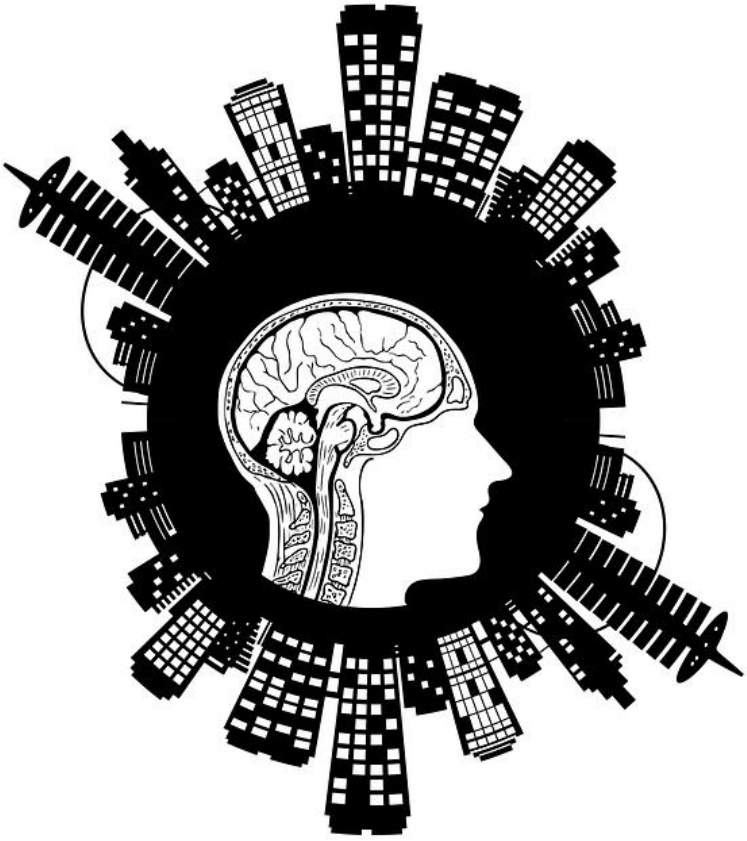
The relevance of the smart city for the low-income part of the population in Yogyakarta, Indonesia



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Preface

Before you lies the bachelor thesis that is written in the context of the Geography, Planning and Environment bachelor at the Radboud University in Nijmegen. The research was planned to do in Yogyakarta, Indonesia, but due to the Covid-19 pandemic this did not happen. Therefore, this research was conducted from home as an online research. The process of the research started in February, 2020, and was finished in June, 2020.

Together with my supervisor in the Netherlands, Prof. Lothar Smith (Radboud University), we created my main question. In the process of answering my main question, the complexity of the topic became clear. In this process my supervisor in Indonesia, Prof. Djaka Marwasta (UGM-Yogyakarta) supported me a lot in trying to understand the local situation of Yogyakarta. In addition to this, Prof. Lothar Smith supported me with new insights and feedback on my results.

Hereby, I would like give special thanks to my two supervisors for their guidance and support during this research. Secondly, I would also like to thank Mr. Farid Suprianto and the UGM-Yogyakarta for helping me in arranging the online survey. Thirdly, I would also like to thank all my experts who I interviewed for their time and help. Lastly, I would also like to thank Martijn Vriezen and Jelle van Bethraij for helping me writing this thesis.

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Summary

The smart city is a way of improving city services with the help of ICT. With this help the smart city wants to overcome problems in society, such as, poverty or social exclusion. However, when the smart city is implemented in the wrong way this can also increase the gap between rich and poor. The smart city is a popular concept in Indonesia. The Indonesian government has already implemented several smart cities across Indonesia (Fridayani & Numandi , 2018). However, the relevance of the smart city concept can be questioned (Kummita & Crutzen, 2017). Especially for the low-income part of the population, who have less capacity and opportunities to access this smart city community. The goal of this research was therefore to gain insight in and knowledge on how a smart city tool can be relevant in supporting their livelihoods and social security approaches, in the face of external shocks for the lower income parts of population of Yogyakarta. The choice for Yogyakarta was made here because they already made plans to implement the smart city back in 2014 (Gunawan, 2018). In addition to this, there was also a focus on the current Covid-19 pandemic. This was to look at how relevant the smart city is for the low-income in times of an ongoing shock. The main question of this research was therefore the following: ***Are the applications/tools of the concept of smart cities relevant for the low-income part of the population in Yogyakarta, as a city in the global south, especially in times of Covid-19?***

This research is a combination between a qualitative and quantitative research and uses a deductive method. This research is a case study of the smart city related to Yogyakarta, Indonesia. To gather the data three methods were used. First, a literature study on the smart city concept was conducted to create a basis of data. Second, semi-structured interviews were used to gain more in-depth information from different experts about the topic. Thirdly, a survey was done to create more in-depth information of participants that joined a low-income program that is part of the smart city program of Yogyakarta.

In the beginning of this research the relevancy of the smart city for the low-income part of the population was explained. In this part the theory of Bourdieu and the DFID framework were used to explain the importance of capital. Society exist namely of different fields, where people own different amounts of capital. The higher the field the higher amount of capital someone possesses. To level this playing field between the rich and the poor, Bourdieu and the DFID framework stated that the low-income needed to be equipped with more capital. In doing so the access to the different kinds of capital need to be improved for the low-income part of the population, in order for them to improve their quality of life. With this knowledge the smart city should therefore provide the low-income part of the population with more access, otherwise their different kinds of capital cannot increase and the they keep on being poor. If this does not happen the smart city would not be relevant for the low-income. From this point of capital building for the low-income part of the population, two tools of the smart city in Yogyakarta were found and discussed. The first tool are online platforms. Online platforms offer the low-income a chance of building social capital and local empowerment. This is because online platforms are connecting citizens to each other, which could lead to a more inclusive society. On the platforms everyone can post something and this offers the low-income also a chance to be heard. Therefore, policies could be better adjusted to their local context, which could lead to an improve in quality of life for the low-income. To make the platforms more accessible for the low-income part of the population the government needs to provide this access. This is because the low-income part of the population do not have the capital to access this platforms by themselves.

Another important result is the way the platforms were implemented. One platform used a top-down approach, which lead to 2.662 local users. The other platform used a bottom-up approach which leads to 1.026.674 users. This shows that the latter approach is a more effective approach. The second tool that was investigated was the E-warong. This smart city application is only meant for the low-income part of the population. The goal of the government by using the E-warong is to support the low-income part of the population in setting up their own business with the help of ICT. In doing so, they are supported with education, money and or food. The respondents of the survey about the E-warong were positive about the impact of the program on their lives. This was mostly due the fact that the program generates an (extra) income. Because of this the respondents felt more financially independent and had a better chance of making a living in the city.

Another focus of this research was how the smart city can help the low-income part of the population during this Covid-19 pandemic. Firstly, the online platforms were discussed. During this Covid-19 pandemic online platforms could offer the low-income a form of help. This is because with online platforms low-income people will be more connected to each other. Therefore, the online platforms offers a way of spreading information on how to act during this crisis. However, an important prerequisite here again is that the government needs to provide the low-income with these access. Secondly, The E-warong was discussed again. This was because the E-warong offers their participants extra help in this pandemic in the form of basic needs. The respondents were therefore also very positive about the help the E-warong gives them during this pandemic. The E-warong offers also the other low-income a way of shopping closer and cheaper to home. Therefore, the chance of getting infected or spreading the virus is declined. In the end of the result chapter the critical side of smart cities is Indonesia was discussed. In this part it became clear that even though the ideas are meant well there is often a lack of institutional capital. This results in that some implementations are not implemented well and therefore not function properly. The low-income programs are therefore sometimes greenwashing the smart city concept. In addition to this, the low-income part of the population are not having the smart city high on their agenda because they first want to maintain a normal lifestyle. Therefore, the participation of the low-income in the smart city will be not that high and a new technical divide between the rich and the poor will arise.

To conclude this research an answer was given to the following main question: ***Are the applications/tools of the concept of smart cities relevant for the low-income part of the population in Yogyakarta, as a city in the global south, especially in times of Covid-19?*** The tools discussed in this research could not be seen relevant yet for all the low-income population in Yogyakarta. This was because the access to capital for the low-income part of the population is not functioning well at the moment. If this is access is being improved then the online platforms could be relevant for the low-income part of the population to increase their capital and create more local empowerment. In the case of the E-warong the tool can be seen as relevant for their members. On the other hand, The E-warong has only 250 members. When you compare this with the total amount of low-income people in Yogyakarta, 29.450 (BPS,2019), the E-warong cannot be seen relevant for the entire low-income part of the population. In order for the E-warong to get more relevant the total amount of participants need to increase. From this research the potential of the two tools can be seen as something relevant for the low-income part of the population in future. Only due the reasons mentioned above this cannot be seen as relevant for now for the entire low-income part of the population.

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1. Introduction

This part will firstly explain the smart city concept. Secondly, the problem definition and the research goal will be given. Thirdly, the main and sub questions will be given and elaborated. Lastly, the social and scientific relevance will be discussed.

1.1 Introduction: The smart city concept

In a forecast study of the United Nations it is estimated that the urban population will increase by 63% between 2015 and 2050. In 2030 more than 60% of the world population will live in cities. The biggest growth of this urbanization will be in Africa, Asia and Latin America (Eremia *et al*., 2017). While this provides all kinds of opportunities for economic and societal progress, it also brings all kinds of challenges, such as social exclusion and pollution (UN, 2020). One potentially valuable tool to help overcome these compounding and complex problems is 'smart city'. With this tool cities hope to reduce poverty, inequality and unemployment and also create an efficient management of energy resources (Eremia *et al*., 2017).

Local governments of cities strongly rely on ICT infrastructure to help with the implementation of this application for the provision of new social services (Albino & Dangelico, 2015). Multinational companies like IBM are providing the database for a lot of cities. IBM (n.d.) describes this as followes; *''Cities should use new technologies to transform their core systems to optimize the use of limited resources.''.* With the help of these multinational companies, cities want to create a more inclusive environment for their citizens. However, all those multinational companies have a commercial interest and therefore their intentions can be questioned (Wigg, 2015). This technocratic approach with a strong focus on ICT may lead to much financial resource using, limiting the scope for citizen participation in the budget. Besides the ICT, the role of the participation of citizens is also important for the smart city. On the individual and collective level they must play an active role, otherwise the smart city concept will not perform well (Zubizarreta *et al*., 2016). The smart city there to create synergy between citizens and technology (Fridayani & Numandi , 2018), in which the technology is a tool for the people in becoming 'smart'. However, when people do not participate or do not have interest in becoming 'smart', the smart city will not function properly. For cities in the global south this synergy is important because they have to deal with problems such as poverty and nature disasters. Therefore, it can be questioned if it is wise to pay big companies a lot of money in helping creating a smart city. Especially for the citizens with relatively low income, it is interesting what the smart city can offer them and when they are willing to participate.

This research will focus how policy implementations of the smart city concept can help the low-income part of population. Thereby specific focus will be given to the current Covid-19 pandemic, and how this affects the situation in Yogyakarta in Indonesia. The choice for Yogyakarta relates to 2 principal reasons: First, Yogyakarta is the center of activity and administration in the region. Since 2010 the population of Yogyakarta went from 389.000 to 440.000 (Marcrotrends, nd). The population density is therefore quite high (Marwasta & Suprianto, 2019). In addition, the city is rather vulnerable to natural disasters due to the geographical location (Effendi, 2010). On top of that, some areas of Yogyakarta are more vulnerable than other areas for natural disasters. In these areas mostly low-income citizens live (Rachmawati & Budiarti, 2017). Second, Yogyakarta already made plans to implement the smart city in 2014 (Gunawan, 2018). However the research of Sanjaya *et al*., (2017) concludes that there is little research done about the effects of the smart city in Yogyakarta. One of the goals of Yogyakarta's smart city is to guaranty safety for their citizens and to create an

inclusive community (Purnomo *et al*., 2019). In combination with the first reason, a closer look will be given at how smart city implementations can help low-income areas in Yogyakarta, especially with the current Covid-19 crisis. To encounter this pandemic, adequate education and information on what to do and how to act will be essential. Especially in areas where people have a low education and health levels and where they live closely together. The smart city could be useful in spreading this information and education if the system is working well. Without these measurements the virus will spread quickly and the damage will be enormous (Riley, 2020).

1.2 Problem definition of research problem

The smart city is a popular concept in Indonesia. The Indonesian government has therefore already implemented several smart cities across Indonesia (Fridayani & Numandi , 2018). However, the relevancy of the smart city concept can be questioned (Kummita & Crutzen, 2017). Especially for the low-income part of the population, who have less capacity and opportunities to access this smart city community. It is therefore interesting to see if the smart city, especially in the global south, can offer a more inclusive and more prosper society for the low-income part of population. In the path of governments in creating this new smart city society, new implementations should help the low-income part of the population in becoming smart. In addition to this, it is interesting if these new implementations can offer some help during the current Covid-19 crisis.

1.3 Research goal

The goal of this research was to gain insight and knowledge on how a smart city tool can be relevant in supporting their livelihoods and social security approaches in the face of external shocks for the lower-income parts of the population of Yogyakarta. Therein the focus was on the part of the city's population that lives below the poverty line, set by the Badan Pusat Statistik (BPS-Statistics Indonesia) (2019), at 49.6652 (35.25$) rupiah per month. As regards an external the ongoing Covid-19 pandemic provides a salient case.

1.4 Main questions and sub questions

For this research the following main question is formulated: ***Are the applications/tools of the concept of smart cities relevant for the low-income part of the population in Yogyakarta, as a city in the global south, especially in times of Covid-19?***

This led to the following sub questions:

- *How can the smart city be relevant for the low-income part of the population?*

This sub question will provide the research with knowledge on the situation of the low-income in society. This results in an conceptual model which explains how the smart city can be relevant for the low-income and improve their quality of life. This model would then also be the basis for this research.

- *How is the smart city implemented in Yogyakarta, especially focusing on the low-income part of the population?*

With this sub question, general information about the smart city concept in Yogyakarta will be given. From this general information it will become clear what the goals of the smart city in Yogyakarta are. From the literature and data gathered from this and the previous sub question the tools that were investigated were chosen. The choice was made to look at online platforms and the E-warong, because these both offers the low-income part of the population a change on building capacity. These tools have the potential to increase different types of capital related to the low-income part of the population, which will be elaborated in the theoretical chapter.

- *What is the effect of the smart city applications/tools related to the capital of the low-income part of the population?*

This sub question follows up the sub question above and will elaborate the smart city tools. With this question will be examined if the smart city applications lead to better capital access and if the capital will grow as a result of this. Consequently, the quality of life of the low-income part of the population could improve, which will be an important factor in answering the main question.

- *How can the smart city concept currently help the low-income part of the population with the Covid-19 crisis?*

In this sub question it will be explained how online platforms and the E-warong can assist during this pandemic. In addition to this, there will also be looked if this assist can be seen as relevant.

- *What are the criticisms the smart city have to deal with in the global south?*

This last question is added to give a critical look at the smart city concept of Indonesia. The purpose of this is to create a clear image of the smart city. This is important because this research was not conducted in Yogyakarta itself, due to the Covid-19 pandemic. Therefore, the information and data could not be compared or tempered with empirical research.

1.5 Societal Relevance

In 2019 there are still 29.4500 people in Yogyakarta living below the poverty line (BPS, 2019). In order to prevent the gap between the rich and the poor from getting bigger, it is important that the low-income part of the population is not overlooked in the smart city development. Otherwise there is a chance of a new technical divide. According to some goals of the Yogyakarta's smart city program, the smart city should offer an inclusive community and safe guaranty of humanity (Purnomo *et al*., 2019). These goals are made with good intentions, but can sometimes be hard to achieve in practice. To look therefore at the 'real' impact of the smart city, the focus was on implementations related to the capital building of low-income part of the population. If these implementations can really improve the quality of life for the low-income part of the population, the smart city can be seen as a good concept for empowering the poor. On the other hand, this research will also focus on the critical side of the smart city, where possible downsides of the smart city concept will be discussed. As a city in the global south, Yogyakarta will benefit for tackling these downsides. Otherwise, there will be a lot of money spend on a concept that will not end up functioning well. In the current Pandemic the low-income part of population is more affected by Covid-19 than other groups of the population. For example, one of the reasons is that they do not have the choice of staying at home. Otherwise, a lot of them will not be able to get any food or other basic needs (Riley, 2020). If the smart city can offer some support for the low-income part of the population in these times, the smart city could really be seen as relevant.

1.6 Scientific Relevance

Most research about smart cities nowadays is related to smart cities in developed countries. In consequence, a lot of outcomes and policies do not take the local conditions of developing countries into account (Effendi *et al*., 2016). In the research of Sanjaya *et al*., (2017) they also conclude that there is little research done on the effects of the smart city in some locations of Indonesia, one of these locations is Yogyakarta. This is because there are other locations who have shown more effort to their smart city program (Sanjaya *et al*., 2017). It is therefore important to create a bigger database on the possible effects of the smart city in Indonesian cities (Effendi *et al*., 2016). This is because every city is unique and therefore certain data cannot be used universally. In consequence, it is essential to do more scientific research in gathering more information for governments. Policymakers can make better choices as a result of this. The smart city program can therefore be better adjusted to the local conditions of Yogyakarta, so that possible negative outcomes are minimized. This is especially important in times of disasters where the local condition is very important (Effendi, 2010).

2. Theory chapter: Understanding the complexity of the smart city

The smart city can have different meanings and can have different outcomes for certain people or businesses. This complexity can cause some concepts to be sometimes misunderstood. To avoid this and to create a better understanding of how the smart city can support the low-income part of the population, the theory of Bourdieu and the DFID framework are used. First the situation of the poor in society will be explained, for a general understanding. Also will be described here, how their situation can be changed in order to improve their quality of life. With this understanding it will become more clear how the smart city can help to change their situation in order to improve their quality of life. After that, the mechanistic of the smart city itself will be elaborated. In the end, there will be a critical part to create a realistic image of the smart city.

2.1 Capital building

Before starting research on the smart city literature, this part is used to explain the situation of the low-income part of the population. This also describes how the role of the poor can change in order to increase their quality of life. In order to elaborate this, the theory of Bourdieu and the British Department for International Development (DFID) livelihoods approach were used. These were chosen because they both put the role of the poor central in their work. Besides, the DFID livelihoods approach is especially developed to decrease poverty in poorer countries (GLOPP, 2008).

Society exist of different fields where people own different amounts of capital. The higher the field the higher amount of capital someone possesses. Bourdieu defines this, that people are possessed with a particular habitus. The habitus determines the amount of capital people have in relation to a specific field, which is created by a particular amount of capital (Inglis & Thorpe, 2018). In the theory of Bourdieu, he describes three types of capital (Bourdieu, 1993):

1. Economic capital: The level of monetary resources a person has at their disposal.
2. Social capital: The amount of resources in terms of networks and relations with other people.
3. Cultural capital: The cultural resources that a person possesses. To make the cultural capital more clear, the work of Chudzikowski et Mayrhofer (2010) was used. Here they divide the cultural capital in two forms: 1. Embodied, this is cultural capital that is transferred from the habitus inside a family. 2. Institutionalized, this is cultural capital through academic titles and degrees (Chudzikowski et Mayrhofer., 2010).

Bourdieu describes in his theory that in society all types of games are played. In these games the winners keep winning and the losers keep losing. This is because the winners are often possessed with more capital or resources to win the game (Inglis & Thorpe, 2018). According to Bourdieu the poor will therefore stay poor in society. In order to change this social reproduction it is important to level the playing field and equip the low-income part of the population with more capital. An approach that tries to level this playing field is the DFID livelihoods approach. In this approach the sustainable livelihoods framework is used as a tool in order to understand poverty (GLOPP, 2008). In this framework there are 5 elements. The first element is the vulnerable context were people live in. This element is influenced by shocks, trends and seasonality. An example of a shock is the current Covid-19 crisis. People have no influence on those elements and therefore these elements shape the livelihoods and access to assets. The vulnerability is therefore described by GLOPP (2008) as followed: 'The degree of exposure to risk (hazard, shock) and uncertainty, and the capacity of households or individuals to prevent, mitigate or cope with risk.'
The second element is the assets people possess. These are divided into 5 different capitals: 1. Human 2. Social 3. Physical 4. Natural 5. Financial (GLOPP, 2008). The framework uses therefore 2

more capitals then Bourdieu. The similarity, however, is that they both acknowledge that these capital determine the strength of people in society.
The third element are policies, institutions and processes. The importance of this element is shown because of the fact that this determines the access to capitals and influences decision making processes. This element also decides the inclusion people feel in society (DFID, 2000).
The fourth element is livelihood strategies. These are the choices people make in order to achieve their livelihood goals. To do this, they are directly depending on the assets and the policies, institutions and processes. The last element is the livelihoods outcomes. These are the outcomes of the previous elements such as, increasing income or food security. With this framework DFID wants to increase the assets of the poor (GLOPP, 2008). As a result of this, the situation of the poor will be improved, as they have more ability to influence policies and to change policies.

In the previous part it is described how to better understand the situation of the low-income part of the population and how their situation can be improved. In the next part will be explained how the smart city can help improving the situation of the low-income part of the population. In the previous framework the smart city can be seen as a policy or process which has influence on the access of people to the different kinds of capital. This differentiation between forms of capital helps establish how people establish their lives, what perils they face, and how local government interventions can help offset these. Therein our interest goes notably to the potential role of the smart cities as a policy instrument. To that end the literature already derives 3 key potential benefits. Firstly, it can assist with helping poor people expand their financial capital. The smart city should therefore increase the welfare of the low-income part of the population trough several implementations or programs. Secondly, the smart city should connect different people and communities with each other, in order to create a bigger social capital for the low-income part of the population. In this way, social capital can create more awareness and local empowerment. Lastly, The smart city should offer the low-income part of the population more education or trainings to upgrade their skills. If this happens the low-income part of the population would gain more institutionalized capital but also more embodied capital. This is because the knowledge and skills can be passed on to their children or other members of their family. From this explanation the smart city has three ways to help the low-income part of the population. However, these capitals are not three pillars that can only be used separately. The smart city can combine these pillars with each other, in order to create a bigger total capital. For instance, by giving education to several people of low-income from different districts, which automatically increases the culture and social capital. Another example is by increasing culture capital the low-income part of the population will also gain more economic capital. This are just a few ways of how the smart city theoretically can help the low-income part of the population. In the next part the smart city concept will be further elaborated.

2.2 Smart city perspectives

This part will start with creating a better understanding of the concept of the smart city. When taking a closer look at the research of Albino & Dangelico (2015) about *Smart city definitions* and Al Nuaimi *et al.* (2015) research about *Application of big data to smart cities*, it becomes clear that there is not one definition for smart city. In their research, Albino & Dangelico (2015) compare a lot of different definitions and interpretations of the smart city. In the end, they suggest that the reason that there is not one definition is because there are two different domains. The first domain they describe is the 'hard' domain and the second is the 'soft domain'. The 'hard' domain is mainly about natural resource management, buildings, energy grids, etc.. In this domain the ICT companies, like IBM, play a big role for the function of systems. On the other hand, the 'soft' domain is about education, culture, social inclusion, etc.. In this domain ICT do not play a big role. The distinction between the different perspectives and views is important to understand how people or governments make sense

of the smart city. Especially in Indonesia, where the national government wants to implement a smart city program for several cities (Fridayani & Numandi , 2018).

In addition to the paragraph above, the research of Kuhmmitha & Crutzen (2017) created a framework for understanding the existence of the smart city. This framework was the result of an analysis of 161 articles about smart cities. From this, four schools of thoughts were created: 1. The restrictive 2. The reflective 3. Rationalistic and 4. The critical. When taking a closer look at the schools, one of the distinctions that can be made is between the possible losers and winners of a smart city. Three schools conclude that communities and citizens are possible losers. Whereas, the rationalistic school concludes that communities and citizens are possible winners. This is because the restrictive and the reflective school are based mostly on technology driven methods. For a city to become smart, the most important criteria is ICT-based integration. The smart city in this school is therefore focused on the technology and not so much on the human aspect. The possible winners in this school was in consequence the corporatist, because they benefit the most from this ICT-based integration. In the rationalistic school this works the other way around. In this school the focus is mostly on how the smart city can improve the human aspect. They are saying that through education, people will know how to use certain technologies, in order to enhance their capabilities. As a result of this, the people will promote and use technologies adjusted to their local needs. The difference between this school is therefore in their line of focus. The critical school is the last school of thoughts. In this school they argue that from the technology mechanism only the elite will benefit. This technology will therefore not cause an inclusive society, as was being concluded in the rationalistic school but will cause the opposite. Because of this, they call the smart city society an utopian vision, that will not be achieved.

2.3 The theoretical pillars of the smart city concept

A research where Kummitha & Crutzen (2017) and Albino & Dangelico (2015) often refer to is the research of Lombardi *et al*. (2012) about *Modelling the smart city performance*. In their research they made a framework with indicators for measuring the performance of a smart city. 60 indicators were selected after analyzing several documents including, for example, the EU project reports. Afterwards, those 60 indicators were divided into five groups, which were then called the main pillars of the smart city. These main pillars are: 1. Smart governance (related to participation), 2. Smart human capital (related to people), 3. Smart environment (related to natural resources), 4. Smart living (related to the quality of life) and 5. Smart economy (related to competitiveness).

The only disadvantage about this framework is that it is focused only on smart cities in Europe. This can imply that some of the chosen 60 indicators may not fit well for regions in other continents. This research will therefore use an adjusted framework of the smart city indicators (See section 4.2).

2.4 Smart city and pandemics

To couple some elements to the current Covid-19 disaster, the research of Kickbusch (2006) titled '*Flu City--Smart City: applying health promotion principles to a pandemic threat',* is used. In order to make some connections between the previous chapters, the focus in this paragraph will be on how the smart city can improve the quality of life for the low-income part of the population during any disaster, specifically Covid-19 here.

About 15 years ago, Kickbusch (2006) argued that there was a high probability of a new pandemic in the next 10 years. To face this new threat, Kickbush (2006) talks about the use of the smart city concept as a way to be better prepared. This preparation is based on three components namely: 1. Knowledge 2. Values and 3. Innovation. According to Kickbush (2006), these preperations can be effective because in case of a panademic virus, a city should not be focusing on the virus only, but also on the understanding of how a city functions and how communities and individual make choices to deal with such a crisis situation. This is also in-line with the previous part which showed the that the people of Yogyakarta not only base their choices on science but also on cultural aspects and local wisdom. This knowledge is important because social response is the most important factor in pandemic control. For example, in the case of the SARS virus approach in Toronto. This approach was successful due to the voluntary quarantine and isolation practices. Too optimize this response, the smart city concept should help with breaking down the barriers of information distribution among different stakeholders.

The Jogja smart service app can help with this for example. If the app is available for all citizens, they will be better informed and able to prepare for possible infections. To create this kind of supported base by citizens, trust is needed in the government. For the low-income part of the population in Yogyakarta this can be a problem because the trust level in the government is not that high (Winarno, 2011). Therefore, the smart city can help to turn that sense of fear and uncertainty into a sense of control. This is because the citizens in a smart city can be seen as partners from the government. It can also mean that the quality of life of the low-income part of the population can improve because of an increased sense of control. According to Kickbush (2006), the smart city sees these preparations for a pandemic as an element of improving the quality of life. These preparations are based on community values and will improve citizens participation and competence. Therefore, this feeling of control can again improve because communities will be more involved in these preparation. This is also in line with the vision of the smart city of Yogyakarta to create more inclusivity (Nurnawati & Ermawati, 2017).

2.5 Critical view on the role of smart cities

As mentioned in the introduction there are some critical side notes for implementing the smart city concept. The next section will show different critical effects in order to get to know the 'real' impact of a smart city.

The main problem that appears in the literature is that there is a big difference between the theoretical idea of the smart city and the practice of a smart city so far. In Philadelphia for example, only the private sector benefits from it, whereas the rest of the citizens do not. This how the government of Philadelphia was expecting it to be. However, the smart city of Philadelphia is still seen as a 'success' (Wiig, 2015). Between this difference in theory and practice, a few critical views arise. Those views will be further elaborated in the following section.

A first critical view about smart cities is, is that they could be a mask to promote or attract corporate business according to Wigg (2015). Kuhmmitha & Crutzen (2017) also say that the smart city is an utopian vision that private businesses tell to citizens. Probably, because these companies need the participation of citizens in order to let the smart city function well. This is exactly what happened in the Philadelphia example. In the research of Wigg (2015), he also concludes that the policies around smart cities are mostly outward looking and for the globalized economy. The ICT companies are playing a big role in this, implying that technology can solve every urban problem. Governments often turn to the ICT companies to help them with implementing smart city governance. Therefore, Allam (2018), Wigg (2015) and Hollands (2014) argue that smart city concepts must not be led by technology or service providers as they all prefer profit over people and planet. In a research of Navigant Research (n.d.), the smart city technology market in 2020 will be annually worth over 20 billion US dollars. This means that a whole new market is rising around the smart city concept. As a result of this, a lot of policies that are recommended actually are investments in e-governance instead of physical or social projects for the city. In addition to this, Hollands (2014) concludes that this profit motive turned city governance into a form of 'urban entrepreneurialism'. In this 'urban entrepreneurialism' cities are turning into marketing machines.

A second critical view is that because of all new technology a new social gap could appear. According to Chourabi *et al*. (2012) there is a risk, due to the smart city strategies, of creating a digital divide. This digital divide arises out of inequality among population groups and unequal access and knowledge on ICT usage in their everyday lives. This is also one of the results of the research of Angelidou (2014) about smart city policies. She says that one of the disadvantages about smart city oriented strategies in the literature is a new fragmentation in society. This new fragmentation is the result of new technological developments. In consequence, this will lead to the continuous growth of inequality within a society due to unequal distribution of benefits throughout urban areas. In the critical school of Kuhmmitha & Crutzen (2017) they also refer to this new divide. As a result of this, some citizens can lose their identity and existence if they not participate in this new ICT world. Thereby, the smart city will not be more inclusive, on the contrary, it will be more exclusive.

Thirdly, a critical point is the high cost of implementing the smart city concept. There is a risk for cities where the implementation is not going well from the beginning, that the costs can be very high (Al Nuaimi *et al*., 2015). Therefore, it can be questioned if those investments would be better off for other purposes just like Hollands (2014) argues.

2.6 Conceptual model

From the theory explained above, a conceptual model was created. In this part this model will be explained. The model starts with the smart city tools/implementations. The smart city should increase the access to capital. An example of this is a free Wi-Fi network through the whole city, which indirectly results in more social capital because more connections can be made with social media. The access to capital can influence four elements:

1. If the access to capital is increasing, the impact of shocks will decline, because when people have more capital they will be better prepared or will recover faster from shocks. An example of this is that when the low-income part of the population has more knowledge on how to build a stronger house against natural disasters. The result of this will be that some houses are more resilient to natural disasters, which increases the safety of the low-income. The quality of life for the low-income part of the population will therefore also be better.

2. If people have more access to capital, their own total capital will increase. Because of that they can have more resources and their possibility of ending up in a higher field will increase. This could change their social reproduction. Education, for example, is costly. Having more capital can increase the chances of going to university. This can provide leveling up in a higher field, and thus change their social reproduction. With changing the social reproduction, their physical and social wellbeing will also be improved, which means that the quality of life will also increase.

3. The access to capital also has a direct influence on the quality of life for the poor, this interaction is explained in the DMDR framework, discussed earlier (GLOPP, 2008).

4. In the section in the middle of the model there is also an interaction between the elements: an access to more capital leads to a change in social reproduction, which will then change the influence in structure and processes. This is because when your are ending up in a higher field people are more likely to listen to you. For example when the low-income part of the population is better connected to each other and form an unity, they will have more influence on processes then they are not a unity. From this point this influences two other elements. Firstly, more influence on processes and structures will increase the quality of life for the low-income part of the population directly. This is because, for example policies will be more adjust to the low-income part of population because they now have more influence. Secondly, more influence of the low-income part of the population on processes and structures will decline the influence on the impact of shocks. Because of this growing influence, policies regarding shocks will therefore be more focused on the low-income part of the population. In the end, this will also lead to a better life for the low-income part of the population, because the impact of shocks will therewith be decreased.

The smart city tools/implementations are important, because it only affects the quality of life if it leads to more access to capital. If this is the other way around, which is the case if the smart city tools/implementations do not produce more access to capital. The model shows that this finally ends up in less quality of life for the low-income part of the population. Therefore, also the critical side of the smart city is shown in this research in order to look at the 'real' impact of the smart city.

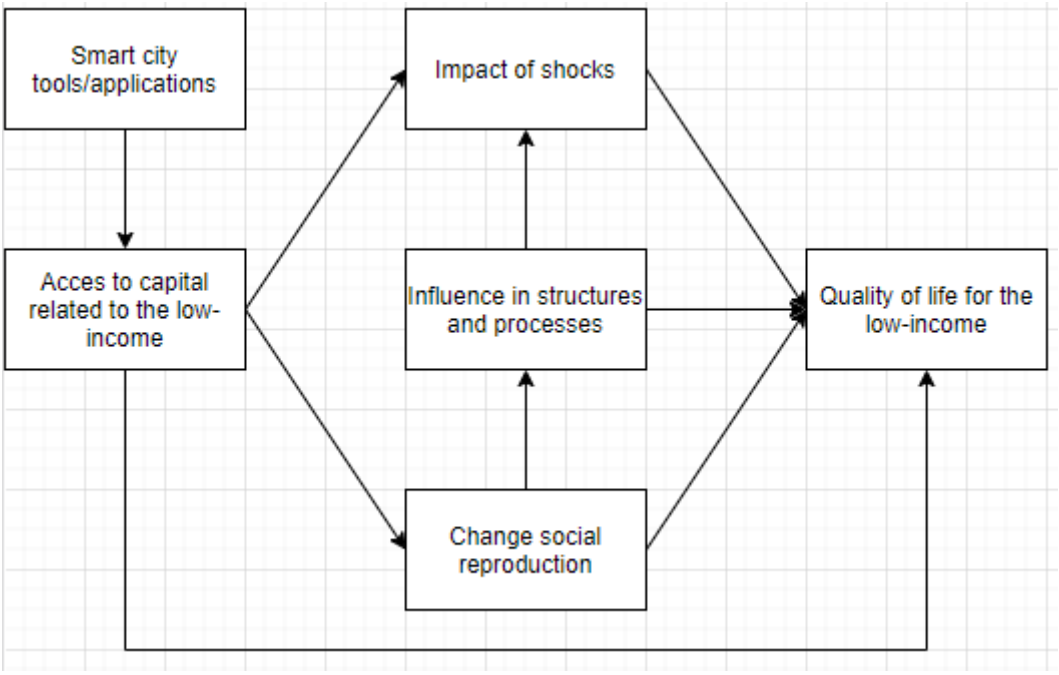


Figure 1: The conceptual model

3. Methodology: The method behind an long-distance research

The methodology chapter of this research may differ a little bit from other researches. The reason for this is because this research was intended to be conducted in Yogyakarta, Indonesia. This, however, did not happen due to the Covid-19 pandemic. The research was therefore conducted from the Netherlands. The perspective and method of this research could in consequence differ from the research if it was conducted in Yogyakarta. This chapter is therefore used to elaborate the research strategy that is used, what kind of data is gathered, how this data is gathered and how this data is analyzed. In the end there will be a reflection on the methods that are used.

3.1 Research strategy

The first step in deciding the research strategy was making a choice between a quantitative or a qualitative study. As well as between an inductive or deductive research method. For this study a combination of these first two will be applied. This is because a qualitative study is better for describing or gaining in-depth information into specific concepts or phenomena. On the other hand, quantitative studies are better for measuring, categorizing and making generalizations (Swaen, 2019). This study will also use an deductive method because it moves from generalized principles to a specific case and conclusion.

The second step is deciding which strategy to use. Cresswell & Poth (2018) make a distinction between five different methods for a qualitative research: 1. Narrative research 2. Phenomenological research 3. Grounded theory research 4. Ethnographic research 5. Case study research. From these five methods the case study fits in best. A case study is an in-depth study that investigates a bounded case over time, which often has an issue or social impact connected to it (Cresswell & Poth, 2018). In this research this is the quality of life of the low-income part of the population of Yogyakarta, which can be potentially improved by smart city tools/applications.

The last step is about what kind of case study will be conducted. According to Cresswell & Poth (2018) there are 3 forms of case studies: 1. The single instrumental case study 2. The multiple case study 3. The intrinsic case study. For the research in Yogyakarta the single instrument case study is used. This method is being used because '*the researcher focuses on an issue or concern, and then selects one bounded case to illustrate this issue* (Stake, 1995)'. The concern here is how smart city implementations can help the low-income part of the population in the context of Yogyakarta.

After the research strategy is decided, the research begins with a literature study, to create a database with useful knowledge. Secondly, interviews are used to gather information. To arrange interviews three sources were used: 1. Contacting researchers from the researches that were read. 2. Through the supervisor in Yogyakarta. 3. The snowball method was used. This means that at the end of every interview the researcher asked the interviewee if he or she knew anybody else to interview related to this topic. From these interviews the qualitive part of this research was written. The interviews were also taken in different times during the research. Therefore, some statements of experts that were interviewed in the beginning, were stated to other experts, to ask their opinion about it. This was done to create a better view of the results and to give a more clear answer of the main question.

To gain more in-depth information**,** an online survey was used. A survey is used to create a clear overview of the data that is being collected, which is presented statistically (Vennix, 2016). In order to generalize the results of the survey, a sample was taken among E-warong members. To create more external reliability as many members as possible were asked who could fill in the survey. In

addition to this, the goal of the survey was also to reach members with different characteristics and in different districts. This resulted in a survey, which was posted 7 days on the online E-warong platform, that only E-warong members could fill in. Because the E-warong members do not speak English, the questions of the online survey were translated by my supervisor (Prof. Marwasta). In this quantitative part the information that came from the qualitative part (described above) was examined. To do this google drive was used, in consequence that every participant could fill it in at home and nobody would be at any risk during this pandemic. This was a possibility because participants of the E-warong have access and knowledge on how to use the internet. Afterwards, SPSS was used to analyze the data.

Despite the fact that this research has done as much as possible in creating a high reliability and validity level, the research was not conducted in Yogyakarta. Because of the Covid-19 pandemic this research was conducted online, from Nijmegen, the Netherlands. Therefore, it was hard sometimes to imagine the real local situation. Some of the results could in consequence maybe differ from the potential results if the research was conducted in Yogyakarta.

3.2 Choice of experts

Number and date	Interviewee	Subject
1. 30-04-2020	Mr. E. Purnomo. Lecture of Government Affairs and Administration in Yogyakarta	Smart city program of Yogyakarta regarding the low-income part of the population.
2. 01-05-2020	Mr. R. Primanto. Head of Communication and Information Provincial Board of Yogyakarta	The smart city program of the special region Yogyakarta.
3. 06-05-2020	Prof. dr. E. van der Krabben. Planning. Chair: Real Estate, Raboud University.	The smart city concept in Indonesia.
4. 06-05-2020	Expert X. Researcher on Smart Urbanism and City development. Private research center.	The smart city concept in Indonesia.
5. 07-05-2020	Prof. D. Jones School of architecture & Built environment, Deakin University.	The relevancy for smart cities in Indonesia.
6. 11-05-2020	Mr. R. Khrisrachmansyah. Department of Landscape Architecture Faculty of Agriculture, Bogor Agricultural University	Some implementations of the smart city focused on the low-income part of the population.
7. 22-05-2020	Ms. D. Rahmawati.	Discussing my results and the smart city in time of Covid-19.

	ITS, Department of Regional and Urban Planning, Surabaya.	
8. 09-06-2020	Dr. Wisnu Pradoto. Vice Director Research Collaboration, Head of Cooperation management Board Diponegoro University and Lecturer in Urban and Regional planning.	How the smart city can help with shocks.
9. 10-06-2020	Dr. Doddy Aditya Iskandar. UGM, University of Louisville and Cincinnati. Urban and Regional Economics and Planning researcher.	The smart city of Yogyakarta.
10. Throughout the research	Assoc. Prof. Dr. Djaka Marwasta. M.Sc. Department of Environmental Geograpy Faculty of GEography UGM-Yoyakarta	Getting better understanding of E-warong and local situation.
11. Throughout the research	Mr. F. Suprianto. staff in "Board of Social Affair of Yogyakarta".	About the E-warong

3.3 Data gathering

In this part of the research I will explain how data was gathered for each sub question. This is an important part of the research because from the data that is gathered for the sub questions, the following main question will be answered: ***Are the applications/tools of the concept of smart cities relevant for the low-income part of the population in Yogyakarta, as a city in the global south, especially in times of Covid-19?*** This research will therefore use triangulation to create more reliability. This means that the research will consist of several methods that will be compared with each other (Vennix, 2016). For this research a literature study, interviews and an online survey are used. In the next part these two first methods will be explained further. The online survey will not be discussed here because this will be done in the next chapter. Afterwards, the methods per sub question will be explained.

Firstly, basic data was gathered through a literature study. Therefore, scientific articles are studied and then divided into eight groups. Afterwards, the articles were summarized and connected to each other. To make the connections between articles easier, the snowball method is used. This method means looking for useful literature in the references list of other literature (Win, 2019). With this literature study the validity of the content is increased (Korzilius, 2008). In order to not create a one-sided argument, because these authors may be supporting each other's approach, there is a critical part in the end of the literature study.

Secondly, semi-structured interviews were used to gather data. The interview guide from this is presented in the appendix. With this method the researcher can inlfuence the interview. As a result

of this, the reliability is increased because the chance of getting a clear answer on the questions being asked is being increased (Creswell & Poth, 2018). A disadvantage of this method is that the interviewee could leave some important information behind, because there is too much influencing. If this is the case the internal validity can decrease (Creswell & Poth, 2018). To solve this problem, at the end of every interview the question was asked to the interviewee if there was still a topic missing that could be important for this research. Because of the Covid-19 crisis these interviews were conducted with Skype or Zoom. The interviews lasted around 30 to 50 minutes and were all single time interviews. After that the interviews were summarized in Word and the audio files were sent to my supervisor.

In the next part the methods used to gather data for each sub question will be explained.

1. *How can the smart city be relevant for the low*-income part of the population?

To answer this question, a literature study was used. From this literature study a conceptual model was created to get a clear view how the smart city could be relevant for the low-income part of the population.

2. *How is the smart city implemented in Yogyakarta, especially focusing on the low-income part of the population?*

To answer this question, this research used a literature study and interviews. From the literature study, the basic information about this question was gathered. To complement this and to check results of previous researches several interviews were conducted. For this question the information was gathered for the tools/applications that were investigated in this research.

3. *What is the effect of the smart city applications/tools related to the capital of the low-income part of the population?*

To answer this question the three aforementioned methods were combined. The literature study was used as a base again. To check this basis there were several interviews conducted and the data from the surveys was used. The survey was in its way used to check if the results of the interviews of the experts were correct. This is therefore a good example of how triangulation is used in this research.

4. *How can the smart city concept currently help the low-income part of the population with the Covid-19 crisis?*

To answer this question the triangulation as describe above was used.

5. *What are the criticisms the smart city have to deal with in the global south?*

For this last question the literature study and the interviews were used.

3.4 Data analysis

In this part the analysis of the data of the online survey will be explained.

The data from the online survey was analyzed with the help of SPSS. From the 250 participants of the E-warong 72 people filled in the online survey. Those 72 respondents were divided over 13 districts and 5 age categories. Therefore, the quantity and the spread of the sample is quite good. For the analysis the data was inserted into SPSS. The survey was therefore divided into three groups: 1. The introduction 2. The multiple choice questions and 3. The open questions. In the introduction only some general questions were asked to create more background information about the respondents. This shown in the figure below.

	Tijdstempel	@1.Gender	@2.Age	@3.Education	@4.District
1	14-May-2020	Woman	Between 36-45	Middle / high school / equivalent	Mantrijeron
2	14-May-2020	Woman	Between 36-45	Higher Education (Academies, Institutes, Colleges, Universities, and Higher)	Danurejan
3	14-May-2020	Woman	Between 46-55	Middle / high school / equivalent	Mergangsan
4	14-May-2020	Woman	Between 25-35	Middle / high school / equivalent	Umbulharjo
5	14-May-2020	Woman	Between 25-35	Middle / high school / equivalent	999
6	14-May-2020	Woman	Between 46-55	Middle / high school / equivalent	999
7	14-May-2020	Woman	Between 36-45	Middle / high school / equivalent	999
8	14-May-2020	Woman	Between 36-45	Middle / high school / equivalent	Gondokusuman
9	14-May-2020	Woman	Between 46-55	Middle / high school / equivalent	999

Figure 2: Screenshot of the data from the introduction in SPSS

In the multiple choice area there were first three questions asked followed by 7 statements about the impact of the E-warong. For the answers the Likert scale was used, so that the respondents could answer how much they agree or disagree with the statement. This is shown in the figure below. To check if these questions were reliable and could be combined the Cronbach's Alpha was calculated.

	@5.Ewarongpartofsmartcity	@6.Localcollaboration	@7.ImpactlifeEwarong	@8.Citylife	@9.Financiallyindependent	@10.Lesslowincome	@11.Moreopportunity	@12.Smartcityrelevance	@13.Covid19crises
1	yes	Yes	High	Agree	Neutral	Agree	Agree	Neutral	Neutral
2	yes	Yes	High	Neutral	Neutral	Neutral	Agree	Agree	Totally Agree
3	yes	Yes	Neutral	Agree	Agree	Agree	Agree	Agree	Agree
4	yes	Yes	Neutral	Neutral	Neutral	Agree	Agree	Neutral	Agree
5	yes	Yes	High	Agree	Agree	Agree	Totally Agree	Agree	Agree
6	yes	Yes	Very High	Agree	Agree	Totally Disagree	Totally Agree	Totally Agree	Totally Agree
7	yes	Yes	High	Agree	Agree	Agree	Agree	Agree	Totally Agree
8	yes	Yes	Neutral	Agree	Agree	Agree	Agree	Neutral	Agree
9	yes	Yes	High	Agree	Disagree	Agree	Totally Disagree	Agree	Agree

Figure 3: Screenshot of the data from the multiple choice questions in SPSS

The open questions **were** used to get behind **the reasoning** or arguments the respondents **have**. In order to analyze this correctly, the multiple response was used because sometimes the respondents gave more than one answer. To do this, this questions were covered in different SPSS files as shown in the below figure.

	@15.EwarongandCovid19	@.Income	@.Jobless	@.Distribution	@.Shopping	@.Veryhelpful	@.Other
1	Alleviate the needs of affected citizens	No	No	Yes	No	No	No
2	Can help meet the needs of people's lives	No	No	Yes	No	No	No
3	There is income when the husband is temporarily jobless	Yes	Yes	No	No	No	No
4	Meeting basic needs	No	No	Yes	No	No	No
5	Meeting basic needs	No	No	Yes	No	No	No
6	Distribution of basic needs trough E-warong	No	No	Yes	No	No	No
7	Generate income	Yes	No	No	No	No	No
8	Distribution of basic needs trough E-warong	No	No	Yes	No	No	No
9	Meeting basic needs	No	No	Yes	No	No	No

Figure 4: Screenshot of the data from one of the open questions in SPSS

The only disadvantage was that all the answers were Indonesian, therefore google translate was used. Because google translate is not that reliable sometimes, the answers that were not clear were

translated by my supervisor in Indonesia. After the online survey a WhatsApp group was created with the respondents of the online survey and I. In this group chat the researchers could still ask some questions to the respondents if something was not clear. Therefore, the reliability of the research increases. This was also the case with some of the respondents that were interviewed. After analyzing the data the choice was made to delete one question and one statement from the survey, namely:

- Is the E-warong in collaboration with the local community implemented?
- The smart city program is relevant for the low-income part of the population in Yogyakarta.

This was done because of the interpretation of the first question depended on which perspective was looked on by respondents. Because of this confusion this question was not used. The statement was also, like the aforementioned question not correctly formulated (what does relevant mean?) and therefore also not used.

3.5 Reflection of methods

In this part a reflection of the used methods and field approach is given. For the literature study there were a lot of researches read and analyzed. This was useful to get some basic knowledge of the smart city. At some point, however, I had read so much that it was difficult to use all the information and convert it into one story. For the interviews I started on time with arranging this and had no problem finding respondents. The only disadvantage was that this research was not conducted in Yogyakarta and because of Covid-19, all the contact was through email or WhatsApp. This resulted into that some experts were suddenly ignoring me or were not responding anymore. In addition to this, there is one video of an interview without sound and one interview with no audio file at all, due to an error on the computer. The first thing happened to me and the second happened to my fellow student Jelle van Bethraij. Therefore, two audio files are missing and we only have the notes from those interviews. From that point on we always used a second device to record the interview. In processing the data into SPSS I underestimated the time this takes. Therefore, this took a slightly more time than planned. I planned, however, everything a few days before the deadlines, making it possible to have enough time for this.

4. Research results: An insight into the smart city of Yogyakarta

In this part of the research the results of the interviews and the online survey will be further elaborated on. Firstly, the research location will be discussed and some local context will be given. Secondly, a critical perspective that some of the interviewees had on smart cities in Indonesia will be explained. Thirdly, the smart city, with regards to Yogyakarta will be further elaborated on. Fourthly, the online survey will be analyzed to give a clear view of the E-warong implementation. Finally, I will discuss if the smart city could offer any help to the low-income communities of people? during this Covid-19 crisis.

4.1 Research location

The research area that was investigated is Yogyakarta city, not to be mistaken with Yogyakarta province, which is located on central Java. The province exists of five kabupaten (districts) namely; Sleman, Bantul, Kulon Progo, Gunung Kidul and in the middle Yogyakarta city.

If we zoom in on Yogyakarta city there are 14 *kecamatans* (subdistricts). According to Macrotrends (n.d.) , 440.000 people in total live in these *kecamatans*. In order to get a better view of where the low-income part of the population live in these *kecamatans* (subdistricts) and what their situation is, the next part will get more into detail. The poverty line of Yogyakarta city has increased in the period from 2013-2019 from 35.3602 rupiah per month to 49.6652 rupiah per month, according to BPS (2019). In addition to this the number of poor people has decreased from 35.600 to 29.450 as well. Most of these poor people live in the slum areas near the three rivers that flow through the city (Iqbal, 2017). This is because in those area there is a high flooding risk and therefore the land value is low. The kecamatans (subdistricts) with the most poor people are: 1. Umbulharjo 2. Tegalrejo 3. Wirobrajan and 4. Gondokusuman. According to the Office of Social, Labor and Transmigration Affairs of Yogyakarta there live 12.329 poor people in those 4 districts in 2015. That means that in 2015 more than 33% of the poor people lived in one of those 4 districts. Nevertheless, this poor indication is only measured from an economical perspective. This does not mean that those people are poor in other perspectives. In the interviews with Mr. E. Purnomo (30-04-2020), Lecture of Government Affairs and Administration in Yogyakarta, and Mr. Primanto (1-05-2020), Head of Communication and Information Provincial Board of Yogyakarta, they explained that if you measure the low-income part of the population from another perspective, like consumption or education, you will see that the number of poor will decrease. They called it an example of local context, which most people often do not see because they only look at the economic situation. Another example of local context, in order to better understand the Indonesian society, is about their way of thinking. The Indonesian society is built up from communities. For example**,** there is a women community and a young people community. Those communities are working together and looking after each other, according to Ms. D. Rahmawati. (22-05-2020), who is working at the Department of Regional and Urban Planning, Surabaya. Therefore, the Indonesian society is less individualistic then the western society. To create a more inclusive society in Yogyakarta, the smart city should therefore focus more on communities then on individuals.

4.2 Previous disasters

Before going to the subject on how the smart city can help with the current Covid-19 pandemic, this part will discuss some previous shocks Yogyakarta had to deal with. As a result of this, it will become clearer what kinds of problems the low-income part of the population have to deal with in the current pandemic.

Firstly, the earthquake of 2006 will be discussed. In this disaster 5,800 people died and 1.5 million people have become homeless (Kompas, 2010). In the research of Winarno (2011) about; *House Seismic Vulnerability and Mitigation Strategies: Case of Yogyakarta City,* a field survey of 402 houses in 12 districts was carried out. As a result of this, 84.8% of the houses were vulnerable to earthquakes. This number is so high due to several reasons, namely: 1. Lack of building knowledge 2. Lack of awareness among all community members and stakeholders and 3. The absence of political commitment. As a result of this, the vulnerable houses will continue to proliferate within low-income and to low-medium income (Winarno, 2011).

Secondly we turn to, the Merapi eruption of 2010. In this disaster 259 people died and 303,000 have become homeless (Effendi, 2010). In the researches of Lavinge *et al*. (2008) and Effendi (2010) an important factor for the high number of casualties and homeless people is local wisdom. In Yogyakarta many people believe that natural disasters like earthquakes and volcano eruption are sings from a supernatural power. This belief is so strong that in many cases they choose to trust their local wisdom above the warnings from the governments. On the other hand, do the policies of the government of Yogyakarta often not include local values (Effendi, 2010). In the research of Lavinge *et al*. (2008) this is further explained by looking at the risks perceptions of the local communities. For instance, that a lot of poor people must protect their livestock for their food security. Lavinge *et al*. (2008) describe this as followed*: 'Poverty and food insecurity are an everyday hazard while volcanic phenomena are rarer hazards and those less significant if people's decision making process.'* Therefore, the context of a lot of situations must be taken into account in the risk management policies of the government. When this is applied by the government, the capital of some people, like their livestock, will be protected or insured. In a next disaster, people's risk perception can therefore change, which will result in that those people will go to a safer place.

Thirdly, the flood risks of Yogyakarta city is discussed. There are two kinds of floods for the city. Firstly, there are floods that are happen due to the three rivers that flow through Yogyakarta. These are the disasters that most often happen in Yogyakarta (Sulistiyani *et al*., 2017). Secondly, there are floods from the lahars of the Merapi Vulcan (Rachmawati & Budiarti, 2017). The areas around the rivers are the most vulnerable for these floods. Most often these areas are filled with poor people living in the riparian areas. In order to keep the people safe the government build a dike around the Code river. In addition to this, the government added a legislation that the distance between housing and the dike must be at least 3 meters. However, in reality the houses are located much closer. One of the reasons for this, is that the people are not well informed about the protected area. As a result of this, those areas were affected by the lahar flood of 2010. Nowadays, this land around the river code is most densely populated area of Yogyakarta (Rachmawati & Budiarti, 2017). Therefore, it can be concluded that there is a weak government in spatial planning and in enforcing the law of the 3 meter rule. On the other hand, most people living in the risks area cannot or do not want to leave their home. This is because of the earlier mentioned context of the local situation. Everything the people need is in that area so they do not want to abandon that. For example, work or the school of their children. Another reason is that people simply do not have the money to move to another place. The social reproduction stays therefore the same and people cannot change to a different safer place. Their risk perception of flood differs therefore from people in richer areas (Rachmawati & Budiarti, 2017). This is the same as mentioned before with the Merapi eruption. In order to reduce to the risks Sulistiyani *et al*. (2017) and Rachmawati & Budiarti, (2017) suggest more community capacity building for a better respond in times of disasters and in anticipating for future disasters. If this happens their capital can increase and therefore their habitus could be a safer place.

In summary, there are three main problems where the smart city can assist Yogyakarta during disasters. Firstly, the lack of awareness and distribution of information in times of a disaster. Secondly, the local context is not included in risk management. Thirdly, reducing poverty in order for the low-income part of the population to move to a safe area.

4.3 Smart city Yogyakarta

When the concept of smart city came to Indonesia, the concept started to develop. Firstly, the smart city together with the technology was being seen as an instrument to reach the objective of the city. Not all Indonesian cities understood this conception, in consequence that some of the cities thought they already reached the goal of the smart city with only implementing free Wi-Fi around the city. This is not where the smart city stands for because the technology is just an instrument. Secondly, there is a difference between the use of the technology. The majority of Indonesia has not that same sophisticated technology as in Europe for example, therefore the conception of smart has also started to change (Rahmawati, Personal communication, 22-05-2020). This change is described as followed by Rahmawati (Personal communication, 22-05-2020):

'As much as people can make use of this and get the most out this technology even if it is simple, we already recognize it is smart city because it is an instrument to reach the objective of smart'.

As earlier mentioned the Yogyakarta province exists of five kabupaten (districts). Because many problems cannot be solved by only one district, collaboration is needed between the districts. Therefore, there is this umbrella which contains every smart city implementations for the province (Primanto, Personal communication, 01-05-2020). However, this research will only focus on the implementations for Yogyakarta city. The smart city in Yogyakarta has a different view than the original smart city views, the view is adjusted to the local context. In an interview with Purnomo (personal communication, 30-04-2020) he said the following: *'Smart city is not only participate in ICT sector but also in participate in the cities activities.'*. In Yogyakarta the technology is, according to Primanto (Personal communication, 01-05-2020), only used if it is relevant for the local communities and if they can use it. So the smart dimension is not limited to the technology, but also to whether it can solve problems effectively.

The main goals of the policy vision of the smart city program of Yogyakarta are achieving quality education and to create a community with character and inclusivity. Yogyakarta wants in addition to this cultural based tourism and to be a center of services with an environmentally based economy (Pratama, 2018). An example of this, is the E- warong program which will be elaborated later on. Yogyakarta wants to reach this implementations with smart governance and smart economy. Due to Pratama (2018) this can be realized by good and clean governance, quality public services, community empowerment and strong regional competitiveness. In addition to this, Primanto (personal communication, 01-05-2020) is talking about the 5 dimensions of the smart city program of Yogyakarta. These are: 1. Smart governance 2. Smart environment 3. Smart culture 4. Smart economy and 5.smart society. To get a clear view of the dimensions the table of Rahmawati (personal communication, 22-05-2020) was used to adjust the above 5 categories to the low-income part of the population. In her table she adjusted the 'original' smart city indicators to the local context of Surabaya, located on East-Java. The name smart city is changed to smart kampung, which describes a neighborhood where largely people of low-income live (Ernawati, 2013). This table is shown below.

Table 1 Criteria of Smart Kampung

Category	Criteria
Smart Economy	Availability in online-based HBE (Home-based Enterprise) to support quality, quantity, and marketing of the product;
Smart Mobility	Ability and accessibility in daily mobility;
Smart Environment	Availability of environment management infrastructure; Availability of wastewater and waste management activities; Availability of environment quality enhancement activities by the community and facilitators;
Smart People	Availability of community involvement and empowerment activities for kampung development; Adaptable to new things and able to change;
Smart Living	Comfortable in accessibility, internal and external communication, and energy consumption; Security and adaptability for disaster and criminal risk; Enhancement in quality of life and self-existence;
Smart Governance	Effective service and right on target; Online-based management and responsive service.

Source: Analytical Result from 2018 Research

Figure 6: Framework smart Kampung (source, Rahmawati, Personal Communication,22-05-2020)

For this research the focus was on 4 categories, namely: 1. Smart economy 2. Smart people 3. Smart living 4. Smart governance. The other two categories were not further investigated because two other students had already investigated those. The research of Jelle van Behtraij for example is about hazard management systems and smart infrastructure. To adjust the rest of the categories more to the context of Yogyakarta, the research of Purnomo *et al*. (2019) was used to help supplement some of the criteria.

Smart economy:

1. The development of E-commerce and small or medium enterprises.

Smart living:

2. Easy access towards education services with smart services and safe guaranty for humanity.

With those 4 categories there will be taken a closer look on the smart city applications and tools of Yogyakarta in the next chapter. If the criteria for those categories are achieved with the smart city tools of Yogyakarta, this can lead to more access to capital. In the end, this can result into a better quality of life for the low-income part of the population as shown in the conceptual model. To choice in this research was to look at two tools of the smart city, Online platforms and the E-warong. This two tools were chosen because these tools were found in the literature and from the data of the interviews. In addition to this, these tools also both can lead to an increase in capital for the low-income which can made them interesting for this research.

4.4 Online platforms

One way of creating more social capital and concomitantly a more inclusive society is trough smart city measures by generating online platforms. With these platforms the low-income part of the population can increase their participation in city developments, this would help them to improve their lives. This is because the low-income part of the population would have more emancipative potential and could therefore have more influence in processes and structures. These platforms can

thus be used as tool for creating more local empowerment for the low-income part of the population. In order to create more accessibility for the low-income part of the population the Communication and Information Provincial Board of Yogyakarta is providing free Wi-Fi for poor areas (Primanto, personal communication, 01-05-2020). However, this not functioning well at the moment, according to Purnomo (personal communication, 30-04-2020). When, however, this does functions, the low-income part of the population should have access to these platforms because the mobile phone is no longer a luxury item, according to Pradoto (Lecturer in Urban and Regional planning, personal communication, 09-06-2020). On the other hand, this does not mean that the low-income part of the population also would have the knowledge on how to access the online smart city services. To solve this problem, Primanto (personal communication, 09-06-2020) explained that the government is still trying to make the system easier, in this way more people can have access to the services. He also talks about a free program, which will educate illiterate citizens on how to get access to the system and about co working spaces where they would have free access to the internet. However, this is delayed because of the Covid-19 crises. In the next part two online platforms will be elaborated. These are Jogja smart service and Cetagan Jogja. Both are two smart city tools, but there is a difference in their approaches.

Firstly, the Jogja smart service will be elaborated. This implementation can be seen as a combination between smart government and smart living. The reason for this is that smart living is needed for this smart governance to be effective. For example, you will need access to the internet to communicate with other people. If this is not the case, it is not possible for the smart governance to be effective. In the following part this app will be more elaborated. To improve city services through e-government, Yogyakarta developed Jogja smart services. This app is created to make the society of Yogyakarta more inclusive and to encourage smart citizenship. Therefore, the app assists users in searching for Yogyakarta related information, especially in culture, government, hotels, and transportation (Nurnawati & Ermawati, 2017). This initiative started in 2018, and in 2019 there were 18.807 users. However, from those 18.807 users only 2.662 users were citizens from Yogyakarta, the other part consisted of students, tourist and government employees. This is a small number in comparison with the total number of population in Yogyakarta, which was 440.000 (Marcrotrends, n.d.). Therefore, it can be concluded that the participation of the citizens needs to improve (Purnomo *et al.*, 2019). In the research of Fridayani & Numandi (2018) about ''*Do Smart Citizens Make a Smart City?''* they elaborate the importance of smart citizenship. One of the conclusions is that many regions in Indonesia are introduced to smart governance and smart economy, however smart citizenship is left behind. Therefore, it is important to encourage smart citizenship, because without smart citizenship the smart city will not function well (Fridayani & Numandi, 2018). Smart citizenship can be encouraged by making the Jogja smart service more available for everyone. If this app is more accessible for the low-income part of the population, the low-income part will be more included in the society. One of the features of this platform is that it provides an online place where people or small businesses can advertise their product. In consequence, the people who have a small business or work in a small business can directly or indirectly benefit from it (Khrisrachmansyah, personal communication, 11-05-2020). Therefor this app can be useful for the smart economy. Another feature of this app is that people can send in complains to the government. The menu for this feature is adopted from cegatan jogja, which will be further explained next. This feature can make it possible to create more local empowerment.

The other online platform is Cetagan Jogja. This is a Facebook forum that was created in 2013, which has 1.026.674 members now. In addition to this there is also an Instagram page with 656.000 followers. These are a lot of members in comparison with the total population of Yogyakarta, which was 417.705 in 2019. The reason that the number of the total population is less than the members of

the Cetagan Jogja, is probably because of the fact that everyone can join this page. Therefore, also people from outside Yogyakarta can become a member of the page. The motto of this page is the following: *'Here, we just chat and share a little of our time to share with each other. Because we fully understand that "you know better''*. Therefore, this forum is not for commercial ends, as has been stated on the page. On this forum citizens post problems to which other citizens can respond with solutions (Khrisrachmansyah, personal communication, 11-05-2020). An example of this is an older women that did not come back from her walk, which was posted on 26-6-2020, and already has 110 reactions. This form of helping is in line with the earlier mentioned community based society, where people are less individualistic and more collectivistic. In addition to this, general information especially about crime incidents, traffic accidents and natural hazards can be shared (Marwasta, personal communication, 02-06-2020). This forum can be seen as a good example on how to use ICT in combination with local knowledge. The platform is very low-key, in consequence that it is easy for the low-income part of the population to access. In the WhatsApp group of my respondents of the online survey, the respondents said that there are other platforms similar to this one available.

The difference between the success of these two platforms is probably due to their different approach, the first platform takes a the top-down approach and the second platform takes a more bottom-up approach. The Cegatan Jogja, is started by the local community and therefore the participation rate is high. Jogja smart service is in contrary, developed by the government of Yogyakarta (Nurnawati & Ermawati, 2017). This also shows that even without government influence, the smart city concept is creating more local empowerment and a more inclusive community. From these two online platforms can be concluded that if the implementation uses a bottom-up approach, the participation and awareness is higher. Therefore, this could also be the case for other smart city implementations. This is especially important for the low-income part of the population, because as Rahmawati (personal communication, 22-05-2020) mentioned they think inwards. Summarily, from the above results can be said that if implementations are more low-key and bottom-up have more chance to succeed. This makes it important for a government to discuss and participate with the low-income part of the population, to get a more bottom-up approach. In addition to this, the low-income population should have more access to technology for more information and better communication, in other words improving smart living. If they can accomplish this, the low-income part of the population would have a chance to build capital and to become smart people.

4.5 E-warong

This implementation can be seen as combination of three smart categories, namely smart economy, smart people and smart living. This is because the E-warong exists of small (ICT) business, where people of low-income can increase their intellectual capital. In order to do this, the government provides the resources for this program to function well. In the next part the E-warong will be further elaborated.

The government of Yogyakarta implemented the E-Warong program as a part of their smart city program. For this section, I received a comprehensive document from Suprianto (personal communication, 11-05-2020) who is staff member in the Board of Social Affair of Yogyakarta. This document will be shown in the appendix.

The E-warong is created to empower the low-income part of the population, so that they can be more independent. This is done in creating joint ventures with the use of ICT. The low-income part of the population receive support in setting up their businesses in form of staple food or electronic money. In addition to this, they also receive education for the marketing of the products. The goal of the E-warong is to improve the wellbeing of the participants. This exists of the following:

1. The E-Warong helps underprivileged communities to reduce poverty.
2. The E-warong program improves the access to inclusive services financial services and eliminates abuse of help.
3. The E-Warong is part of an attempt to improve mutual cooperation and to exterminate poverty.
4. The price of groceries of the E-warong is probably lower than the market prices. This is because the groceries come directly from the distributor.
5. The E-warong also functions as a bank agent, in order that the responsibility of the government towards the low-income part of the population is shared with the business life.

To summarize, the E-warong functions as a place to buy and purchase cheap, basic needs of good quality. To get access to the E-warong every participant receives an electronic card. In order for the E-warong to function properly, the role of the internet is very important. If this does not function well, people cannot deposit or transfer money to their electronic passes. Therefore, the program offers the facilities where the participants have access to these ICT services. To illustrate the progress the underlying figure is made.

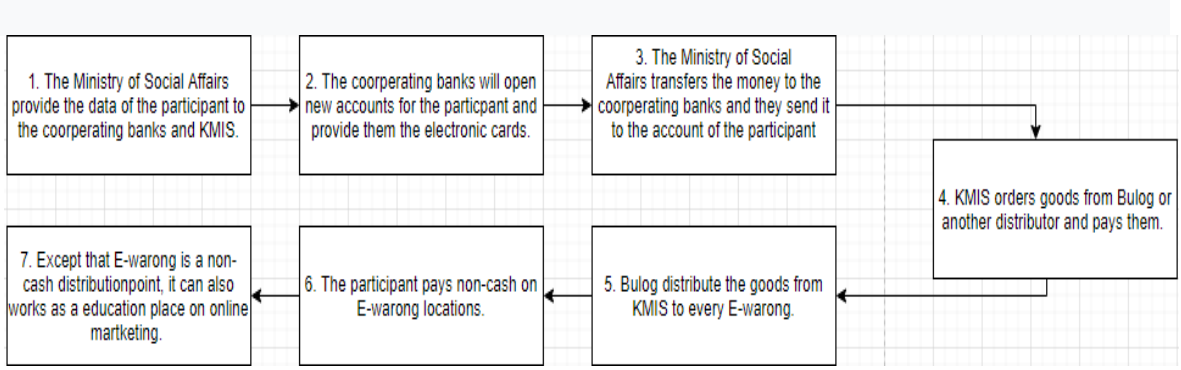


Figure 7: The E-warong process

In the research of Marwasta & Suprianto (2019), they conclude that the E-warong program is not yet resulting in poverty alleviation for their members. A reason for this is that the government still uses a top-down approach. Hereby, Marwasta & Suprainto (2019) said there is a lack of inclusion of the community participation. The government initiatives are therefore universal and not related to the different situations of the poor. In the end, they conclude that for the E-warong program to succeed there must be more collaboration among the stakeholders. Another conclusion they make is about the lack of entrepreneurship and participation among the people and that this needs to be upgraded.

As explained before, the E-warong tool is an implementation developed to support the development of Yogyakarta as a smart city. This implementation can only be used by poor people. It is a system that is developed by the community, not only the government. In the E-warong people can sell their products to their community (Primanto, personal communication, 01-05-2020). Where the previous chapter mainly used the qualitative data, this chapter will use the quantitative data from the online survey. This survey was filled in by 72 of the 250 E-warong participants.

After this qualitive analysis of the E-warong, this research will now use quantitative data from the online survey among the E-warong members. This survey was conducted with the help of The Universitas Gadjah Mada (UGM) and Mr. Suprianto. In order for Mr. Suprianto to spread the survey among the E-warong participants UGM provided a cover letter for the local authorities. The purpose of this online survey was to look at how the people, participating in this smart city program for the

low-income part of the population, think about this implementation. Furthermore, this survey tests if the capital building of the E-warong is resulting into a different social reproduction, has an effect on the impact of shocks and if their quality of life was improved. The analysis of the survey results that focusses on the Covid-19 pandemic are not shown in this chapter, but in the next one. The insights from the survey are therefore valuable because this shows an in-depth look into how the program is perceived through the eyes of the participants. This is extra valuable because this research was not conducted in Yogyakarta. Therefore, no empirical research could be done. To do this, the survey can be divided into three parts. First, the introduction was used to gather some general information of the participants, such as their gender, age, education and which district they live. These general questions will be shown in appendix 2, only the gender is discussed in the next part. This is because the result of the gender has some limitations but also an interesting note for the long-term. Secondly, two multiple choice question and some statements were asked to get behind the awareness and the impact of the E-warong. Afterwards, two questions were deleted because the interpretation of the question could be different for every individual. Therefore, the results of this question were not reliable. In the end, the open questions were used to get behind the reasons of the previous questions. In the next part the results of the survey will be shown and analyzed.

Gender

First of all, the gender of the respondents will be discussed.

1.What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Woman	70	97,2	100,0	100,0
Missing	999	2	2,8		
Total		72	100,0		

Figure 8: Gender table of survey

This first question was firstly not seen as very relevant, but when it became clear that the respondents were all women, this changed. One of the reasons all participants of the survey are women is because the men are mostly already working. Therefore, the E-warong is a way for the women to make some additional income for their family economy (Marwasta, personal communication, 15-05-2020). This was not the intention when the E-warong was implemented. The government expected men, as head of the household, instead of women to join the program, but this did not happen. Because women are not used to set up something on their own or to sell products (currently this is the role of the man), they need more training. As a result of this, the program is being slowed down (Marwasta, personal communication, 15-05-2020). However, when taking a closer look at poverty alleviation a conclusion can be made that educating women is a better method than educating men. This is because, for example, women will spend their food or money more wisely (UNChronicle, 2010). On the long-term these investment can have better outcomes then on beforehand was expected.

Awareness

To check if the respondents were aware that they were participating in a smart city program the following question was asked.

5.Did you know that the E-warong is part of the smart program of Yogyakarta?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	57	79,2	85,1	85,1
	no	10	13,9	14,9	100,0
	Total	67	93,1	100,0	
Missing	999	5	6,9		
Total		72	100,0		

Figure 9: Data from question 5

The awareness of the smart city among the low-income part of the population is an important factor for participation in the smart city. Just as Rahmawati (personal communication, 22-05-2020) explained in her interview the awareness is needed to change to view of the low-income part of the population from thinking inwards to outwards. This can be done by showing the low-income part of the population how to access this new smart society. However, at the moment the smart city is not promoted well among their citizens (Khrisrachmansyah, personal communication, 11-05-2020). The results of the question above show that the most of the respondents know that the E-warong is part of the smart city program (85.1 %). On the other hand, 14.9% of the people who answered still do not know this. This percentage shows, that even among participants of a smart city application there are still some people not aware of the smart city program.

Impact E-warong

To measure the Impact of the E-warong, there are three statements related to their own experience and two statements related to the E-warong in general. The following question and statements were used:

1. Does the E-warong program have an impact on your life?
2. Because of the E-warong I have a better chance of making a living in the city.
3. Because of the E-warong I am financially more independent.
4. Because of the E-warong there are less people with a low-income part of the population in Yogyakarta.
5. Because of the E-warong program people with lower-incomes have gained more opportunities.

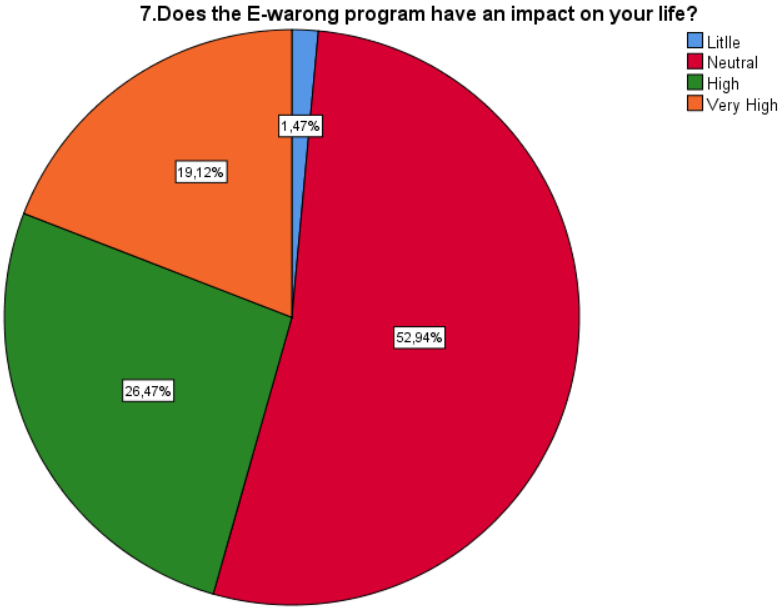
To measure this, the Likert scale was used. To measure if these questions have a reliable scale the Cronbach's Alpha was calculated.

Reliability Statistics

Cronbach's Alpha	N of Items
,801	6

Figure 10: Table of reliability statistics

From this analysis can be concluded that this part of the survey has a reliable scale. This is because the Cronbach's Alpha is higher than 0.7. In the next part, the question and the statements will be analyzed. In the following part pie graphs will be shown to illustrate the results. Afterwards, those results will be explained. In order to get more insight in these questions, the answers of the open questions will be used to complement the results.



Missing	999	4	5,6
Total		72	100,0

Figure 11: A pie graph from the results of question 7

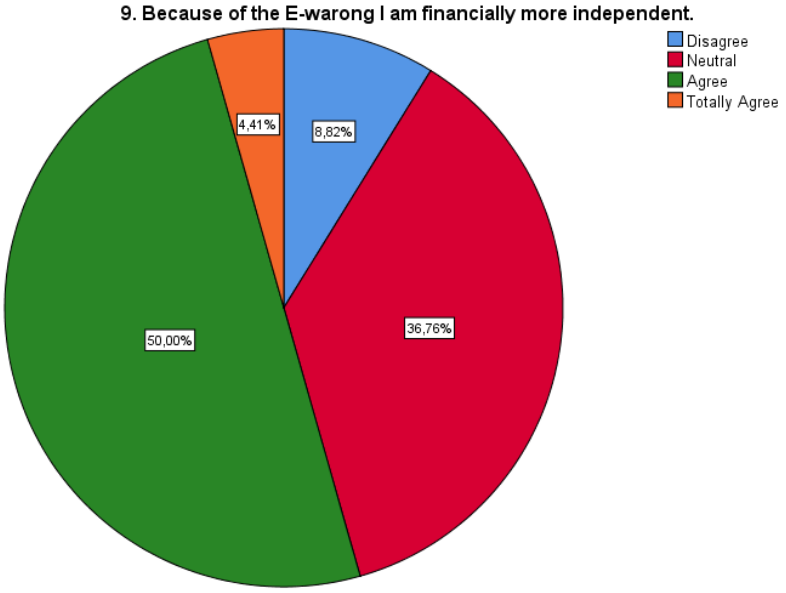
A large part of the respondents answered to this question positively (45.59%). Only 1.47% answered little and 52.94% answered neutral. Thus, the E-warong has an impact on many respondents lives. To find out more about the motives and why they answered this the following open question was asked: *What is the role of the E-warong in your life?* From this question the results were divided into different groups in SPSS, which will be shown in table below.

		Count	Column N %
Role E-warong in your life	(extra) Income	44	63,8%
	Distribution of (cheaper) basic needs	11	15,9%
	Education	6	8,7%
	Making more friends	5	7,2%
	Create employment	3	4,3%
	Help for economy	6	8,7%
	Others	8	11,6%
	Total	69	120,2%

Figure 12: A table from SPSS from question 12

From all the above, it can be said that the E-warong plays multiple roles in different respondents lives. These roles are not only financial, but also intellectual capital building in the form of education and social capital building in the form of making more friends. The impact can therefore depend on

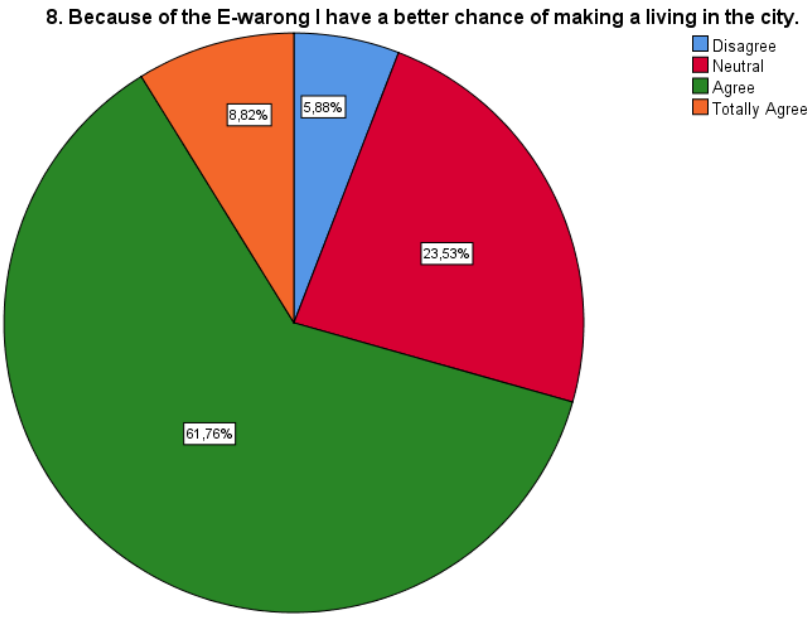
different roles. However, it can be stated that the positive impact of the E-warong on their lives is probably because of the (extra) income. To check if the respondents were indeed more financially independent the following statement was made.



Missing	999	4	5,6
Total		72	100,0

Figure 13: A pie graph from the results of question 9

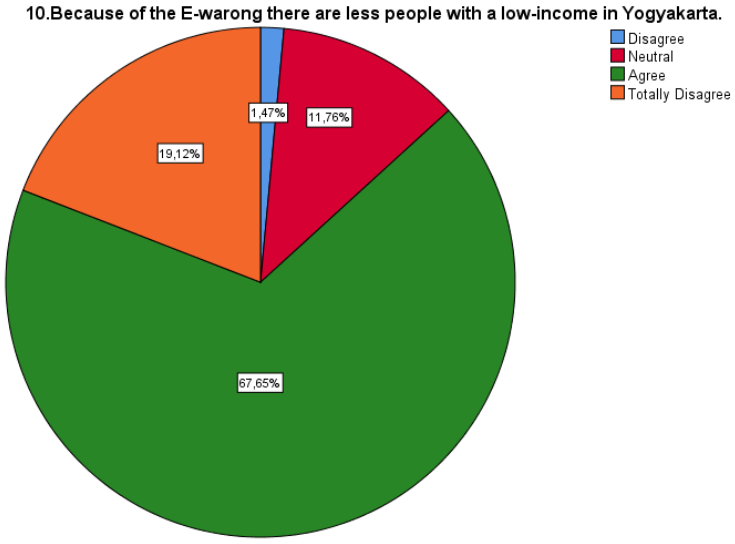
This graph shows that the majority of the respondents feel that they are more financially independent (86.76%). This in line with the previous results, which showed that income is the most frequently mentioned role when asked on which role the E-warong has an impact. Because women are earning (extra) income with the E-warong their chance on participating in society could also be higher. To check this, the underlying statement was asked and pie graph was created.



Missing	999	4	5,6
Total		72	100,0

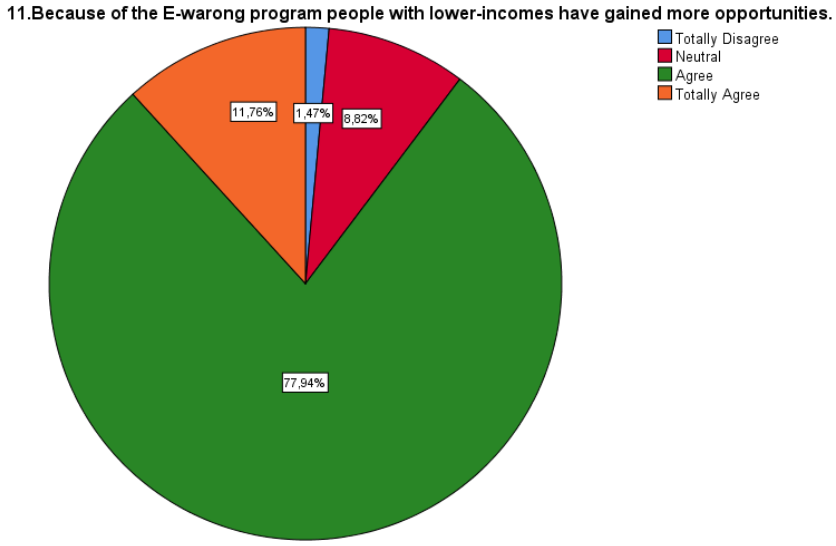
Figure 14: A pie graph from the results of question 8

From the results of this graph, can be stated that the majority of the respondents (85.29%) have now a better chance of making a living in the city, and therefore to be part of the society. The smart city is in this case indeed creating a more inclusive society for the majority of the respondents. In addition to the questions above there were also two more general statements made, which will be elaborated below.



Missing	999	4	5,6
Total		72	100,0

Figure 15: A pie graph from the results of question 10



Missing	999	4	5,6
Total		72	100,0

Figure 16: A pie graph from the results of question 11

From these graphs about the two statements, it can be concluded that a large majority of the respondents think that there are less people of low-income and that the low-income part of the population gained more opportunities. Both these general questions show, that because the E-warong offers them a better access to capitals, like financial and educational capital, they have a chance in becoming more independent. For women, the E-warong changes their social reproduction because, as earlier explained, their behavior is changed. This is because women generally do most of the domestic tasks in Indonesia. With the E-warong this changes because they now have to set up their own business and have to maintain that, and so they have gained more opportunities. Lastly, an open question was asked namely if it would be relevant for other low-income part of the population to join the E-warong.

14.Would it be relevant for all with lower incomes to join the E-warong program? Why would this be relevant, or not?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	63	87,5	96,9	96,9
	No	1	1,4	1,5	98,5
	Do not know	1	1,4	1,5	100,0
	Total	65	90,3	100,0	
Missing	999	7	9,7		
Total		72	100,0		

Figure 17: A table from the results of question 14

		Count	Column N %
Relevance ewarong for other low income	Increasing income	27	41,5%
	Meeting the daily needs	6	9,2%
	Very helpful for low-income	7	10,8%
	Helpful in distribution	6	9,2%
	Form of Government support	3	4,6%
	Helpfull for community	7	10,8%
	Improve quality of life	4	6,2%
	Other answers	8	12,3%

Figure 18: A table from the results of question 14

The majority of the respondents thinks it is relevant for other people of low-income to join the E-warong, only one person answered no. The reasons the responds gave varied, but the majority finds it relevant for other people of low-income to join the E-warong because it can provide them an increase in income. Other reasons that were often given were, that the E-warong is very helpful for the low-income part of the population and that the E-warong is also helpful for the community. After the positive results one questions remained unanswered; *why are not more people of low-income joining E-warong?* This question was presented to the respondents of the online survey but also to the experts Prof. Marwasta and Mr. R. Primanto. From their responses several reasons could be deduced:

The first reason was because of government constraints (Marwasta, personal communication, 02-06-2020). This is also in line with the critique from van der Krabben (personal communication, 06-05-2020), who said that there is a lack of institutional capital in Indonesia for these kinds of projects. Secondly, the E-warong program is still not very known by the low-income part of the population (Primanto, personal communication 03-06-2020). Thirdly, there are some conditions if you want to become an E-warong member, such as no criminal background. Some families of low-income could therefore not meet those conditions (Marwasta, personal communication 02-06-2020). As a result of this, some families of low-income will be excluded from the smart city program. This is in contradiction with the smart city goals, which should increase the inclusivity of the whole society. In addition to this, it is also difficult to find a person with the right social characteristics and personality to join E-warong (Resondent Z, personal communication, 05-06-2020).

The overall results of this survey show that there are still reasons why not more people of low-income can join the program. On the other hand they show, that the E-warong members are positive about the program and that their quality of life is increased. The members are getting trained in this program to become smart people and in the end learn how to join the smart economy. The E-warong program can therefore be seen as a community with people of low-income that has the potential to join the smart city society Educating people of low-income in how to become smarter is the most important step for the smart city in Indonesia, according to Rahmawati (Personal communication, 22-05-2020). However, there is also a risk that the E-warong community is becoming an exclusive community inside the low-income community, if not more people of low-income are able to join the program.

E-warong Whatsapp group

After the online survey, I was asked to join an E-warong Whatsapp group. In this group I was given the ability to ask some additional questions if some data was not clear. However, in this group some general information was immediately spread about the E-warong and some other issues were discussed among the members. It became clear that indeed a lot of E-warong member have the access, knowledge and skills to create a group chat and are able to spread information with each other.

4.6 Smart city in times of Covid-19

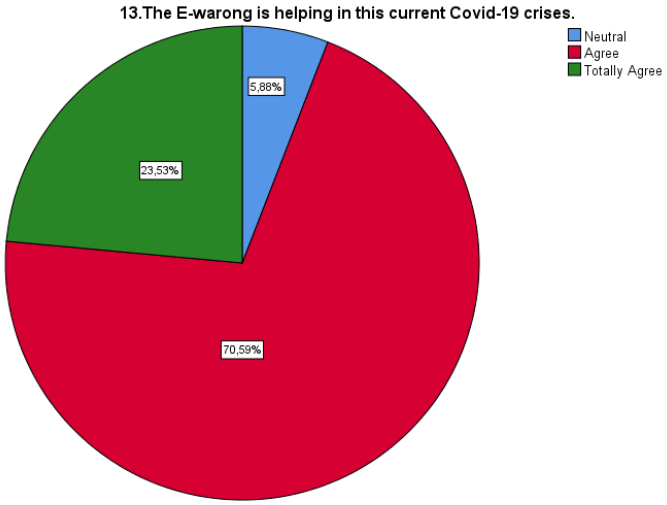
In the introduction the following sub question was asked: '*How can the smart city help in the current Covid-19 crises?*'. To answer this question, several interviews were done and the main consensus was that the smart city is helpful during the Covid-19 crises. In these part the previous two tools will therefore be further discussed on how they can assist the low-income part of the population during this pandemic. In addition to the interviews, a part of the survey results will also be used here. This is, because these data is specifically focussed on the E-warong program and Covid-19.

Online platforms

As explained before online platforms can be used to create a more inclusive society. In such a society people are more connected to each other. In times of Covid-19 these platforms can be used for spreading information of the virus. This information could be related on for example on how to act during this pandemic. Therefore, two of the previous problems of the natural disasters will be tackled, namely the distribution and lack of information. Because people are also more connected to each other they also can help each other more out. This could therefore result in more help for the low-income during this crisis. An example of an platform specially developed for this pandemic is the Covid 19-radar. With this platform people can see where there the people live, who are currently infected with the virus (Rahmawati, personal communication, 22-05-2020). With this platform the low-income part of the population itself are not directly been helped. This because they do not have the luxury of staying at home cause they do not have the resources for that. On the other hand, This radar is indirectly influencing the low-income part of the population. This is because the government can make better decisions regarding Covid-19, cause they have now have a better overview of where the people live who are infected (Rahmawati, personal communication, 22-05-2020). A perquisite for this to be a help for the low-income part of the population, however, is that the government needed to provide the access to this.

E-warong

For this part first there will be some quantitative data shown and after this an analysis of this will be done.



Missing	999	4	5,6
Total		72	100,0

Figure 19: A pie graph from the results of question 13

From this first pie graph it can be stated that the respondents are very positive about the E-warong helping during this Covid-19 crisis. 94.12% answered this question positive and nobody answered negative. To get behind the reasons why they answered this so positively the following open question was asked; *Is the E-warong program of any use to deal with the Corona (Covid-19) crises? And why is this?* The reasons are shown in the table below.

		Count	Column N %
Ewarong helpful in Covid19 crises	Because of income	6	8,8%
	Because many people lost their job	10	14,7%
	Distribution of basic needs and products	39	57,4%
	Shopping closer and cheaper	6	8,8%
	Very helpful	9	13,2%
	Other answers	8	11,8%
	Total	68	114,7%

Figure 20: A table of the results from question 13

From this table it can be seen that the E-warong is helpful during this crisis mostly due to the distribution of basic needs and products. However, this is only meant for the E-warong participants and not for the other low-income part of the population. In consequence, this smart city implementation is excluding the other low-income for this kind of aid (Marwasta, personal communication, 02-06-2020). Another reason, that is not so often referred to but can be seen as important, is that because of the E-warong the low-income part of the population can shop cheaper and closer to their homes. The low-income part of the population are therefore better protected because they do not have to make long journeys outside, which reduces the chance of getting and spreading the virus. The last reason is that many people lost their jobs, according to some respondents of the survey. Therefore it is important that this women still have jobs that generate some income to maintain their family. The E-warong can be seen from this results as a helpful tool for the low-income part of the population during this Covid-19 pandemic. Especially for the members of the E-warong who also receive basic needs and products. In order to look at it as if the E-warong could be used in times of other shocks the following question was asked; *If it was not of use for this Corona crisis, could it be of any specific use to deal with larger crisis in the future? Can you indicate how?* This question was intentionally meant if the respondents answered no to the previous question. Nevertheless, 66 respondents answered to this question and gave a reason why the E-warong could be of any use in other shocks.

16.If it was not of use for this Corona crisis, could it be of any specific use to deal with larger crises in the future? Can you indicate how?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	63	87,5	95,5	95,5
	Neutral	3	4,2	4,5	100,0
	Total	66	91,7	100,0	
Missing	999	6	8,3		
Total		72	100,0		

Figure 21: A table from the results of question 16

From this, the results are again very positive about the help in times of shock. To get behind the reasons the following table was created.

		Count	Column N %
Using Ewarong for other crises	Basic needs (such as food)	12	19,4%
	Ligthen the burden of low-income	5	8,1%
	(extra) Income	7	11,3%
	Distribution of aid and products	7	11,3%
	Products are cheaper	4	6,5%
	Helpful for low-income	21	33,9%
	Local knowlegde about the situation of low-income	3	4,8%
	Others	11	17,7%
	Total	62	113,0%

Figure 22: a table from the results of question 16

From this table the following can be derived. Firstly, most of the respondents who said yes are saying that the E-warong is helpful for other crises. Secondly, most respondents are saying that the E-warong is helpful in other crises because of the basic needs. Thirdly, distribution of aid and products and (extra) income is most often referred to. Fourthly, the reason that the E-warong is considered helpful because it will lighten the burden of the low-income part of the population is most answered. Fifthly, products are cheaper at the E-warong, this is answered the most to be helpful in other crises. Lastly, local knowledge about the situation of the low-income part of the population is mentioned. From all these reasons it can be concluded that the E-warong is helpful to deal with and overcome future shocks. In addition to the results above, the smart city program offers every household 600.000 roepiah (42.07 USD at 06-2020). With that money the city hopes to achieve that the E-warong still can sell the product of their community and people in that community have the means to buy this product. The government hopes that the money will stay inside these communities (Primanto, personal communication, 01-05-2020).

In summary, this chapter showed how the online platforms can assist the low-income part of population during this pandemic. This was because of the online platform the low-income part of population can get more help from other parts of society trough an increase in social capital. This chapter also showed how the E-warong assist the low-income part of population during this crises and for future crises. The members of the E-warong were very positive about the help of the program. The E-warong also helped to overcome the two reasons why the low-income part of the population cannot stay at home. This is because the E-warong provides their members with basic needs and makes shopping cheaper and closer to home. In the next part the research will elaborate the critical side of the smart city.

4.7 Critical view

In the previous parts the smart city of Yogyakarta was analyzed together with the two tools. In the theory chapter the smart city already received some criticism. In this part this criticism will be complemented with data from the interviews. This was done to look at the relevancy of the smart city for Indonesia.

An agreement that a lot of the interviews contain, is about the help a smart city can offer in times of natural disasters. For example, van der Krabben (personal communication, 06-05-2020) is talking about the possibility that because of the smart city, the information distribution also to local communities can be improved. However, he also pointed out that this is probably the only way the smart city program is reaching the low-income part of the population. This is also in-line with what Prof. Jones from the
School of architecture & Built environment, Deakin University (personal communication, 07-05-2020) said in the interview. Here he explained that the programs focused on the low-income part of the population are mostly a mixture of show or greenwashing. These words can be seen as hard. However, if we take a closer look at for instance the E-warong program, there is some truth in it. The E-warong is a program for the low-income part of the population that exists of 250 participants. Looking at the total amount of people of low-income (29.4500), this could not be seen as something that is beneficial for the all the low-income part of the population. Another reason is because from the perspective of the poor people, the smart city is not high on their agenda. The smart city is not a language they are familiar with. They are more occupied with maintaining their lifestyle with the core values of their families (Jones, personal communication, 07-05-2020). In addition to this, the implementations of the smart city are often difficult to implement in the global south because of a lack of institutional capacity. An example of this was the Jogja smart service, which was not a success because of a lack of users. Therefore, the ideas and intentions are often good but the implementations on local scale are mostly missing (Krabben, personal communication. 06-05-2020). The part of society that feels this the most are the low-income part of the population. This is because of their lack of capital and connection to the world. In consequence, that the gap between poor and rich will probably grow (Expert X, personal communication, 06-05-2020). Respondent X describes this as followed:

'*Because the smart city concept is something new and expensive (an elite project for some cities), the poorer parts usually get looked over.'*

On top of this, Jones is talking about a competition between different smart city programs. As a result of this, the different cities are not working together and a national fragmentations of smart city programs arises. In this competition the political interest is not that much on the low-income problems says Jones (personal communication, 07-05-2020). Iskandar, who is a Urban and Regional Economics and Planning researcher at UGM-Yogyakarta (personal communication, 10-06-2020). said the following over this fragmentation:

'The issue is how we can implement these concepts and models of smart city/smart region/smart province while at the same time, we have fragmentation in regional governance due to decentralization and local autonomy.'

However, does this mean that the smart city is not relevant for the low-income part of the population? According to the experts. To give an answer to this both van der Krabben and Jones are saying that there is a potential for smart living. This potential exists because of the use of cellphones and media. They both agree that there are major differences between economical and urban sectors

of the western world and Indonesia, but that the use in internet and mobile phones is not that big. Therefore, in that sector there could be some changes for the low-income part of the population. It is expected that in 2022 more over the half of the Indonesian population have access to the internet. This is an increase of 65% with 2013. The use of smart phones is expected to increase with two-thirds in comparison with 2013. At the moment Indonesia is the number fourth largest mobile market in the world (Müller, 2020). This is also in-line with Pradoto who is a Lecturer in Urban and Regional planning at Diponegoro University (personal communication, 09-06-2020), who argued that phones are no longer a luxury item in Indonesia. However, Jones (personal communication, 07-05-2020) argued that most of this people are twenty years or younger and that the people above the age of thirty do not have many know-how about this. Therefore, he speaks of a rising technical divide. Expert X (personal communication, 06-05-2020) also said the following:

'When the smart city is implemented in a good way, this can help the low-income part of the population to become more involved in the city and get a connection with the big and rich part of the city.'

Nevertheless, this will be a faraway situation because the government will probably first focus on other issues like sewage, electricity and other facilities for a normal human life (Expert X, personal communication 06-05-2020).

5. Conclusion: The smart city relevance for the low-income

The focus of this research was how the smart city concept can help the low-income part of the population, especially in times of Covid-19. The main question of this research was the following: ***Are the applications/tools of the concept of smart cities relevant for the low-income part of the population in Yogyakarta, as a city in the global south, especially in times of Covid-19?*** In order to do this, there was taking a closer look at how the smart city can create better access to capital. To give a clear answer to the main question the four sub questions will be answered first.

How can the smart city be relevant for the low-income part of the population?

In order to describe how the smart city is relevant for the low-income part of the population the theory of Bourdieu and the DFID framework was used. From this the importance of capital building became clear to level the playing of society and to create more local empowerment for the low-income part of the population. The smart city should therefore offer the low-income part of the population a better access to capital. If this happens four things will follow:

1. The better access to capital is directly improving the quality of life.

2. The better access to capital creates a different social reproduction of the low-income part of the population which lead to an increase in the quality of life.

3. The better access to capital to decreases the impact of shocks and therefore increases the quality of life.

4. The better access to capital changes the social reproduction of the low-income part of the population, which lead to more influence on processes and structures. This will result into, for example policies take the will of the low-income part of the population into account. As a result of this, this will lead into two different ways to improve the quality of life: Firstly, because of this the impact of shocks will decrease and the quality of life increases. Secondly, because of this the quality of life will increase directly.

It is therefore of great importance that the smart city tools are creating more access to capital for the low-income part of the population. Because if this not happens well and the access of capital is not increasing for the low-income part of the population this can also lead that the 4 ways above will be negative and the quality of life decreases.

How is the smart city implemented in Yogyakarta, especially focusing on the low-income part of the population?

The main goals of the smart city of Yogyakarta are to achieve quality education and create a community with character and inclusivity. In order to achieve this, the smart city in Yogyakarta is adjusted to the local context. The smart is therefore not limited to the technology, but also whether it can solve problems effectively. The smart city program of Yogyakarta consist of 5 categories: 1. Smart governance 2. Smart environment 3. Smart culture 4. Smart economy 5. Smart society. To look at how these 5 categories could be achieved the framework of Rahmawati was used. In her framework she adjusted the 'original' smart city categories to the kampung area in Surabaya, Indonesia. This framework showed different criteria that needed to be achieved in order for a Kampung to become 'smart'. After this part the research looked at two tools of the smart city. The first tool are online platforms and the second tool is a smart city program that is only for the low-income part of the population. The choice to focus on these two tools was made because these two

tools were used in the smart city of Yogyakarta. In Addition to this, these tools also both have the potential to create more capital for the low-income part of the population.

What is the effect of the smart city applications/tools related to the capital of the low-income?

To answer this question this research looked firstly at the online platforms and secondly to the E-warong program.

In the first the two online platforms were discussed. Online platforms creates more social capital and simultaneously create a more inclusive society. In these inclusive society the low-income part of the population have a more emancipative potential, which can lead to more influence in processes and structures. With online platforms the low-income part of the population can create more local empowerment. In order to support these the Communication and Information Provincial Board of Yogyakarta is providing free Wi-Fi for poor areas. However, this is not functioning well at the moment. Free Wi-Fi access does not necessarily give rise to successful platforms. This depends also on the way they are implemented. In this research there were two online platforms were investigated; the Jogja smart service and the Cetagan Jogja. Jogja smart service is an app that was created to improve city services and create a more inclusive society. From this app the smart citizenship should be encouraged. The Cetagan Jogja is a Facebook and Instagram page, on which people can post information and problems, to which other people can react. However, they differ in their number of users. The Jogja smart service has only 2.622 users that are citizens of Yogyakarta. Cetagan Jogja's Facebook page, however, has 1.026.674 members. This difference is probably because the Jogja smart service app used a top-down approach and the Cetagan Jogja was created from a bottom-up approach. The smart city implementations that are therefore more low-key and bottom-up have more chance to succeed. The potential effect of this is that the way of thinking may change from inwards to outwards, on how they can contribute to the city. If the government assist this bottom-up approach then the low-income part of the population can also build more capital and And the low-income part of the population can become smart people.

The third tool that was looked at was the E-warong. This smart city program was especially designed for the low-income part of the population. The goal of this program is to improve the quality of life for the low-income part of the population. In the program low-income people are getting training and education in setting up their own business with the help of ICT. In addition to this, the members receive staples food or electronic money. In order to get behind the impact of the E-warong for their members a survey was done. From the results of the survey could be concluded that the participants are very positive about the E-warong program. The reason they gave the most often for this was because of the (extra) income. With the E-warong they feel more financially independent and have a better chance of making a living in the city. The E-warong can therefore be seen as a good program that offers their members better access to capital which leads to an improved quality of life. However, this program has only 250 members in comparison with the total of 29.4500 low-income people living in Yogyakarta. There is therefore a danger of getting a exclusive smart city community inside the low-income community.

The effect of the Jogja smart service cannot be described as relevant for the low-income. However looking at the Cetagan Jogja and the E-warong the effect can be seen as relevant. This because with these two applications the low-income have a change of building capital, which can lead to a better quality of life.

How can the smart city concept currently help the low-income part of the population with the Covid-19 crisis?

The online platforms are a tool of the smart city, which could help the low-income part of the population. This is because on this platforms information about the virus could be spread. Therefore, the two of the problems of previous natural disasters could be decreased. This problems where the lack and distribution of information. A prerequisite of this is again that the government needs to provide the access for the low-income part of the population, in order for this platforms to be a help for the low-income. In the case of the E-warong, the program was seen as a good help during this Covid-19 crises according to the survey. The respondents said that this was mostly because they received basic goods and needs, this help was however only for E-warong members. The other people of low-income were also helped because of the E-warong offers them a place where they can shop closer and cheaper to home. Therefore, the risks of the low-income part of the population in spreading or getting the virus is declined.

What are the criticisms the smart city have to deal with in the global south?

The criticisms has mostly to do with the fact that there is often a lack of institutional capital for implementing such projects as the smart city. The effect of this is that some programs focused on the low-income part of the population are greenwashing the smart city program. Therefore, the ideas are often good but the implementations on local scale are often missing. In addition to this, the smart city is not something high on the agenda of the low-income part of the population. They are more occupied in maintaining a lifestyle. Therefore, the relevancy of the smart city is questioned for the low-income part of the population because they probably want a normal life first.

To conclude this research an answer was given to the following main question: ***Are the applications/tools of the concept of smart cities relevant for the low-income part of the population in Yogyakarta, as a city in the global south, especially in times of Covid-19?***

The application/tools of the smart city shows in this research how the access to capital can be increased. In the case of the online platforms it became clear that if the government provide the access for the low-income part of the population to this platforms, this can increase the quality of life also in times of Covid-19. However, at this moment the government is providing this access in some poor areas but this do not function well at the moment. In addition The low-income part of the population therefore have more difficulty in accessing these platforms and be a part of a more inclusive society. For now it is therefore difficult to say wat the impact of these platforms on the low-income part of the population is. At this moment the impact is maybe not that high because of that the government does not provides enough access to it for the low-income part of the population. However, in the future this can be different If the government can improve this. In the case of the E-warong tool it can be said that this is relevant for their members. The program is increasing their access to capital which lead in the end to more financial independency and a better chance of making a living in the city. However, this program only has 250 members in comparison with the total of 29.450 people of low-income living in Yogyakarta. Therefore, the relevancy for all the low-income part of the population in Yogyakarta is not high. However, when the government increases this number of participants and make people more aware of this program the relevancy for the low-income part of the population can change. In the end , the smart city tools/applications related to the low-income part of the population are not yet relevant for all the low-income but are showing relevancy for the future of the smart city.

6. Recommendations

In this part there will be first some recommendations for further research and second there will be some recommendations for smart city applications/tools.

The first recommendation for further research would be to look at the role of only women participating in the E-warong program. Is there for instance more poverty alleviation because of this? And how are the roles in the families changed by this? The second recommendations will be to look at the if the benefits of the smart city are truly spread equally in Yogyakarta. In addition to this, there could be an investigation into the question of whether the higher levels of society are not more benefiting from the smart city then the low-income part of the population. The last recommendation would be to focus more on the lack of institutional capital and why Yogyakarta is still implementing such complex implementations like the smart city.

The first recommendations regarding smart city implementations, is to use the bottom-up approach and to listen to the needs of the low-income part of the population. If you do this the low-income part of the population will also feel like they are heard and likely more to participate in the city life. The second recommendation is to expand the E-warong program. The members are very positive about this program and the idea of the program is also good for building capital. I would probably also investigate, like described above, the role of the women in these programs. Because if the women are indeed creating more poverty alleviation, I would suggest to make this program only for women to make it more effective.

7. Reflection

The first intention of this research was to do this in Yogyakarta, Indonesia. This, however, never materialized due to the impact of the Covid-19, which disallowed travelling to international destinations, or even for any kind of physical fieldwork. The research had therefore from the beginning difficulty in making assumptions about a place I did not went to. Another drawback of this long-distance research was the time difference. Because of this the communication between me and some respondents was difficult. In addition to this, some of the respondents just stopped answering emails. For the next research it would be therefore better if there was not a worldwide pandemic going on. Going back on reflecting to my on research several things could be better next time. Firstly, I must make a better plan on what to research specifically. In this research I just found a lot data first and as a result of that I could not make clear anymore what the through purpose of my research was. One of the reasons for this was I rewrote my first research proposal to focus more on Covid-19. This resulted into even more data and more difficulty in finding my way into this data. Secondly, it would be better If I do an cursus on writing good English to improve my own skills in writing. lastly, it would be better if I check to coherence between different parts from the beginning on. This time I checked this too late in consequence that making it coherent again costs a lot of time.

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