself, no matter what the purpose is. There are cases where PPGIS has been used (Hodgson and Schroeder 2002) with the purpose of "clarifying" village boundaries, by classifying and dividing land uses using polygons as output. The result did however disrupt relationship

between the locals because of how the traditional shared areas among the communities were portrayed. The lesson learned is that not only can GIS sometimes be irrelevant, but it's very benefits, such as improved visualization or data accuracy, can even induce further injustice (Hodgson; Schroeder 2002:96).

Another problem identified by several scholars (ex. McCall, Ghose and Elwood, Viitanen; Kingston) when trying to implement PPGIS in municipal operations is the fact that participation to some extent means public empowerment in practice. It seems that it is common for high-level officials and politicians to resist local empowerment and decentralization of power. This also goes for the public where the prevailing majority, or local elites do not give up their power easily (McCall 2004:558). Often, community organization staff and residents that have invested time and energy in producing complex strategic plans are not taken in to consideration or implemented in the actual planning process (Ghose; Elwood 2003: 20). As Khakee (2006) already identified in his research, much of the future planning and need for dialog will be about environmental related issues in urban areas, and as Viitanen and Kingston presents in their article of smart cities new technology is believed to provide solutions. However, even if GIS in any form is a powerful tool for analyzing risks, or engaging the public in debates about climate change, "smart technologies" offer no guarantee of the quality of decisions made in cities (Viitanen; Kingston 2014:804).

4.3 Summary

Rational planning comes from the economic theory of rationalization where any decided action must be the one with the most benefits. This methodology has greatly contributed to rational planning theory which is recognized as be top-down in the decision-making process, where the planner has the role of an expert.

There are two concepts within rational planning: Market rationality which only caters to the self-interest of individuals and businesses, without any coordination of decisions in the context of market activities; and social rationality where the collective interests are more important than individual interests. The rational planning method is argued to use rational arguments as a front for politicians to make their own decisions. The first rational planning model, designed by Geddes, was however intended to include the public in the process as rational beings and in the long run lead to the public making their own rational decisions. This idea was unfortunately lost along the way.

In rational planning the planner is seen as an expert that makes decisions. In communicative planning, the planners roll changed and merged in to more of a facilitator of the public. The communicative planning tradition has its origins in postmodernism and "social learning". During this time-period the population gained a more important roll, as did space which was put in the center of discussion as being an active component in planning where the present takes place.

Communicative planning method derived from Habermas's theory of communication action and its methodology emphasizes dialog. There are two kinds of participation in communicative planning; participation as individual participation, and being in a group, collective participation.

Sager is convinced that the typical Nordic planner is much closer to communicative planning theory than to new public management which presumably would confirm better with rational planning. Sager is worried that the future role of the planner is under pressure from conflicting values promoted by

politicians and administrators promoting new public management. However, he also sees some common ground in concerns regarding user influence, service quality, and client satisfaction.

“Smart technologies” offer no guarantee of the quality of decisions made in cities. No matter how much information we access. Unfortunately, as all methods has critique, so does PPGIS. By using PPGIS, participation becomes possible in collection of data, though being a quantitative method at hart it is sometimes difficult to translate soft values and analyze them. Therefore, it’s important to be both careful and critical when using GIS and PPGIS.

5. Analysis

The following section is a summary of the qualitative interviews made during the course of this thesis. By finding common themes in the responses, the material has influenced the chosen literature. There are eight interviews in total, representing tree municipalities (Malmö, Copenhagen, Gothenburg), one representing the national planning level, two from the private sector working with statistics, and one representing a property developer in Lund. For a better overview of the interviewees and their projects see Appendix 1. These actors all work with either large scale data collection, or with alternative methods of data collection allowed trough technical progress. All interviews, except with Jos Van Vlerken has been translated from Swedish to English during the process of summarizing them.

5.1 Qualitative interview result

5.1.1 Public sector

Copenhagen

Copenhagen is taking advantage of the new technique available in order to increase the capacity of the transport system is the city. Due to population growth, each year, the City of Copenhagen sees that the number of people using their bicycle to get to work and education are increasing. Unfortunately, the municipality is missing a viable data source for cyclists that gives insight of the travel time and daily route choices of cyclists, in order to manage the bicycle traffic more efficiently. Jos Van Vlerken is one of the people behind the Climate KIC initiative, and plays a key role in organizing the Bicycle Big Data Workshop.

Data already available in Vlerken’s departments is data from traffic signals, some weather data and environmental related data. Aggregated data is also already available from cars, this data is collected from a company called Inrix (Inrix), giving general segments of the infrastructure. Data from busses is also collected and GPS based. Pedestrians are counted manually twice a year, and some ad hoc. There are some stationary data collection for bicycles, and manual counting in some locations, but nothing for the whole bicycle traffic system.

Van Verken and the initiative is mostly concerned with data that gives the department an insight in travel time. There are already enough data available from all busses and cars to know how long it takes in certain corridors going from point A to point B for motorists. However, similar data for bikes is missing. To get an idea of the situation, every year the department send students out with GPS trackers to measure how long it takes in certain segments in the bicycle system. Knowing how long it takes in “real

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time” for a bicycle to go from A to B is valuable knowledge and is used for valuation, and showing that they are improving the situation for bicyclists.

Van Vlerken is hopeful that new technology in data collection will give the municipality better data over all. The data collected for car traffic today is for example aggregated in a certain way because the supplier (Inrix) don't have enough data and is forced to mix the new data with historical data, therefore the data could be more comprehensive. The methods of herding bicycle data are completely missing, and therefore Vlerken is exploring two approaches that were presented at the workshop. One is an app based approach, and the other a “sensor hardware approach”.

There are privacy issues in both methods that are being tested but in order to get the result they want, Vlerken need information regarding each individual biker. Vlerken stresses that they don't care about the individual person, only the time it takes for a person to travel between two places. The basic data needs to be based on the individual cyclist and then aggregated to 100 or 200 individuals not to become a privacy issue. One option is to use cameras that recognize something about the cyclists, color rather than the face, in order to recognize the same person at a different place, giving the municipality the travel time without a recorded feed. There would be cameras Vlerken explains, and they are in a way filming. But the municipality would never be given the parameters used.

The purpose of data collection within all three municipalities seems to be related to on demand service, evaluation and long term planning. In the case of Copenhagen traffic management uses historical and real time data in order to draw conclusions of what is happening in the traffic flow in real time. If the travel time drops below a certain time, it gives the management a signal that something has happened on the lane. The data is fed in to a central traffic management system for planning and daily management. According to Van Vlerken, for data collection purposes, access to travel time is the highest level of daily traffic management. The initiative he is involved in prioritize solving the problem of on demand type of services. Though, because of the large amount of data needed, it is a very big challenge for the municipality. Better data for valuation is also an assumed outcome of the new methods being investigated, but for this purpose less data is needed and therefore not as prioritized in this initiative.

Another expected outcome of successful data collection that Van Vlerken mentioned is to be able to identify an increasing number of bicyclists in a corridor. If the users are exceeding the capacity of what the lane is meant to hold, this type of data is taken in to the planning and budgetary process, as well as the political process. If the data motivates a new project and is accepted on the political level, there will be a widening of the bicycle lane. *“Data gives you something to act upon. This regards all data and all levels on management, even political.”* (Van Vlerken). The same principals apply for other transportations, including the bus lanes, but in the current framework cars have low priority. If cars are increasing in roads where buss have priority, then a bus lane might be established instead. In corridors where cars are prioritized, it is possible adjust the traffic signals through ITS (information technology systems) to better facilitate the flow, however this is an expensive method. Copenhagen is just now introducing traffic message signs for bicycle traffic information. The active signs will be able to tell the cyclists if there are congestion coming up, or road works. This service is also available for car lanes, but the municipality mostly use twitter and radio to spread information at this time.

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Van Vlerken says that more data and more knowledge on what is happening on the streets in real time will make a tremendous difference in planning. *“The more we know, the better we can long-term plan and short term manage”* (Van Vlerken). An obstacle for access to more data than what is currently available is that the Danish policies are quite strict regarding what kind of data that you are allowed to collect. The municipality also has strict principles itself when it comes to data collection. Of course, Van Vlerken says, different administrations want to know different things, but you should not collect more than what is necessary. Meaning, since Van Vlerken is interested in travel time, that is the only thing they will collect, everything else would be thrown away immediately. He thinks it is a solid framework when it comes to privacy. The municipality will never compromise privacy.

Van Verken’s department has a big focus on dialog. Some of the changes they make are a result of citizen workshops where they want to do “something” in the local area. These projects should be based on the needs of the area. If they’re interested in more general input, they talk to the Danish bicycle federation for example, or other similar federations for cars etc. After implementing a new project/structure they make a qualitative evaluation to see what they think about the changes that are done.

Van Vlerken assume that people are aware that data is collected in the transport system, besides, the data collected is not even close to what private companies are doing. The municipalities principles need to be stricter than the private because *“we have real power in a way compared to private actors”* (Van Vlerken). Data collected from cars are aggregated to merely a blip on a radar, therefore Van Vlerken doesn’t see it as critical if the public is aware or not. He thinks that when companies are collecting, the data is much more detailed, that’s why the public have to agree on the data being collected.

The app that is on trial now is not up and running yet, however this is the type of tool that require people’s agreement. Using an app that collects personal data and movements by GPS becomes a closer communication to citizens, however Vlerken states that it is not a dialog. If they were to have actual dialog with as many as 10 000 people it would take much effort and be very costly. Also, there are problems connected to having too much qualitative input, at some point their focus of input becomes quantitative anyway. One example is a project where citizens could inform their municipality of dangerous bike lanes in GIS. They got 10 000 inputs. Vlerken says that the result in a way was similar to a dialog but using a quantitative method.

When asked if GPS data could be regarded as qualitative Vlerken answered that they want nonspecific aggregated large scale data, *“superficial and general movements of people and not specific in depth knowledge of the movements of individuals”* (Van Vlerken). He sees no reason why the municipality would be interested in a very specific route of very few individuals unless it was for a specific research project. He adds that consent by the user is always a priority, especially the closer you get to the citizen. Consent for stationary counting stations (radar) is not necessary, but for GPs it would be.

The only field he identifies as in need of further improvement is communication towards road users, being able to communicate data back to the citizens right away. Communication, he adds, is the focus going forward.

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Sweden, Trafikverket

During the same time period as Copenhagen stated a larger interest in data collection and its possibilities in infrastructure due to new techniques gathering and understanding data, the Swedish transport administration, Trafikverket, initiated a new project that aims to develop a strategy for monitoring the cycle and moped traffic on state owned roads. Maria Varedian is one of the people behind the new framework agreement, she explains that Trafikverket, as a state authority, need to use the Public Procurement Act, which means that various actors can offer a solution to their problem, and a price. The actor that has the most fortunate offer will facilitate all data collection of bike lanes in the future. This way the data will look the same in the whole country, no matter where you measure.

The reason for a growing interest in collecting more data of how their roads are used is connected to the health issue perspective, traffic safety, and general knowledge of many people who are using their roads for bicycling. Data can be used as background information when discussing new areas of development. For example, if you want to build a bicycle track, it's interesting to see how many people who are traveling there daily, and how they travel. That only works when people bike there already. According to Varedian it makes sense economically to see how the space is used before making an investment. But she doesn't think it's "(not) *reasonable to measure how many bicycles there are on all state roads in Sweden*". Instead focus should be on places where there is a specific issue when considering investments.

Just as in Copenhagen, Varedian is hoping that new data will complement their evaluation methods. There is a demand for better before and after measurements to evaluate the results of new projects, and in long term for operation and maintenance. To know peoples bicycle routs could for example help with giving alternative routes for cyclists when a road needs to be closed. One of the biggest challenges with data collection in general according to Varedian, is that nobody has the whole picture. It will be a challenge to coordinate this and get a result that everyone can work with. It seems as if Trafikverket has difficulties with creating an overview of their problems due to the size of the organization.

Vardierian thinks that Trafikverket will do a lot more data collection and measuring in the future compared to what they are doing today. When it comes to bicycling better before and after data will make it easier to measure and follow the development. There are thoughts on making a project with a private consultant who wants to use an app to try to measure bicycling on state owned roads, this means that the user needs to download the app which could be problematic, however they will make an effort to see if it works in practice. The most important part in such measurements will be that a lot of people join in to do it. Unfortunately, this project has not yet started so Vardierian could not say much more about the expected outcomes.

Malmö Municipality

Stationary measuring points are by far the most common way to collect data in Sweden since Trafikverkets uses it as their main source of information. The city of Malmö has a similar system as Copenhagen with stationary measuring points for both cars and bicycles in their cities. Though, as the city of Copenhagen already realized, the nature of cyclists makes it harder to keep track on routes and travel time. In order to get a proper idea of how the city is collecting data I had an interview with Biljana Eriksson who is responsible for all traffic data in Malmö city. Her department also has access to data regarding noise and air. Three years ago, they started measuring pedestrians as well, as grounds for

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deciding whether the street is to be narrowed or widened according to pedestrian needs. This data is particularly important for mixed traffic, and something that Eriksson thinks will pay off in the urban space long term, *"It is important to know how things really are"* (Eriksson).

When the data is collected, manually or using stations under or above ground, the data is prepared as raw data and converted into text files in order to be converted into a database called TDS. The problem is that this database is an older generation and Eriksson is in great need of a new one that can handle new types of data. However, it is also crucial that the data that has been collected since 1968 can be converted too. Eriksson's job is to look at traffic trends in different sections of the municipality, which means that former collected data is important. The result is then divided into cuts (sections) and presented at the political level. Although the measurement points will be supplemented and changed in the future, it is important to retain old points, but may not measure as often, to see the development over time.

For Eriksson, it is important to look at all spaces, to get the whole picture if possible. If you have all the data regarding a space, *"(...) you do not need to do anything unnecessarily if everything works as it should."* (Eriksson). Sometimes people call with different complaints to the department. As Eriksson has data to see how for example traffic has changed over time, she can confirm if the complaints have grounds.

The data that the department collect is clearly fundamental to decisions made in the municipality. There are plans of trying new methods of data collection at the department, but the department is still in the beginning of using new methods of aggregated data collection. A project that will be up and running soon is using Bluetooth. The project is waiting for approval from the county board to start, a journey that has taken almost two years. The reason why she initiated the project is to access more information than they have now, using new technology. With new technology, she says, you can get a whole area at the same time; travel time, congestion traffic flows and so on. The amount of detailed data allows for better analysis. As an example, Eriksson mentions how transport patterns are affected when citizens receive their salary.

I also interviewed Christian Resebo who is the manager for the analysis and development unit at the traffic department in Malmö. He explained that the department has complemented their existing methods with new variables, such as automatic number plate measurement recognition and laser as a complement measuring bigger vehicles. The department are experiencing problems with some of the traditional methods related to speed. The systems in place for collecting ÅDT (årsdygnstrafik; year and day traffic in English) only work when the cars are going at the assigned speed. As a project, they are thinking of using a Norwegian company with type of camera that interprets what it sees, but does not record anything. Perhaps something similar to the recognition cameras mentioned by Van Vlerken.

Another option is to purchase flow-data via Google, or from another company called Endomondo which makes bicycle route maps for a low rate. Resebo also gives an example of how a colleague of his put a GPS tracker in the backpack of a number of summer practitioners who *"took back on someone"*, thus resulting in a number of routes pinned out on a map and later used for a bicycle model showing different cycling routes in the city. The municipality already have a similar flow model for cars which could be supplemented by bicycle traffic, where accessibility and critical points could be distinguished.

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Although Resebo is keen on trying new methods of data collection in Malmö, he is somewhat hesitant of using applications as the source for planning. *"You'll never get the total flow, if you're using googles data, you'll only get your android users"* (Resebo) If the aim was to only measure congestion it would be enough, or looking for big bicycle movements in a crossing. But as basis for designing the dimension of a motorway they would need more than congestion; they would need the total number of vehicles.

A problem with the companies that the municipality is looking in to now is that they all sell different parts of the puzzle. For example, one company that sells sensors and data transmission, another that sells database management, and a third sells analysis. Or you can purchase finished data from Google.

Another problem with buying new methods is the price. The number plate reading camera that is being tested costs 200,000 kronor. To get the full picture of a crossing one would need six cameras, supplemented with laser. What is interesting about this project though is that the municipality will get an idea of what direction the cars are coming from in real time. This means that the municipality can have a conversation with Skånetrafiken and ask them to add more bus routes to a specific location, or give monthly offers to a particular target group. When asked if the citizens are aware of any of the projects the answer is no. Since they have been approved by the county administrative board, and they are hard to get an approval from, it should be okay. Perhaps, he adds, we should put up a sign saying *"we register your car"*.

The dialog process within the department is mainly through leaving comments online regarding issues around the city. Citizens can also let the municipality know if they want more information about a project anywhere in the city. *"We collect information, and they get back information from me. Then it becomes a bit like a form of dialogue."* (Ericsson) Eriksson says, when asked about her thoughts of the connection between dialog and data collection. All data regarding traffic is supplemented with travel surveys, however, *"With some technologies, personal integrity puts an end of the development."* (Eriksson). Both Resebo and Eriksson express an interest in having more information of the population to better plan urban spaces. Eriksson wants to collect data regarding the degree of "staying in one place", something that with old methods would mean manual counting methods together with estimations of who is using the space.

Resebo mentioned during the interview that there is no data regarding the utilization of their parks and squares. The department is in charge of these areas in the city and know everything about their capacity and limits according to standards, but they don't know how the park is used, how people move in the park. For example, Resebo would like to be able to see if the flow in the park interferes with the "tranquility" that it aims to achieve as a recreational area. Resebo ends out conversation stating that the management of the city is not in need of new methods of data collection in order to handle the city as it is now. Rather, the development of new methods should aim to find cheaper methods, or to accomplish new things.

Gothenburg Municipality

Sara Boije af Gennäs was responsible for the project using a new bicycle data collector app in Gothenburg. She explains that the participants had to volunteer to be able to participate in the project due to the involvement of personal information. The purpose of the project was to see in what ways

new data collection methods could help to improve the conditions for traveling in the city. The municipality has goals to increase the amount of sustainable travels and is therefore trying to create better conditions for bikes. A more general aim is to increase the accessibility, road safety and create good conditions for traveling. In long term, such information gathered in this project could contribute to follow up and a more efficient way of identifying problems. "Gothenburg needs to be better at offering (their citizens) what they are responsible for".

The problem that Boije af Gennäs is hoping to solve is that the stationary measurement stations do not catch all cyclists, only those who cross their stations. Just as mentioned in the case of Copenhagen cars are easier to track. Cyclists can take shortcuts where there are no exact roads, resulting in incomplete data. Boije af Gennäs says that measuring bicycle traffic is difficult. When they are remodeling parts of the city and traffic is redirected, the measurement stations remain.

Boije af Gennäs states that Gothenburg is responsible for catching needs of the people, which gives input to whatever the municipality is planning through different methods. The system for complaints is similar to Malmö's where you can file complaints through a website or call. According to Boije af Gennäs only certain people come through, *"but with data collection, the municipality can take a more active role, if the input is volunteered, maybe there is a chance that they could reach other groups."* (Boije af Gennäs) With "other groups" Boije af Gennäs is referring to younger citizens who usually do not submit comments via the current system. It is hard for the municipality to find representatives for all groups. For bicyclists for example, it is up to every individual to raise their concerns since they don't have a foreman. Thus, Boije af Gennäs thinks that it is important to help them and raise their issues.

Talking about possible areas of improvement in data collection, Boije af Gennäs states that even if it's not correct to measure everyone, *"it would be an incredible foundation for decisions"* as the degree of detail increases so incredibly with for example GPS.

5.1.2 Private sector

AF bostäder

To get a representative of the property development sector I had the opportunity to talk to Jasmine Kitzing who was the initiator of a project using GIS. Kitzing felt that she and the management of AF had different views of the urban areas in Lund, and that she had difficulties describing her experience as a student to the board when discussing the future OF the company's property development. Kitzing had the feeling that the costumers of AF bostäder (students) had a different city center than the official center in Lund. She based this on her own experience of being a student, and for her it felt like a "shared truth", but she had no way to prove that it was the case. The need to communicate this feeling to the management team in a non-speculative way resulted in the project.

Kitzing does not use the term public participatory GIS in our interview, however the method used in the project chares some characteristics of PPGIS . All costumers (students) of AF bostäder received an email with directions to point out where they lived, and places that mattered to them (such as gym, supermarket, friends) on a map. There were a lot of responses and the result showed that the center indeed was different than what you might call the official center in Lund. The institutions around Sölvegatan, and the area around BMC was according to Kitzing's project the unofficial center. The result was greatly influenced by the location of LTH and popular nations, and there was also a lot of movement

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in the area called Delphi due to the large number of students living there. These factors drew the point of in the east direction, even if many the respondents live in the west parts of the city.

Students were also asked to mark places that they considered as unsafe areas when riding their bike. It was clear that there were places where many people felt unsafe riding their bike.

The result of the survey was handed over to the municipality as a gift from the project, thinking it was important for the municipality of Lund to see to the places that were identified as unsafe. However, it was perceived by Kitzing that the reception of the project was "quite cool" by the municipality. Kitzing says that it is understandable that the municipality wasn't too excited by the project since the project wasn't theirs, however *"It is required that the results be placed in the middle of the decision board"* (Kitzing) in order to have some effects on planning. Kitzing also have a feeling that the municipality sees the students as a temporary population because they come and go. Though she thinks that it's essential to see the students as important residents. As the municipality's attractiveness is more important now the municipality of Lund should realize that. She is also critical of her own project since it only used student residents of AF bostäder which could be misleading. However, she still considers the result quite representative of students due to the high rate of respondents.

Kitzing thinks that the result of this project has contributed some to the decisions and strategies made in AF by helping the management making the right priorities. GIS can help an organization to get more substance behind their decisions she says. Similar methods can also be applied to service in order to understand where to establish certain social functions. Instead of guessing you are able to identify the need before making any decisions. GIS can also be applied to service by investigating where one should add different social functions, *"Seeing the geographical reality on paper makes it easier. Many market researches provide numbers that are not linked to any geography and location, but it should be as important as statistics are linked to dates"* (Kitzing).

When asked about the participation of data collection Kitzing states that collecting data regarding a person's commuting habits are okay as long as the person is aware of the data being collected. Looking at the bright side of data collection. *"There is a (general) fondness for numbers, if you can get soft values regarding dangerous places, or places that need more greenery in statistics, it would be received well by the society."* (Kitzing). On that note Kitzing even think that collected data might be better than some worse forms of dialogue. She gives an example; let's say you approve that an app is collecting data during one week, and you have the opportunity to comment on the items stored. It would give the citizen a one-way communication line to the municipality, that can't be misinterpreted. She says that such result would way much heavier than feedback from people sitting in a conversation group.

Although Kitzing is positive towards these new tools and new basis for decision, as she sees that it could become the heart in planning, she is also cautious of how numbers can be misinterpreted. Since *"You can prove everything with statistics, you can be sure that you can prove anything with data collection as well"* (Kitzing).

Location based services (LBS) and traffic flow

One of the people that I got in contact with was previously working in a project that investigated how passively collected data, data that this operator and other like them already have access to, could be

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used in theory to make certain analyzes of socio-economic benefits to a population. The data is collected with any cellphone. A cellphone talks to its operator between 1000 and 2000 times a day through different types of telecom information such as Facebook, movements etc. This information is collected through the company's masts. In an urban environment, these masts are approximately 200 meters apart. The information about which mast the mobile has been talking to already exists with any operator, but is only used to see if the company should expand the mast's capacity.

The project that the subject was involved in might seem unusual by Swedish standards, but the subject explains that this isn't a new phenomenon globally. The EU has one of the toughest regulations regarding this type of passive monitoring, which means that such projects are not officially happening in the EU. It is more common in Asia and in the United States for large telecom companies to sell information about their user's flows to private companies. They use the information to analyze where particular target groups are moving.

The specific task of the project that Anonymous1 was involved in was to look at the passive information collected from all mobiles in a particular area, and analyze how and where people were moving. The project was never about observing individuals, but merely looking at movement patterns in order to see how the data could contribute to planning of new infrastructure. Anonymous1 was the first person that I interviewed for this thesis, and he/she explained that the infrastructure sector is interesting for this type of project since there is a lot of money in the sector, and the results has great social benefits.

The subject sees some challenges with collecting data on an aggregated level using cellphones. One problem is that the development of LBS (location based services) are hindered by strict legislation in Sweden and EU. The subject thinks that there already are several laws that protect private individuals, and that upcoming legislation concerning the individual's right to be forgotten online, as well as how personal information is to be classified, is making it difficult for operators to harvest information in a legal manner. New legislation for 2018 in the EU is going to make it even more difficult for actors to use data collected through for example apps. The new law is called "informed consent" which means that *"the company must be able to prove that the person who approves it (data collection) must also understand that they have approved the use of the data."* (Anonymous1). The problem is that informed consent will make it nearly impossible to sell data collected via apps according to Anonymous1. In the case of Sweden, Anonymous1 thinks that actors must establish better cooperation between each other for the sake of the whole country. There would be major socio-economic gains if Trafikverket made it a national priority to use more information in for some purposes.

The challenge of collecting and analyzing aggregated data is data management. According to Anonymous1, data management and analysis of large amounts of data has not been possible earlier, due to the size of the data and the programs available to handle it. Since data up until now has been collected using older models of analysis, or survey methods, it might be difficult to translate the result of new data in order to compare with the old results. *"Just because you have more data it does not mean that you get better results if you can't translate the data into the old system."* (Anonymous1).

The greatest perks with data is the incredible detailed and wide basis of information available. For example, Google knows where people are and where they have been for a full day. You can choose to

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look at a particular segment of that day, or target group, and make conclusions. The subject states though that this type of information is not sold by Swedish operators today.

Despite the difficulties with legislation, Anonymous1 doesn't think that it will be an obstacle to realize the values of data collection. With the upcoming reality of self-driving cars, it is hard to imagine all possibilities. Anonymous1 believes that there will be a dramatic change in how people drive in only 10 years, due to a more customized infrastructure. New technology will also have an impact on behavior and how people move in general.

Trivector

Anna Clark works for the consultant firm Trivector and work with data and traffic related issues. I got in contact with Clark after researching different apps concerning data collection, GPS surveillance and services provided from the private sector to municipalities. Trivector has just recently developed a new app called Travelview which will probably become a complement to their travel survey service in the future. The app works very much like any workout app that stores information of geographical movements and travel time. When installed on the phone, the user must give permission for the app to collect data. The purpose of the new app is to raise the response rate of travel surveys, and to get better data while inserting GPS data as a component. Trivector works a lot with unprotected road users, Clark feels that information regarding pedestrian and cyclists is poor. They are much better informed of how people travel with cars and public transport because these actors travel in a fixed system.

A problem with using traditional travel surveys is that it is not possible to ask on paper how a person has traveled for the last week. It's amazing how to forget which trips you take Clark says, but the small details are also part of the trip. This is also the biggest difference between previous surveys and the app. The app will tell you "this is where you've traveled", and if something is wrong there is a possibility to change the mode. One thing that has struck Clark when they tested the app is that participants had a lot of short walking trips, compared to what you usually get in traditional travel surveys. According to Clark the interest for this kind of app is big right now, one reason being the fact that the response rate for travel surveys has decreased.

The aim of the app is not so much to log the flow of travels on the streets, but instead how people choose to travel. Clark has for example been in contact with Van Verken in Copenhagen and is aware of their ambitions to have real time data of the cyclist flow on their streets. The case with Trivector's app is that they care more about who the cyclists are in order to analyze the data at a population level. *"There is no solution today that gives the whole picture, so different solutions have to be combined"* (Clark).

Clark thinks that the data Trivectors new app provides can cause policy changes, motivate new goals and governance. Better travel surveys and better data can *"help actors to get a better understanding of how people travel today, in order to influence how they travel in the future"* (Clark). GPS is also a lot cheaper than traditional methods which allows you to do it more often, and for a longer period of time.

Clark is very much aware of the new general data protection regulation that will come into effect next year. However, since Trivectors app has be approved when downloading, the fact that they use GPS this should not be a problem. However, they have legal help looking at the issue of being able to prove that

the person is aware of what they agreed to. Using the output, they are not allowed to look at individual GPS tracks, because it is highly personalized information meant to be used for analysis at an aggregated level.

5.2 Discussion

By using themes from the empirical material as the framework for both the background and theory chapter, this section aims to merge these two chapters with the empirical findings. By addressing the aims stated in the beginning of this thesis, this section will present the reasoning behind the answers to the research questions in the conclusion that follows.

The three aims were to

- discuss the perspective on data as a form of communication and the level of participation in data collection methods and GIS.
- provide some insight in how data collection is used in planning today, and discuss the possibilities and difficulties with the emergence of new tools of data collection.
- bridge the gap between theory and practice by introducing a more theoretical discussion, using human geography as the theoretical input.

5.2.1 The planning perspective

The planner, a job description that has undeniably changed over the years, though only the last century is examined in this thesis. The role and the responsibilities of the planner has meant both being a facilitator of the citizens wants and needs, as well as the expert planner who solely makes the decisions of what needs to be done.

This thesis started with the idea of participatory GIS being on one side of a spectrum in data collection, and GPS surveillance being on the other. I think it is safe to say that communicative planning theory and rational planning have the same relationship. Communicative planning uses a qualitative method, where the group or the individual's opinions are interpreted by the planner and generalized. Rational planning uses more economical terms, looking at evidence in order to make the most profitable decisions, a more quantitative approach. But what struck me when researching both rational and communicative planning methods is not where they differ, but what they have in common.

It seems as both planning methods started out as methods with the same goal, to include the public. The top-down tradition of rational planning didn't start off as the positivistic model it is known for today. Geddes wanted to create an evidence based planning method, where rational decisions of the population would lead to better decisions for all. A method that was meant to foster awareness and participation, and in the long run become self-governing. Communicative planning also started off as something different than the method and theory it is today. It is clear that Arnstein's critique against realized participation methods in the 60's has connections to Habermas's original idea of communicative action. Arnstein, nor Habermas, wanted dialog and participation to be "a necessary evil" but rather the goal of planning, similar to Geddes. Through proper participation, I suppose, the result could lead to some sort of self-governing as well.

Looking at the past and the present, keeping in mind that scholars are seeing that the many core functions in the urban space will be connected to integrated communication technologies, allowing us

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to collect real time data in larger amounts than today, what can we assume of the future? What is the new planning paradigm ahead?

Sager is convinced that the typical Nordic planner is close to communicative planning theory, but his work also suggests that the planner's role is under pressure currently from conflicting values promoted by politicians and administrators promoting new public management. The magnitude of different services available already suggests that the private-public partnership will continue and be part of the future. This is also implied when interviewing actors from the private sector. Both Trivector, and the Anonymous¹ mentioned the public sector as their main target group for the services they are developing. The responsibilities of the planner might therefore very well change as Khalia-Tani predicts in her doctoral thesis. She thinks that the role of the urban planner in the "smart city" will become more of a facilitator who understands the ongoing development patterns, while overseeing the possibilities of enabling the implementation of new innovations locally. Khalia-Tani's description of the planner is very similar to how Muller and Doloreux describe knowledge intensive business services; services that combines universal knowledge of technologies and applications together with local knowledge of specific issues of their clients. The difference is I guess who owns the project and the product. Khalia-Tani expects the municipalities to use tools for their own purposes, while Muller and Doloreux takes the position that knowledge intensive businesses will provide the service and a final product. The difference in these two scenarios is who has the power? In these examples the public are simplified as being ruled with no participation, which means that they have no power. Using the framework of PPGIS, developed by McCall, answers the question of with who's intentions the project is conducted.

In Khalia-Tani's example, the output is controlled by the public actor and planner because they handle the data, controls the process and the output. However, the answer to who has the accessibility to GIS tools and techniques is the private sector since they own the tools available, and therefore also the technical expertise. Looking at the interview results Gothenburg's project measuring speed of bicyclists, the app was developed by a private actor, but used and owned by the municipality, which in a way secures the process where the municipality has both the technical skills and owns the process of the project, as well as the output.

The case of Trivector describes a similar cooperation as describes by Muller and Doloreux, where the tool is developed and owned by the private actor, and then used by the public actor. McCall points out that owning the sources of data and information, the processes of making the product, as well as the final products itself is equal to total ownership. In the case of Trivector, the customer only really owns the rights to the final product. The case of Trafikverket is similar since they are looking for an external actor to outsource data collection of bicyclists.

The later scenario gives the private sector more power in the planning process, thus Sager's concern regarding new public management becomes relevant. New public management will accordingly profoundly change the role of the planner from facilitating public interests to becoming a provider of legal help in decisions. Making the private sector the provider of planned solutions, in consent with the market, leaving less room for politics. Khalia-Tani seem more convinced that the planners function will be more of a technical expert than planner.

It is possible that the future of planning has left the slower process of communicative planning and is, with the help of new public management, on the path of reaching a state of “on demand planning”. It seems that new public management has much in common with rational market planning, considering that the public are treated as costumers. This way public and private interests merge towards customer satisfaction and being profitable. According to Varedian who was interviewed on behalf of Trafikverket, it makes sense economically to see how the space is used before making their investments.

The project managed by AF Bostäder is an example of how data collection can play a big role in the transition toward the new public management methodology described in the work of Sager. Kitzing describes the citizens needs as essential to the municipality as the municipality's attractiveness is important. She implies that the project result partly aimed to capture the customer's priorities, which is no surprise since AF Bostäder is a private company to begin with. However, similar projects could help any actor to make more evidence based decisions. Whether it is to become more economically efficient, or to be able to provide the population with the best solutions is up for discussion, however asking the right questions might provide a clue of with who's intentions.

5.2.2 Dialog and participation

The interviews show that GPS surveillance where large companies are using data on such a large scale that no one is aware that it is even collected is a reality. The amount of data could be very helpful when it comes to flow analysis and infrastructure planning. As Boije av Gennäs, in charge of the bicycle app in Gothenburg, mentioned in her interview; the ability to measure everyone's movements every day would make an incredible foundation for decisions due to the highly detailed data available. But this would not be possible in Sweden, as Van Verken also stated; integrity must never be compromised by the municipality.

Integrity is one of the things that comes up early when talking about large scale data collection and all the respondents mentions it at one point. As mentioned by Anonymous1 it is not allowed in Europe for large telephone companies to use GPS surveillance and sell the information to other actors. Though it is clear that the data is still there, and could “theoretically” be used on an aggregated scale, nationally or locally, for analysis. In fact, some of the interviewees even mention legislation as a problem for realizing the potential of new technology in planning. All interviewees from the public sector did however mention their responsibilities of representing the public in the matter of protecting their rights.

On the opposite side of GPS surveillance are the smaller projects that focuses on data collection on a more local and municipal scale. Public participatory GIS (PPIS) is not mentioned as a method in any of the interviews for this thesis. In fact, participation as a way of engaging the public has not been mentioned at all in any of the project. However, the project by AF Bostäder does use PPGIS methodology by letting the participants voluntarily contribute with places they themselves thought of as important places to visit in their everyday lives, instead of trying to affect the results by giving them options of categories or places on a map. On the scale of participation within PPGIS this project equals “Involvement of decision-making”, stage three out of four, however it might be difficult to claim that AF Bostäder saw participation as a right rather than a way to reach the goal of the project. Also, there are no promise of the result leading to real change.

Both interviews with the respondents from Copenhagen and Malmö mentioned some interesting experiments where they put a GPS sender in participant's backpacks, who collected route and speed data of bicycle paths in their cities. Such projects could be considered as Consultation (2/4) where outsiders refer selected issues to local stakeholders for improvement or help to prioritize issues. External agents have previously defined the problems before consultation and also conduct the analysis. Resebo (Malmö municipality) also describes a new project that uses camera recognition to analyze traffic flow. The result would help the municipality to decrease traffic flow by influencing the car commuters. This project however foster no participation and is more of an updated version of the rigid system used by all municipalities that were interviewed, including Trafikverket. Van Vlerken from Copenhagen talks a lot about using several systems to get a picture of the whole traffic system. Vlerken says that more data and more knowledge on what is happening on the streets in real time will make a tremendous difference, *"The more we know, the better we can long-term plan and short term manage"* Van Vlerken expressed in the interview. One of the tools that Copenhagen is looking at as an option is the tool developed by Trivector. This tool is an app that you download and use to share data. The app is mainly designed for travel surveys, but it also logs where the person has moved and with what type of vehicle by measuring speed.

This app might foster some participation since the participants are active in downloading the app, and will probably become aware of the cause in order to use it. However, it would merely be consultation according to McCall's theory, step two out of four. If a project were to reach true participation according to Arnstein's theory, participants need to be given power in the planning process, acting along with the planners and politicians. This would make stage six, Partnership on Arnstein's ladder.

It is clear that data collection today isn't usually used as a way to foster participation. Looking at Arnstein and McCall's theories though shows that using PPGIS could clearly make data collection in to participation according to Arnstein's standards, if that is the purpose. With technology evolving, I think that the most important thing is for scholars of GIS with knowledge of PPGIS to try to influence the methods that are emerging in data collection in order to at least use methods where the participants are aware of the data that is being collected, and why. That way, participants have the option to get involved if they care about the matter. Otherwise, giving consent to sharing data, as in the example of the British subway mentioned in the background chapter, could perhaps be equal as saying that the cause matter enough to contribute to the result.

But is data collection ever dialog? My experience from writing this thesis says no. When we are looking at GI of a participant's movement in the urban space, we can draw simple conclusions, knowing what the space looks like, in order to understand why the participant has chosen route A instead of route B when for example walking to the store. But, if we want to know more, for example what the participants ultimate route to the store would look like, or if person feels walking route A, we have to ask.

It is clear from research discussed in this thesis, that dialog in the Swedish and Finnish context is lacking true participation. Either because dialog isn't used at all, the results are neglected, or when used it is tokenism and not real participation as dialog is intended to be. Using the PPGIS methodology it is possible to complement dialog by letting the participants control the output, as seen in the example measuring walkability, or the project of AF Bostäder. What might be an issue though is that such project use more resources from both the participant and the planner than pure data collection would.

5.2.3 GIS and PPGIS

The tradition of using quantitative methods in order to claim scientific validity within spatial science and human geography goes back to the quantitative revolution in the 50's and 60's. As the geographical institution was developing law- like statements of the geographical world to become more scientific, geographical information systems (GIS) was part of that effort. Having the advantage of being able to include a lot of information, almost as detailed as qualitative research, and visualizing it spatially on a quantitative scale, GIS is now used in several sectors. PPGIS emerged out of the critique of GIS, where the information is gathered by either merely consent to the project, or by letting the participants share whatever information they feel are important, or by being in charge of the project themselves.

Looking at the evidence gathered from the interviews; what is the added value of gathering highly detailed information of the population, and how are new tools that are emerging used in physical planning? The most obvious example is perhaps Trivectors app Travelview which has a lot of advantaged compared to traditional travel surveys. Clark mentions a few different areas where their new app can contribute with information they didn't have before. For example, the app stores data for a much longer period than a travel survey that traditionally asks for a person's most resent travels. A problem with travel surveys are that people tend to forget how they traveled, but using the app it will tell you all the small details of your trip. So, the information is more detailed, and the experience is that Trivector is also able to reach out to categories of people that they don't have as much information about, such as pedestrians and bicyclists.

Both literature and the interviews with Malmö and Gothenburg mentioned difficulties in having all groups represented in the data. Resebo (Malmö) is for example worried that using new technology will divide the data in to different user groups, depending on what company you get the data from. If you use data collected by google, you get Google users only etc. Boije af Gennäs is worried about not being able to reach the younger population, which is also a known problem according to literature. Boije ag Gennäs hopes that new methods of gathering data will increase the accessibility in the city, improve road safety and create better traveling conditions. In long term, information gathered can contribute to better follow up and a more efficient way of identifying problems. This is also the aim in Copenhagen, to short term manage and long term plan.

Clark thinks that the data Trivectors new app can cause policy changes, motivate new goals and governance. Better travel surveys and better data can "help actors to get a better understanding of how people travel today, in order to influence how they travel in the future" (Clark). GPS is also a lot cheaper than traditional methods which allows you to do it more often, and for longer periods of time. Eriksson who has a long experience with collecting and analyzing data in Malmö mentions data as a asset when receiving complaints from the public. Eriksson can use data to see if the complaints are valid or if they are based on a person's feelings of the situation. If there is no real problem, no action is needed. Resebo and Eriksson mentions areas where they hope to get more insight with better data in the future, both connected to how the urban space is used by citizens, such as squares and parks. Several interviewees also mentioned evaluation as an important outcome of having access data.

What strikes me as a bit contradictory message is that PPGIS started as a revolt against the positivistic tradition and how statistics quantify people and individuals to anonymous amounts of numbers, raising similar concerns that was raised against rational planning theory. However, even if PPGIS uses a more humanistic approach to how and what data that is being collected, the methodology uses a similar language as GIS, where people's feelings and alternative world views are to be organized in a way so that it can be presented in a quantifiable way. Kitzing from AF Bostäder said that there is a fondness for numbers in our society, and having soft values as statistics is easier to receive for the society. With that being said, I suppose PPGIS can contribute by putting the human back in center of statistics, by gathering soft values in a positivist manner, thus being a new version of old methods. Hopefully without repeating old mistakes.

5.2.4 Private-public partnership

The pressure for political leaders, to find economically and environmentally efficient solutions to urban problems in postindustrial economies will grow even further with the threat of climate change. And according to the literature controlling communications, such as internet and infrastructure, will become an increasingly important source of political and economic power in the future urban space. Therefore, the topic of how the private sector will affect the planning in the future is an important part of the discussion.

It seems as if knowledge about the public used to be a competence that was either facilitated or taught by the public sector. But in the process of creating knowledge intensive industries, knowledge about the public has become a product with a value of its own that can be harvested, bought and sold by the private sector. Any company known as being knowledge intensive, such as Trivector, capitalize on gathering information and packaging it in to different solutions. Though Trivector is a responsible company in this context, as they are very protective of the participant's information, and require consent from the user in order to get access to the information.

Even if GPS surveillance is illegal in Sweden, the interview with Anonymous1 implies that information is gathered by large telecom operators here as well, but not used for any commercial purposes. Yet. Which also means that there is a lot of untapped potential for public actors. Van Vlerken seem to think that because the public sector has "real power" in a way the private actors don't, it would be unethical to collect extensive information. However, passive data collection creates a hierarchy where the private company has access to more important information than the public sector, the municipality then becomes the middleman, and the population both the sharer of information and the receiver. As long as the private sector and the municipality's intentions are in line, such a scenario won't be of anyone's concern. However, as cities and politicians are becoming more aware of the possibilities with data collection the demand of detailed data will increase.

If current trends persist it will mean that the private sector's hold on the planning process will increase, due to having the technical skills, owning the data source and output, as well as the tools used to gather and analyze information. As tools are expected to become more integrated in urban core functions in the future, planners will become more dependent on the private sector. Such scenario could result in small short-term decisions being made by the private sector, which could have long term consequences. And as we as a population are becoming more connected, the choice to stop sharing information will become less of a choice as many tools require access to the device you are using.

As researchers in democracy and public dialog states that any sign of tokenism is a democratic failure regardless of the symbolic values they might have in the process perhaps we are looking at the development of new public management in the wrong way. Looking at the problems identified in the planning process where local actions are often decided on without any public consent, or through consultation which comes much too late in the process, perhaps public-private partnership and the commodification of knowledge isn't the end of the democratic process, perhaps we should think of it as a way of restoring it? Could outsourcing of the planning process to the private sector make the process more democratic?

By still being in the era of "user dominance" of geographical information systems, facilitated by competitions between companies, an increased participation and agreement by the population could override the political decision-making process. By doing so the planning process could become a "direct democracy", which in the recommendations by SKL is to be avoided when using dialog. In the light of technology really is partnering with users, in order to ultimately change the power balance between experts and users in the urban space, the process recommended by SKL is actually obscuring the real power within the method.

By giving market have more power in the planning process could help us get closer to Geddes utopia where cities are self-governed according to social rationality where the collective interest is the ruling interest. Or market rationality which in new public management basically caters the individual's interests as well as the market's.

Or, if gone wrong, we end up in a new version of poorly justified decisions, with no grounds in people's participation or wishes. In quantitative qualitative methods, as I like to think of data with detailed information, I picture what Castell described as simultaneously seeing *"the potential of solving and obscuring problems through collaborative planning approaches, but also that the very idea of people engaging in shaping their own environments is ultimately attractive from a humanistic point of view."*, and he is right. As many planners before us, it is easy to get overwhelmed by new methods with the promise of a comprehensive solution.

6. Conclusions

This section of the analysis chapter answers the research questions stated together with the aim in the beginning of this thesis. The answers can be deduced from the discussion above.

6.1 Answers to research questions

- What is the added value of data collection methods emerging in today's physical planning?

There are several areas where detailed data collection with geographical components could add much needed information to the process of physical planning. The interviews only share a few solutions, however some themes can be distinguished.

The most common theme, mentioned by both private and public actors is short term managing, and long term planning of the transport sector. According to the interview with Anonymous1 this is because there are large winnings both socially and economically in this sector. It is also a sector that both needs to be revised in order to function more efficiently, and differently to reduce climate change, as well as manage traffic flow and contestation better.

In long term planning, more detailed data can make for better analysis of future demand of the population, and to gather evidence that can to make better decisions for the future. Decisions based on extensive data flow could be related to property development, increase accessibility, unload overcrowded roads or metro lines, or to get a better understanding of how urban spaces are used. There is also an idea that knowing more about the populations habits will increase the planner's ability to influence them in to make better choices.

Other shared themes among the interviews are how data can be used as means for communication, both by the planner towards the political level, and from the public to the planner. Data is also expected to ensure a more efficient evaluation process, and to save time and money.

From the perspective of the municipality, there is a problem with representation when collecting data through new technique since it is difficult to ensure that all groups are represented in the data and it makes it more difficult to control the representation. Though, as research describes a decline in both participation, dialog processes, survey rates and the ability to reach the younger population; instead of being concerned with getting complete representation, data could be seen as a great way to complement all of these categories. Finding target groups is a trade that the private sector has managed more successfully in the past. Perhaps municipalities could benefit by adopting some of these methods.

- What are the complications using data collection as evidence for decision-making in planning?

There are several complications with data collection in the urban space discussed in this thesis. The most obvious is the question of integrity, which is connected to who collects the data and with what intentions.

In a Swedish context, it might not be the data collection itself that is the problem from the municipality and individual perspective. Rather, it is the relationship with the private sector and what the private sector gets access to, more than economic value, by joining in the public-private partnership that is problematic. The fact that the private sector is becoming an actor with power in the planning process is mentioned as a potential threat to the democratic values imbedded in our political system and planning process. The private sector is predicted to have some advantages by having the technical skills, owning the data source and output, as well as the tools used to gather and analyze information. These tools are expected to become more integrated in core urban functions in the future, making planners more dependent on the private sector. Such scenario could mean small short-term decisions are made by the private sector, which could have long term consequences. Though there is also a small chance, as debated in the discussion, that the private sector will cater to the needs of the public more efficiently than the public sector has in the past. However, whether it is new public management planning paradigm or an expanded version of the private-public relationship, there is a potential scenario where planners will be more interested in catering their economic stable costumers. Such a scenario would result in more segregated cities where selected citizens have access to better services.

As research shows, the quantitative process of data collection is not suitable in all contexts, and practitioners must be careful not to repeat passed mistakes. The fact that any GI system reduces the person to a dot with one or more qualities has met critique of obscuring the “real” power in decision-making in both theory of GIS, PPIS and rational planning methods. Many of the people interviewed recommended that many different sources of data should be used in order to get the whole picture, but even so data can always be manipulated.

Something to keep in mind when using any GI system, as many scholar’s states, there is never enough data, or tool good enough, to ensure the perfect process.

- What could the perspective of PPGIS add to data collection?

Data collection does not necessarily foster engagement in certain questions, but it does provide evidence that could ease decisions made in the planning process. By giving the public power over consent, they can choose to participate in the project. This way, the data is given from them, not taken. As shown in the project by AF Bostäder, PPGIS makes it possible to gather evidence of scenarios that might be difficult to communicate with decision makers.

Data collection can, according to this thesis, never become proper dialog. Data collection could be referred to as a way of communication but only one way. If we had access to data of one person’s route, we can probably understand why that person choose path A instead of B in his or her way to school, looking at the facts and knowing the surroundings. But we will never know what path that person wish he or she *had* to school. In order to get that information, we need to provide the person with a way to communicate its wishes and thoughts. However, as far as capacity goes, for short term managing, and long term planning, knowing you path to school might be enough.

As a final observation, it is clear to me that projects using any level of the PPGIS methodology will have the same results as large scale data collection without any participation. The difference is that projects intended to result in fundamental changes on our behavior, in order to reduce the impact that urban

areas have on our planet, need participation of the public. By engaging the public the chances to persuade people to make better choices, and perhaps sacrifices, are much greater. That's why the determination to foster some level of participation, consent, and transparency is worth the effort when using quantitative qualitative methods in the future.

6.2 Further research

It was difficult to evaluate the experience and added value of new data collection methods as all actors interviewed in this thesis were either in the beginning of a new project, with the exception of AF Bostäder, or looking for new tools. As identifies by scholars referred to in this thesis, this area of expertise needs further research.

To make more accurate claims of the usefulness of data collection, as well as building on the discussion presented in this thesis, further research should concentrate on projects where data collection is intended to complement dialog to evaluate the process and result of data collection. Scholars should then compare the result and process with traditional dialog based projects. The aim should be to evaluate the efficiency, participatory level, outcome and ability of evaluation between the different projects.

As technical progress continues, more research on how the urban space is affected by integrated ICT systems, both from a private-public partnership and service perspective, is also recommended.

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Appendix 1: Interview selection

Name	Occupation	Project background/relevance	Date of interview
Anonymous1	Data analyst, consultant	In 2016 K2 held a presentation on the subject of Location based services (LBS) and traffic flow. One of the people involved in one of the presentations that worked for a big Swedish telephone operator at the time, was looking at the market of LBS and what services they were able to provide municipalities and other actors interested in visualizing data collected through GPS.	2017-02-10 14:15-15:10
Maria Varedian	Works with statistics at the Swedish Transport Administration and has worked with road traffic flow measurements for many years. Trafikverket	Trafikverket has realized that they must "measure" and analyze bicycle and moped traffic in the future to better manage their traffic system. The rigid system used currently only allows surveillance of cars passing certain points. Bicycles and moped measures have not been carried out previously at roads owned by the Swedish state, and Trafikverket is now looking to private actors to suggest different tools to solve the problem.	2017-02-16 15:00-16:15
Sara Boije af Gennäs	Project manager of bicycle services and rental bikes in Gothenburg, Göteborgs kommun	Gothenburg is looking in to new areas of data collection regarding infrastructure and has developed an app together with a consultant. The app is designed to measure the speed of bicyclist, where you make stops and how long you have to wait for traffic lights. The app has only just been tested. During a trial a group of cyclists were able to gather enough data to be analyzed in a way that several bottlenecks could be identified within a certain distance.	2017-03-03 09:00-09:40
Anna Clark	Traffic consultant with a doctoral dissertation in modeling and optimization of transport networks.	Trivector has a long experience in conducting travel surveys for municipalities and regions, and has just recently developed a new app called Travelview which will work as a complement their travel survey service in the future. The app collects data of the person's movements through GPS.	2017-02-28 13:00-14:00
Jos Van Verken	Project manager at KPH traffic department, dealing with ITS (intelligent transport systems) and data collection related to traffic.	There is no viable data source that can provide insight of the travel time and daily route choices of cyclists in Copenhagen at the moment. Therefore, House of Innovation in Copenhagen held a KIC initiative workshop in the end of January 2017 to discuss new methods for data collection, with special interest in bicycling. Verken is one of the people behind the Climate KIC (knowledge and	2017-03-22 10:00-11:00

Agnes Ericsson

		innovation communities, a platform within the EU) initiative.	
Biljana Eriksson	Traffic engineer and responsible for all traffic data in Malmö city Malmö stad.	Responsible for all data collection regarding traffic in Malmö. Her department also has access to data regarding traffic flow, noise and air. She has a lot of experience of working with data and is looking for new methods to expand her knowledge.	2017-03-15 09:30-11:30
Jasmine Jenzing	Former housing ombudsman at AF Bostäder.	Initiated a project where students were asked to submit points in a GIS map showing their surroundings. The points were supposed to symbolize places that they considered important in their daily lives. The project used GIS for visualization and analysis.	2017-04-20 09:30-10:15
Christian Resebo	Manager for the analysis and development unit at the traffic department, Malmö stad.	The traffic department is looking in to new ways of data collection to complement their existing methods with new variables, such as automatic number plate measurement recognition and laser.	2017-04-07 10:00-11:00

Appendix 2: Interview questions

-Berätta om hur arbetar med datainsamling. Vad samlas in? Hur?

-Syfte

-Vad tillför (nya typen av data) datan i planeringsprocessen?

-Vilka problem har man stött på?

-Vad klassas den insamlade datan som?

-Graden av deltagande?

-Hur passar datainsamlingen in i planeringsprocessen?

-Hur ser ert dialogarbete ut när det kommer till infrastruktur?

-Vilken data saknas?

-Tankar om GPS data

-Framtidsspaning