Smart Cities and Forced Trust: Citizens' Attitudes Towards Smart City Innovations

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Smart cities are cities that implement smart innovations and applications to improve the everyday-life of their citizens. Innovations can be, for instance smart infrastructure, smart education, smart governance, smart healthcare and smart citizens. The different dimensions of smart cities are human dimension, technological dimension and institutional dimension.

The smart city we will observe in this thesis, is the city of Salo, which is a small smart city on a world's scale. The city of Salo is implementing smart systems and innovations, and the question we wanted to ask is, how the citizens see innovations, when their trust is forced. We created a survey questionnaire which tries to help understanding citizens' attitudes towards new smart applications.

At first, we did a literature review on trust and forced trust and tried to solve the ethics of the latter. The second part was to create the survey questionnaire for the citizens of Salo and to expand it to cover other participants in Finland. The results showed that there weren't a lot of differences between gender groups. However, between the age groups there were some differences, when it came to the factor of forced trust. Most of the comparison groups also saw forced trust as a supposition and non-optional factor when they had to place their trust in technologies.

Keywords: smart city, trust, forced trust, Salo smart city

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1 INTRODUCTION

Forced trust is a relatively new term first introduced in Soviet Russia and after that in a few publications from the University of Turku. Smart city as a concept is again a developing term, and these smart cities aim to provide modern and futuristic aspects to handle cities government and their citizens' well-being.

How to combine trust, forced trust, and smart cities is a rising dilemma when smart cities are being developed and designed. Since smart cities handle sensitive data of the city's services and especially about its citizens and their way of living, it is vital for the city that its citizens trust in the city's and its decision-makers' ways to handle sensitive data.

In the following chapters trust, forced trust and smart cities are explained more in detail. In addition, it is discussed how the relationship between a smart city and its citizens' trust could develop in the future and how both parties could positively and productively benefit by working in symbiosis.

This thesis is written to develop especially the city of Salo's future smart city services and the city has funded the research. The aim is also that Salo smart city project will benefit from this research. To understand better the acceptance of new smart city technologies we will create a survey questionnaire from existing models and their factors. Because there is no prior work similar to ours we will also have to create some additional factors for the survey. Lastly we will analyze the questionnaire participant answers.

1.1 RESEARCH PROBLEMS

When talking about smart cities, technologies and services are usually designed on the city level without the citizens participating in the design of smart systems. This creates the situation where the citizens might be forced to trust in the technologies, them wanting those or not. The citizens can for sure give their opinions and desires about smart applications and services their city would provide, but in the end the city's decision-makers and technology or service providers have the end responsibility of these designs.

The most optimal situation would be that the citizens trust the services their city is providing and they would trust that the city and its service providers are designing the technologies for the benefit of the citizens. When the citizens are forced to trust their decision-makers and third parties blindly, this can create problems accepting the provided smart technologies and services. This again can have an affect on using the smart implementations, misusing them or in extreme cases the citizens distrusting their decision-makers and eventually moving to another city.

While designing smart cities, it is therefor essential to keep in mind that there are different people living in a city. The people are from different backgrounds, they might have cultural differences, as well as different political and sociological views and they usually are of different age groups. For instance, for older generations it can be difficult to use even other modern technologies, not to mention smart city technologies like mobile apps designed to support a city's decision-making though this is not the case for all. Younger people again could be more accepting towards new technologies and towards learning to use them.

The models and theories used in this study to evaluate citizens' acceptance towards smart city technologies and services should provide new perspectives to these problems and possibly facilitate the possible smart city designs. While there is very little literature about forced trust in smart cities or even towards other modern

technologies it is however difficult to compare these research models to other ones. There is only a handful of literature about forced trust but this thesis can still make a base for all the future researches to come.

1.2 SALO SMART CITY PROJECT

Salo is a midsize city in the Southern Finland and the city used to be the hometown of the telephone giant Nokia's factory. On the world's scale Salo can be referenced to be a small city. The termination of Nokia's operation's in Finland made the company cut off many of their employees, and from 2010 until 2013 Nokia reduced hundreds of employees at their factory in Salo which affected heavily on the city's taxation and unemployment rate [1]. Nowadays Salo has approximately 52 000 residents and 5000 companies. The unemployment rate in March 2021 was 13,3 percent and geographically the Salo area is 2 168 km^2's [2].

The population of Salo has been declining for years [2], which has lead to the decision-makers in Salo to start new projects to improve or maintain the attractiveness of their city. Salo Smart City project discussed in this thesis is one of the ongoing future projects, and this thesis aims to provide new helpful aspects to the city of Salo in their Smart City Project.

The city of Salo has promised the following to their future smart city: smart governance, smart education, smart healthcare, smart building, smart mobility, smart infrastructure, smart technology, smart energy and smart citizen [3].The project collaboration with the University of Turku also aims to produce researched knowledge about designing a smart city, the cybersecurity of a smart city and about the data transfer that is required for a smart city [4].

The decision-makers of Salo have also decided that their citizens would benefit from a smart city app that would, for instance, be a platform for the communication of citizens, provide information about the parking slots in the city area and provide

a more suitable way to participate to the city's decision-making. The application would be developed for different kind of online services as well as for smart devices. The idea is also to have different features for different groups like for the Salo citizens and for tourists and visitors. [3].

While most of the Salo Smart City project's features require a huge amount of data it will be important to have some kind of knowledge base. Properly managing and protecting the knowledge base's data will be vital when maintaining the continuity of the smart features as well as protecting the city's and its citizens' sensitive information. For the continuity and possibility to improve smart applications and services it is also important that the data is reusable. This again can create trust issues towards the smart applications and services which we are examining in our study and which will be covered in Chapter 5. [3]

1.3 RESEARCH QUESTIONS AND THESIS STRUCTURE

The aim of this thesis is to provide new views on smart cities and the trust and forced trust the citizens of these cities show and feel towards smart city services and applications. Research questions of the thesis are the following:

- RQ1: What is trust and especially forced trust, and the ethics of these two?
- RQ2: What are smart cities and small smart cities?
- RQ3: How does forced trust affect on the citizen perspective and their acceptance of smart city services and applications?

This Introduction chapter provides general thoughts about this thesis, an overlook on Salo smart city as well as the research problems about forced trust and

smart cities. Chapter 2, Trust and Forced Trust, explains the concepts and differences between trust and forced trust and the factors affecting these. Chapter 2 also covers ethical view towards the situation where citizens are forced to trust their decision-makers and the smart city's ability to provide secure services protecting the citizens' data.

Chapter 3, Smart Cities and Digital Transformation, covers the idea and concept of smart cities and digital transformation and defines especially the concept of small smart cities. As a continuation Chapter 4, Methodology, handles the models and theories to measure the citizens' attitudes towards smart cities and in general towards technology.

Chapter 5, Study and Discussion, provides the study's results and discusses about the possible effects on the results. Chapter 5 provides general discussion of the topic as well. Chapter 6, Conclusions, concludes this thesis and the Salo smart city case study. In Conclusions there is also a discussion about the possibilities to new smart cities as well as the potential views and suggestions for researches covering the same topic of forced trust towards smart cities in the future.

2 TRUST AND FORCED TRUST

2.1 TRUST

Since one of our main interests in this thesis is forced trust, we must first define what trust itself means. The definition is not so easy since trust can have multiple meanings depending on the literature at hand as well as from which point of view we are looking at the term and the context in which the term is used. The trust we handle in this thesis is an abstract concept and not a verb and something to do so we can focus on trust as a noun.

Many modern dictionaries refer in their definitions that trust is something between people, within people and between people and objects. Trust is therefore interpersonal-reliant as well as internal-reliant in humans' mind. In Cambridge Dictionary trust as a noun of belief is "the belief that you can trust someone or something"[5]. It is relationship that is "based on trust and understanding". When the context is different the definition varies a little. For example, the noun of trust in business English is "a belief that you can depend on someone or something" [5]. According to the Merriam-Webster dictionary again trust is for instance "assured reliance on the character, ability, strength, or truth of someone or something" and "one in which confidence is placed" [6].

Merriam-Webster dictionary mentions also the antonyms for trust: mistrust and distrust. Mistrust refers to the "absence of trust" and to a situation when there is

no confidence in someone or something [6]. Another verb that could be used instead of mistrust is distrust. For example "she had a distrust in the system". Mistrust and distrust could be then considered as synonyms.

The history of trust as a noun can be tracked to circa 1200 when it has been used in Old Norse (the predecessor of modern Scandinavian languages). The then used word *traust* meant "reliance on the veracity, integrity, or other virtues of someone or something; religious faith" [7]. Therefore we could deduce that trust has something to do with faith so trust is faith towards someone or something.

With these definitions above we can understand what is plain trust. In the case of the Smart City of Salo the ideal objective is to have trust between citizens and objects (the citizens' trust towards smart city technologies and implementations) as well as between people (the citizens' trust towards the city's decision-makers). Next we can define what means the situation, where trust is not optional but mandatory: forced trust.

2.2 FORCED TRUST

Forced trust as a term is a relatively new one. Most of the early definitions of forced trust refer to the Soviet Union or to the Republic of China and to their societies as a kind of Orwellian dystopias. One of these early definitions from 2013 by Tikhomirov [8] describes forced trust in relation with the Soviet Union "as a central feature of Communist modernity". He argues that "Forced trust represents a paradox that contributed to the collapse of the Soviet state: an illiberal system was promoting a liberal subject who was forced to trust in the state and the party but, at the same time, experienced their limited autonomy by generating personal meanings, interests and needs as a part of life under the dictatorship." [8].

When searching scientific publications and more recent studies about forced trust in information era only few can be found as Halla-Aho has explained in his thesis

[3]. According to Halla-Aho, only three articles before his, refer to forced trust with information technology: Hakkala [9], Hakkala et al.[10], and Madhisetty and Williams [11].

According to Hakkala [9] forced trust is a situation where a user has no other choice than to trust the system and to "a type of situational trust in which the party in the position of forced trust has no other choice but to trust all aspects of the provided system". According to Hakkala et al. forced trust concept "depict a situation where an entity – whether a customer, an organization or even a governmental agency – does not have a privilege to choose but is instead mandated to use a dictated information system." [10].

Another view of forced trust is presented by Madhisetty and Williams who discuss forced trust with the privacy of shared photos and videos. According to them forced trust is "trust that is unclear if it is real trust by the content publisher or a belief that no harm will be done after publication" [11]. The latest publication by Halla-Aho refers to forced trust with smart cities and describes forced trust as "a situation where a truster has no choice but to trust a trustee, or services provided by the said trustee, with no or minuscule ability to influence the function or behaviour of the target of trust, i.e. the trustee or the services." [3].

In this thesis we will also be using the terms truster and trustee. These are defined by Hakkala et al. as follows: "the trustor is the party who is placing trust on someone (or something) else, while the trustee is the target of this trust" [9]. In our case the trustors are the citizens of Salo and the trustees are the decision-makers of Salo and the smart city implementations and technologies.

2.3 FACTORS AFFECTING TRUST

There are several aspects on what affects on people's trust when it comes to technology. The examples, from a more societal point of view, are national regulations

in Finland and European Union's GDPR, user's previous technological experiences, user's prior technological knowledge and societal pressure.

2.3.1 GDPR and national regulations in Finland

When users' sensitive and personal information is handled with information systems, regional and national regulations for handling users' data is needed for public and private companies. Sanctions must be then defined beforehand since this could prevent most efficiently the misuse of users' data. Some warning examples have been seen for instance with the introduction of EU's GDPR. For example the French data regulator CNIL fined Google in 2019 for 50 million euros for "lack of transparency, inadequate information and lack of valid consent regarding ads personalisation" [12]. On GDPR's official website there are ten different criteria to define the amount and severity of a GDPR fine [13].

The General Data Protection Regulation, shortly GDPR, was first introduced in May 25 2018 and it is used in the area of the European Union. On GDPR's website it is stated that the regulation is "the toughest privacy and security law in the world" [14]. One of the most important aspects of the regulation is that the user has a right to withdraw their personal data at any time from any service provider. The client has also right to know for which purpose their data is being used for.

In Finland there are some national regulations about data privacy. For instance handling a Finnish person's social security number is permissible only when a person has accepted the handling of their social security number or when the handling is justified in the law. Some exceptions are however permitted for example when it comes to historical or scientific research or statistics. Another exception is public sector and as Halla-Aho mentioned in his thesis, it is said in the Finnish data protection act, that: "An administrative fine cannot be imposed on central government authorities, state enterprises, municipal authorities, autonomous institutions

governed by public law, agencies operating under Parliament or the Office of the President of the Republic, or the Evangelical Lutheran Church of Finland and the Orthodox Church of Finland or their parishes, parish unions and other bodies."[15].

Another exception is when a registrar needs the social security number and some other sensitive information for their services to fulfill their duties. The companies and institutions handling peoples' private information must however always protect the rights of their customers and for instance pseudonymisation and encryption of the data is mandatory. In the Finnish data protection law the sanctions for data misuse are defined as well. [15]

2.3.2 User's previous experiences

There are some previous studies about companies misusing their consumers' data and systems due to the difficulty and inadequate education of their personnel. For instance a private hospital in Australia implemented new information system in 2015 and failed to educate their employees using the systems. This lead to misusing the systems and their patient data. The personnel found a way to create shortcuts to the new difficult systems, and in the end this created funding problems to the hospital and in addition their patients' trust towards the hospital itself. The case was published for teaching purposes, but is based on real-life just the names changed. [16]

Another good example from real life is the Finnish psychotherapy center Vastaamo case. In 2020 there was a huge data leak from a psychotherapy center Vastaamo which resulted from poorly handled client database. Thousands of clients got affected by this and their personal information as well as their personal psychotherapy session information was leaked to tor network, where it was for everyone to see or to be downloaded [17].

These cases are good examples of why national requirements are needed and how

past experiences could affect users' or clients' trust towards information systems in general. For instance after the Vastaamo leakage it could be very hard ever again to trust on any company, private or public, to handle personal information and to even try psychotherapy again.

2.3.3 User's prior technical knowledge and social pressure

Another thing to keep in mind is that some people do not have any experience or knowledge about technicalities and how and why their data is handled. For instance elder people who have not been growing up with computers and smart phones might be negative towards new technologies because of their lack of knowledge. Another group is people in countries that do not have stable internet connections, computers or even phones. How can one trust a system they have never used before?

American Psychological Assosiation, APA's definition of social pressure is heavily linked to group pressure. A person might have a huge pressure for instance to belong to a group which could affect on their views on forced trust. People search for social approval on others in their group (ethical, religional, geographical, etc.) and if the others in their group are trusting or distrusting new smart city innovations, it is more likely one person looks at the situation through group's point of view. [18]

2.4 THE ETHICS OF TRUST AND FORCED TRUST

While the ethics is a vast term, in this thesis we focus on the ethics of trust and forced trust. As mentioned in Chapter 2.1, trust can be seen almost as a religion when people "put their fate" in a system. In other words this could be seen as a reliance towards smart city innovations and towards the third parties who handle the data. Another interesting theory is that trust can be seen valuable from a philosophical

point of view. Trust is something of an value for both parties the trustor and the trustee. For instance smart city's recycling system could benefit from multiple users and their data, as well as the users could benefit from the recycling system and its developments. [19]

When it comes to forced trust it's harder to find bibliography to handle the ethical view. However, Hakkala [9] points out the concept of Panopticon and it seems to suit this thesis as well. The idea of Panopticon is based on the work of Jeremy Bentham in the 18th century. It focuses on the view of surveillance society and is described to be a circular prison where every cell is visible to the supervisor in the center. In the 20th century this idea was used for instance by George Orwell in his book Nineteen Eighty-Four. In our case the prisoners could be seen as the smart city citizens, the trustors, and the supervisor as the smart city innovation provider, the trustee. Bentham pointed out that the prisoners could not know when they are under surveillance and this could encourage them to behave in better ways. Again taking the recycling example from the previous chapter: the smart city citizens know that their recycling data is being surveilled, and this could have an affect on their recycling habits. Positive or negative is yet to be discovered since the citizens could throw unwanted waste material to their neigbors' or to someone else's trash if they would not want to be linked to that waste. The positive outcome could again be recycling more coherently if knowing that someone is surveilling the waste management process. [9] [20]

One objection to continuous surveillance is privacy and whether the trustors have privacy if they live in Panopticon. It can be assumed that the more there is trust, the less there is need for privacy. The argument can go to other way as well and it can also be assumed that the more there is pressured surveillance, the less there is trust. When it comes to smart cities the most optimistic view would then be that the citizens know there is no extra surveillance nor surveillance of anything

in vain and the smart city system providers trust that the citizens or the trustors are being honest with their data, e.g. with waste management. Knowing there is no punishment of wrongdoing would lead to more trust between the trustors and the trustee as well. [20]

Some other objections are with independent autonomy, authority and e.g. social sorting. These concepts will yet to be discovered with smart cities. For instance how will the usage of smart city innovations divide citizens based on their socioeconomic status, age or religious background? Who is the highest authority when it comes to handling citizen data - the product designers, the citizens themselves or the city's decision-makers? How will continuous surveillance of citizen data affect the trustors autonomy and free will? These questions will have to be considered in the future when implementing smart city technologies and working together with the citizens to create the most functional and trustworthy city for everyone.

3 SMART CITIES AND DIGITAL TRANSFORMATION

Currently there is a rising amount of smart cities around the world and it has been predicted that many will be developed in the future. The dimensions of smart cities include, according to Cocchia et al.[21], technological dimension, human dimension and institutional dimension. Another categorization can be done with the definition of Yin et al. [22] with technical infrastructure, domain application, system integration and data processing. While smart cities focus around urban areas and improving the quality of life for the citizens, we should also view the concept of digital transformation since the applications that come out of digital revolution are used in the creation of smart cities.

3.1 DIGITAL TRANSFORMATION

Digital transformation is a broader term than a smart city and it can be applicable to private and public sectors, to companies and individuals. Digital transformation has digitization and digitalization as its basis. Digitization means transferring analog data into digital form and digitalization again involves using digital technologies to improve for instance business processes, like new software platforms. Digital transformation goes beyond specific project level and can affect the whole organization. The digital transformation process is portrayed in figure 3.1 [23]

Figure 3.1: Digital transformation process

A good example about digital transformation is e-government. EGDI (E-Government Development Index) of United Nations is a good measure of e-governments, and it is calculated with three independent component averages: the Online Services Index (OSI), the Telecommunications Infrastructure Index (TII) and the Human Capital Index (HCI). At the moment, Europe has the highest EDGI value with 0,85 (the world average 0,64) portrayed in figure 3.2. It has also been stated, that higher-income countries tend to have higher EDGI values. [24]

Average values for:	Year	EDGI	OSI	TII	HCI
193 UN Member States	2024	0.6382	0.5754	0.6896	0.6494
Africa	2024	0.4247	0.3862	0.4534	0.4346
Americas	2024	0.6701	0.5797	0.7345	0.6962
Asia	2024	0.6990	0.6401	0.7740	0.6828
Europe	2024	0.8493	0.7836	0.9227	0.8418
Oceania	2024	0.5289	0.4378	0.4885	0.6603

Figure 3.2: EDGI ratings of UN member states [24]

When we compare the top e-governments, two countries that pop out are Denmark (ranked world number 1) and Estonia (ranked world number 2). Denmark has multiple comprehensive portals for its citizens, and it "emphasizes cross-sector

collaboration, integrating public, private and civil society efforts". The country has also focused on strengthening its cybersecurity. When it comes to Estonia the country has had proactive services for years and is a pioneer in "integrating AI, cybersecurity and – 5G". It has been stated that the citizens in Estonia can do basically anything online. [24]

Finland as an e-government has had the world rank of 9 in 2024 [24]. The Finnish Digitalisation program, which is handled by the Finnish Ministry of Finance, has stated that during the years 2019-2023 the amount of digital services in use was 162 and in progress there were 224 services. The themes for the digitized online services for private persons were social security, healthcare, education, employee services, family and relationships, culture and freetime, etc. The themes for businesses again were establishing business, acting as an employer, businesses monetary support, taxation, etc. [25][26]

3.2 SMART CITIES

The definitions of a smart city vary by different authors and researches and there are multiple definitions for smart cities. Based on the literature searched for this thesis, the most popular one is that for the city to be smart it must have five of the following (covered also in the figure 3.3)[3]:

- Smart governance (the city's governance is organized in a smart way)
- Smart education (the citizens' education utilizes smart implementations)
- Smart healthcare (the healthcare is designed around smart technologies)
- Smart building (the city's building projects are designed using smart implementations)

- Smart mobility (the city's mobility, e.g. public transportation, is organized in a smart way)
- Smart infrastructure (the infrastructure, e.g. water distribution is organized in a smart manner)
- Smart technology (the overall technology of the city is smart)
- Smart energy (the energy distribution is organized in a smart way)
- Smart citizens (the citizens use e.g. smart applications to participate in the city's decision-making)
- Smart waste management (the city's waste management is organized in a smart way)
- Smart agriculture (the agricultural operations utilize smart implementations)

Since smart cities are based on technological solutions, sensors and sensor networks that handle different kind of data, it also important to recognize the technological aspects which are expected from smart cities and the handling of their data. According to Harrison et al. [27] it is vital to emphasize on three features: the near-real-time data obtained from the sensors, the interconnections of services and technologies inside a city and an intelligence analysis of the data handling, analyzing, optimising and visualising. To summarize all these definitions it can be said that the definition varies from the point of view you are looking at it. For example the sociological and psychological views are very different compared to the technical views mentioned above.

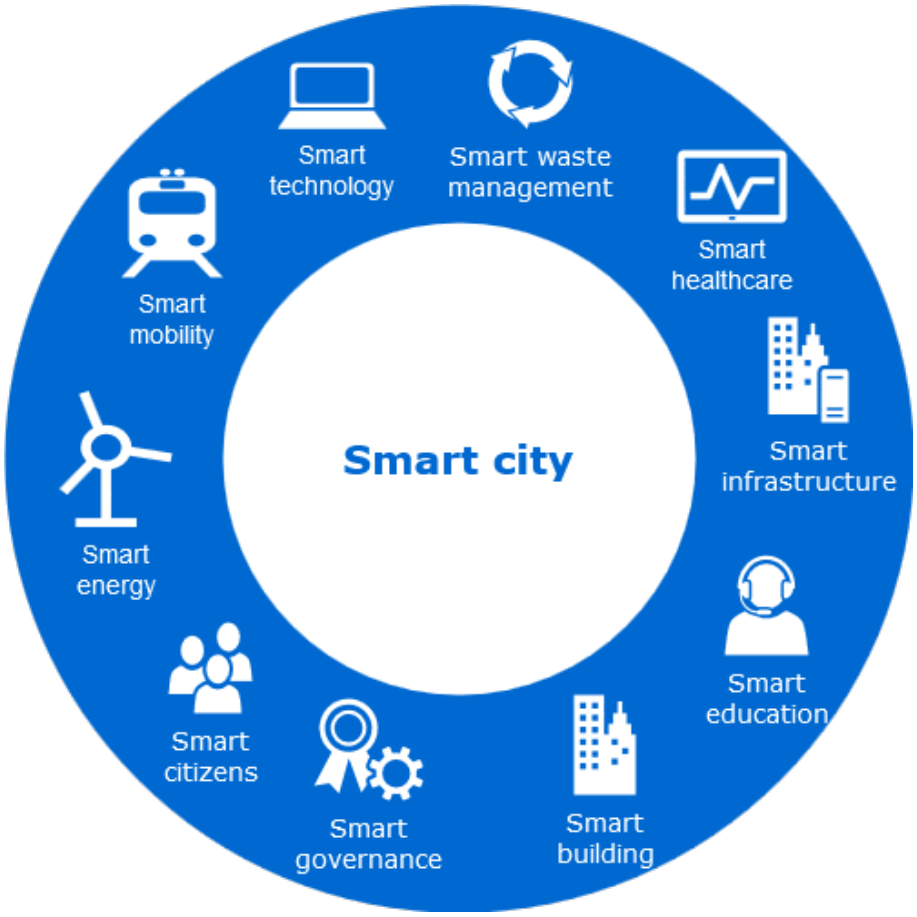

Figure 3.3: Smart city objectives

3.3 SMALL SMART CITIES

The city of Salo which is discussed in this thesis, can be described to be a small city for example when compared to the top 10 smart cities mentioned in the previous chapter. According to Halla-Aho [3] small smart cities are usually more agile since the governance and the amount of decision-makers is smaller than in larger cities and metropolitan areas. A small city's population can also be more homogeneous and the cultural background can be very limited compared to bigger cities, like Singapore, which has residents from different cultures around the world.

While the city's governance and decision-making can be easier to organize in

small cities, it can create some difficulties and limitations as well. For instance in Salo the population is aging since many of the working aged people are moving to bigger cities. This can lead to the assumption that the citizens might not be technology oriented and technology-driven. The education can be however easier, since there is less population to educate and the social distance between the citizens and the decision-makers is generally smaller than in bigger cities with millions of inhabitants. In smaller cities like in Salo the residents might also experience that they can contact the city's government more easily and have an opportunity to make an impact on the services that already exist or are about to be designed.

3.4 FUTURE TRENDS

The increasing amount of studies about smart cities can indicate the development of smart cities gaining more popularity. While most of the implementations are done in bigger cities and metropolitan areas this could also lead to smaller cities following the trend. The ten leading smart cities in 2024 were from 1 to 10: Zürich, Oslo, Canberra, Geneva, Singapore, Copenhagen, Lausanne, London, Helsinki and Abu Dhabi. The list is also portrayed in figure 3.4. The cities are divided into four groups by the Human Development Index (HDI) score. By the IMD Smart City Index 2024: "within each HDI group, cities are assigned a 'rating scale' (AAA to D) based on the perceptions-score of a given city compared to the scores of all other cities within the same group". [28] The groups are:

- Highest HDI: AAA-AA-A-BBB-BB
- Second highest HDI: A-BBB-BB-B-CCC
- Third highest HDI: BB-B-CCC-CC-C
- Fourth highest HDI: CCC-CC-C-D

None of the cities mentioned above cover yet all the definitions for a city to be smart, but all of them cover at least one definition of a smart city. For instance London has the ambition to provide open access to WiFi in public buildings and on the streets, Oslo is trying to cut its emissions with smart energy distribution and Singapore provides its citizens some smart housing possibilities. [28] [29]

City	Smart City Rank 2024	Smart City Rating 2024	Structure 2024	Technology 2024
Zurich	1	AAA	AAA	AA
Oslo	2	AA	AA	A
Canberra	3	AA	AAA	A
Geneva	4	AAA	AAA	AA
Singapore	5	A	A	A
Copenhagen	6	AA	AA	A
Lausanne	7	AA	AA	A
London	8	A	BBB	AA
Helsinki	9	AA	AA	A
Abu Dhabi	10	BB	BB	BB

Figure 3.4: Smart cities top 10 HDI comparison by IDM Smart City Index Report 2024 [28]

The smart city we will review more in-depth from the top 10 is Finland's capital Helsinki since it's a city in Finland and thus linkable to the city of Salo. However there are differences with the two cities since Helsinki is the capital of Finland and there are 1,7 million inhabitants in the Helsinki-Uusimaa region. The area consists of 26 municipalities which size varies from 600 000 inhabitants to 2000. All the municipalities are agile and function as a platform. The region is the second most innovative region in Europe, and was the second best smart city in the IMD Smart City Index 2020 comparison. The area also won European Enterpreneurial Region (EER) label in 2021-2022. [30] [31]

The three priorities for Helsinki-Uusimaa in 2030 are:

1. Climate change mitigation - carbon neutrality by 2035

2. Economic competitiveness - increasing research and development areas

3. Citizen well-being - achieving employment rate of 80% by the end of 2030

The smart city project is providing applications for the Helsinki main area as well as to the more rural areas of the Uusimaa region. The heart of the smart city development has been Helsinki's Kalasatama residential area which is developed with the cooperation of its citizens. Helsinki actually counts so much on its citizens that the city is adhering MyData principle and the citizens are the owners of their own data. [30] [32]

One of their main themes is citizens' city, and this covers for example transportation, housing, urban planning and healthcare which they desire to design together with the citizens with data that has been made public [30]. One interesting ongoing project for the citizens that could also benefit the citizens of Smart City Salo, is gamificated walking tour for the senior citizens. During the walking tour there are stopping points where there might be some information about the surrounding nature or history and some stopping points are for physical exercise designed especially for the elder citizens. Another interesting project is a light installation which entices the citizens to go out and to be part of diverse installation. Both of these projects are part of bigger Kauko project which designs to shape the city with citizens' well-being innovations. [33]

4 METHODOLOGY

4.1 QUESTIONNAIRE DESIGN AND DATA COLLECTION

The research questionnaire was organized as a voluntarily web questionnaire done with survey and reporting platform Webropol, and the models mentioned in the proceeding chapters were handled with different statements to which the respondent had to choose option describing them the best. The statements had an option to be answered according to the 5-point Likert scale which had five options: strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. All the Likert scale questions were mandatory for the participants, since all the questions were vital to the models used in our survey. The questionnaire items are included in the Appendices of this thesis.

At the start of the questionnaire we asked what were the respondent's general attitudes towards technology to unfold the respondents' level of competence in technology. Only in the following page of the questionnaire it was explained what are smart cities and after this the questions were more smart city related. The term forced trust wasn't used at all publicly since this could have affected possibly in a negative way to the respondents' answers.

After the questionnaire survey had been open to be answered approximately eleven months the amount of answers was 99. During the first month the question-

naire was open solely to the citizens of Salo, after which the amount of Salo citizens' answers was 20. It was then decided that the questionnaire should be opened to the public and other citizens' of Finland since 20 answers was too low. We started to promote the questionnaire via social media and email and were able to gather 79 more answers.

4.2 BEHAVIOURAL-REASONING THEORY

According to Westaby [34] modern theories that are linked to behavioural intentions, are based on the Theory of Reasoned Action by Fishbein & Ajzen [35], and the Theory of Planned Behavior by Ajzen [36]. These theories cover from a psychological point of view, how a person's *belief concepts* affect to their *global motives* and this way to their intentions, and thus to their behavior. Westaby also notes there are multiple other studies on the sociology field. [34]

In his study Westaby introduces a whole new model based on its predecessors: the Behavioral Reasoning Theory (BRT). While the traditional behavioral models explained how belief concepts such as behavioral, normative and control beliefs together with global motives create intention, Westaby adds the concepts of reasons and values as an influence in addition to the original objects. The reasoning theory from his earlier work with Fishbein [37] creates the basis for this hypothesis by suggesting reasons being behind people's actions. Through a set of studies tested with different scenarios he comes to the same conclusion with his newer study that "reasons serve as important linkages between people's beliefs, global motives (e.g., attitudes, subjective norms and perceived control), intentions and behavior." [34]

Two models that land under concept of Behavioural Reasoning Theory and which we are using in our study, are Innovasion Diffusion Model (IDM) and Innovation Resistance Model (IRM). As Westaby introduced in his study [34], the reasons in BRT can be divided into factors for and factors against covered in the figure 4.1.

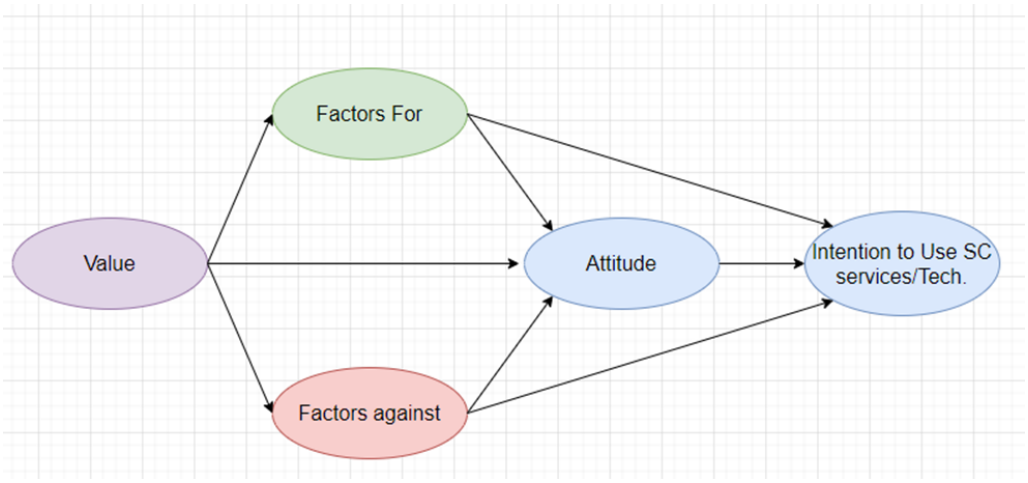

Figure 4.1: The model for intention to use technology

4.2.1 Innovation Diffusion Model

Innovation Diffusion Model is based on the Diffusion of Innovation (DOI) Theory by Rogers [38] and the model's creator has been publishing new versions of the original model throughout the years. In his sociological theory Rogers states how innovation (e.g. new idea) is received in public after the knowledge of the innovation has spread over a population. The spreading process is diffusion which does not happen all at once, but through social stages. The objects affecting diffusion are:

1. What is perceived as an innovation
2. What are the means of communication
3. Time used in this process
4. The social system in general

In their work, Rogers suggests how innovation adaption depends on the factors of relative advantage, compatibility, trialability, observability and complexity. These are also the factors we will review in our study as the factors for. [38]

4.2.2 Innovation Resistance Model

Innovation Resistance Model's base is the opposite from IDM. When IDM concentrates on the positive and assumes that at some point people will accept new innovations, IRM focuses on the resistance towards new innovations. The model was first discussed by Ram and Sheth [39] to understand the underlying reasons of customers' rejection of innovations. To understand better whether the citizens of Salo would accept or reject smart city innovations it is good for us to take IRM under the study as well.

The functional barriers Ram and Sheth list are:

- Usage barrier
- Value barrier
- Risk barrier

The psychological barriers again, are:

- Tradition barrier
- Image barrier

The usage barrier reflects the negativities in use, e.g. that the innovation usage is too different from the one people are used to. Value barrier is straight comparable to the price-value and risk barrier represents the risks new innovations can bring to the person(s) using those. Tradition barrier refers to the difference a user would have to make to their traditions in order to use new innovation. And at last image barrier is the possible negative appearance a user might receive even before using the innovation. [39]

4.3 TECHNOLOGY ACCEPTANCE MODELS

In the comparison of IDM and IRM, IDM is about the factors for acceptance and IRM is about the factors against acceptance. The other models we decided to use in the Salo Smart City study are Technology Readiness Index 2.0 (TRI 2.0) and some parts of the Unified Theory of Acceptance and Use of technology (UTAUT).

4.3.1 Technology Readiness Index 2.0

Technology Readiness Index was first introduced in 2000 by Parasuraman who has later updated their model to meet the modern requirements of what technology nowadays offers to us. The TRI 2.0 was updated by Parasuraman and Colby [40] who have added some items to the Technology Readiness scale of 36 items first introduced with the TRI 1.0. The new list contains 45 items which disperse under four categories:

- Optimism
- Innovativeness
- Discomfort
- Insecurity

All the items focus on users' personal characteristics and of the four, optimism and innovativeness are motivators for technological readiness while discomfort and insecurity are inhibitors. [40]

4.3.2 Unified Theory of Acceptance and Use of Technology

The first version of the UTAUT was developed by Venkatesh et al. [41] and it handled the subject of technology employee usage of solutions. The new version of

this model the UTAUT2 by Venkatesh et al. [42] was designed to target consumers instead of employees. In the original model there were four key items:

- Performance expectancy
- Effort expectancy
- Social influence
- Facilitating conditions

For consumers performance expectancy means the expected outcome of performance from the product and effort expectancy explains how effortlessly the product can be used. Social influence measures the significance of a customer's social circle in relation to the usage of the product (e.g., "Does my caregiver believe I should use the product?"), and facilitating conditions explores if the customer have enough helpful resources and guides to use the product. [41]

The new factors, that were added to UTAUT2 are: hedonic motivation, price value and habit. Hedonic motivation means literally the hedonistic side of using a product, and wether using it is e.g. fun or pleasurable. Price value is about the monetary cost in relation to the usage of a product, and habit means if the customer is able to create a habit using the product. In our study we handle the items social influence and price value since these perspectives fit our study the best. [42]

4.3.3 Additional Factors

This thesis being a new study and not having any research to use as its basis the creation of the questionnaire had its difficulties. To create more depth to the study analysis we added some factors from other studies, which would benefit our study:

- Trust in technology
- Trust in government

- Openness to change
- Forced trust
- Perceived security
- Perceived privacy

In addition to these, we also included some dependent variables: Acceptance and Quality of Life.

4.4 MEASURES

Our study questionnaire consisted of seven parts. The first part was non-optional questions about the respondents basic knowledge about smart cities and smart innovations. The second part included the TRI 2.0 questions and the third part dependent variables' questions. The fourth part was the IDM questions which were the factors for change and the fifth part the IRM and the factors against change. The sixth part included additional factors and the last seventh part was non-optional moderators: gender, age, education level, urban area citizen/rural, living with family or single and city worker or not.

The first model we used, was the Technology Readiness Index 2.0. The TRI 2.0 measures technological readiness and acceptance. The four categories mentioned earlier in section 4.2.1 are Optimism, Innovativeness, Discomfort and Insecurity which are portrayed more in detail in figure 4.2.

S#	Factors	Original Definition	Definition In Context
1	**Optimism**	A positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives.	A citizen's view of technology in general, and whether new technologies offer increased control, flexibility and efficiency in their lives.
2	**Innovativeness**	A tendency to be a technology pioneer and thought leader.	A citizen's tendency to be a technology pioneer and thought leader compared to their peers.
3	**Discomfort**	A perceived lack of control over technology and a feeling of being overwhelmed by it.	A citizen's perceived control over technologies and their feelings of being possibly overwhelmed by the new technologies.
4	**Insecurity**	Distrust of technology, stemming from skepticism about its ability to work properly and concerns about its potential harmful consequences.	A citizen's distrust of technologies, and the degree to which a citizen feels skeptical and is concerned about the technologies' harmful consequences.

Figure 4.2: TRI 2.0

Dependent variables are the Quality of Life (QOL) and the Acceptance (ACP). The QOL in living and working environments (e.g. in a smart city) can impact on new innovations, political decision-making, cultural life and overall change. So the better the acceptance and trust towards smart city services/technologies, the better the experienced quality of life. The Acceptance again refers to the citizens' acceptance towards new SC services/technologies. The Acceptance is linked with the quality of life and citizens' acceptance increases the experienced quality of life.

According to the Innovation Diffusion Model a person's acceptance and adoption of innovation would be influenced by the following factors: Relative Advantage (RLA), Compatibility (COM), Complexity (CPL), Trialability (TRI) and Observability (OBS). From the UTAUT 2 model we also added Price Value (PV) for mea-

suring monetary costs of innovation. The details of these factors are portrayed in figure 4.3.

S#	Factors	Original Definition	Definition In Context
1	**Price Value (PV)**	PV measures the monetary cost of innovation compared to the benefits a user might gain from the innovation.	The degree to which a citizen feels the benefits he/she gains from using SC services/technologies are bigger than the monetary costs.
2	**Relative Advantage (RLA)**	RLA is the degree to which an innovation is perceived being better than the original innovation.	The degree to which a citizen thinks smart city (SC) services/technologies are better than non-smart city services/technologies.
3	**Compatibility (COM)**	COM is the degree to which an innovation is perceived to be consistent with the existing values and past experiences.	Compatibility refers to the degree to which SC services/technologies are perceived to be in line with a citizen's existing values, such as current lifestyle and past experiences.
4	**Complexity (CPL)**	CPL is the degree to which an innovation is perceived difficult to understand and use.	The degree to which a citizen finds SC services/technologies hard to understand.
5	**Trialability (TRI)**	TRI is the degree to which an innovation can be limitedly experimented beforehand.	Trialability refers to the degree to how easily a citizen can test SC services/technologies before those actual adoption.
6	**Observability (OBS)**	OBS is the degree to which an innovation's results are visible and explainable to others.	Observability refers to the degree to how easily a citizen can observe and communicate the usage of SC services/technologies to others.

Figure 4.3: Innovation Diffusion Model with Price Value

Like mentioned in the earlier section 4.1.2, the Innovation Resistance Model again handles the concepts of Usage Barriers (UB), Value Barriers (VB), Risk Barriers

(RB), Tradition Barriers (TB) and Image Barriers (IB). These are the factors against new innovations and described in figure 4.4.

S#	Factors	Original Definition	Definition In Context
1	**Usage Barriers (UB)**	UB is the degree to which an innovation is not compatible with existing workflows, practices and/or habits.	Usage barrier represents the effort required from a citizen for learning and using new SC services/technologies, and the changes to the citizen's existing routine and habits.
2	**Value Barriers (VB)**	VB is the degree to which an innovation offers a strong performance-price value compared to its substitutes.	Value barrier refers to a citizen's resistance resulting from the conflict between the citizen's existing value system and new SC services/technologies.
3	**Risk Barriers (RB)**	RB is the degree to which an innovation poses risks. The risks are physical risks, economical risks, functional risks and social risks.	Risk barrier refers to the barriers that a citizen normally feels with any new innovations, e.g. SC services/technologies.
4	**Tradition Barriers (TB)**	TB is the degree to which an innovation requires the user to deviate from his/ her existing routines.	Tradition barrier refers to the changes new SC services/technologies would bring to a citizen's routines, behavior, and culture.
5	**Image Barriers (IB)**	IB is the degree to which an innovation creates negative perceptions about the innovation for the user even before taking it to use.	Image barrier refers to the negative impression that a citizen might have even before having to deal with new SC service/technology.

Figure 4.4: Innovation Resistance Model

Additional factors we used were Social Influence (SI) from the UTAUT model, and the others were Trust in Technology, Trust in Government, Forced Trust, Perceived Security and Perceived Privacy. These factors are represented in figure 4.5.

S#	Factors	Original Definition	Definition in context
1	**Trust in Technology**	Trust in Technology refers to the degree a user is likely to use SC technologies. This is dependent on perceived security and perceived privacy mentioned below.	Trust in technology refers to the degree a citizen is likely to use SC services/technologies.
2	**Trust in Government**	Trust in Government refers to the degree a user trusts in his/her government and its ability to provide services according to the user's expectation.	Trust in government refers to the level of trust a citizen has towards his/her government and SC municipal decision-makers.
3	**Forced Trust**	Forced Trust refers to the situation where the user has no choice or opportunity to affect any part of the information system, including the choice to use the system itself.	Forced trust refers to a situation, where a citizen is forced to trust the SC technologies the city is offering.
4	**Perceived Security**	Perceived Security is the degree to which a user believes a service to be a secure platform to store and share sensitive data.	Perceived security refers to the degree to which a citizen believes that SC services/technologies are secure platforms for storing and sharing their sensitive data.
5	**Perceived Privacy**	Perceived Privacy is the degree to which a user believes a service to be safe and it protects the user's sensitive information.	Perceived privacy is the degree to which a citizen believes that his/her privacy is ensured.
6	**Social Influence (SI)**	SI focuses on the social significance of other people and whether they believe one should be using new technology.	The degree to which a citizen believes that their significant others want him/her to use SC services/technologies.

Figure 4.5: Additional factors

Moderators for the questionnaire were gender, age, education, citizen or not, city worker or not and living with family or single.

5 STUDY AND DISCUSSION

5.1 RESULTS

After the questionnaire had been open for 11 months the amount of answers was 99. 20 of the answers were from the Salo citizens and 79 from other parts of Finland. The answers were then analyzed with Webropol. The answers were originally gathered with Webropol so the analyze was made with it as well.

Over 50% of the answers were by female participants on both answer pools. The median age of the participants was 46 years for the citizens of Salo, and 27 years for the extended questionnaire. From the Salo citizens the highest level of education was university degree with 45%, and for the rest of the Finland it was the same with 49,4%. 65,8% of the participants from around Finland were students and most part of the Salo citizens were employed (70%). Most people lived in the city area and Salo's city workers were only 5% (n=2) of the answers from Salo citizens.

When viewing the answers for the first part, TRI 2.0, most of the answers were positive. For optimism 38% of answers agreed, the innovativeness agreed 36,4%, discomfort agreed nor disagreed 28,3% and insecurity was surprisingly 29,9% with most people agreeing to be insecure with trusting technology (fig 5.3).

	Choose your highest level of education	
	n	Percent
Elementary school	0	0.0%
Vocational school	2	2.0%
Trade school	1	1.0%
High school	26	26.3%
Lower university degree	20	20.2%
Higher university degree	48	48.5%
Other	2	2.0%

Figure 5.1: Level of education (n=99)

	Are you:	
	n	Percent
Student	54	54.6%
Employed	33	33.3%
Enterpreneur	4	4.0%
Pensioner	5	5.1%
Unemployed	2	2.0%
Other	1	1.0%

Figure 5.2: Work situation (n=99)

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
People are too dependent on technologies to do things for them.	3.0%	26.3%	22.2%	29.3%	19.2%	3.4	3.0
Too much technology distracts people to a point that is harmful.	4.0%	8.1%	18.2%	39.4%	30.3%	3.8	4.0
Technology lowers the quality of relationships by reducing personal interaction.	2.0%	27.3%	20.2%	29.3%	21.2%	3.4	4.0
The human touch is very important when doing business with a company.	15.1%	31.3%	28.3%	18.2%	7.1%	2.7	3.0
New technology makes it too easy for governments and companies to spy on people.	3.0%	3.0%	17.2%	33.3%	43.5%	4.1	4.0
Total	**5.4%**	**19.2%**	**21.2%**	**29.9%**	**24.3%**	**3.5**	**4.0**

Figure 5.3: Insecurity from TRI 2.0

With dependent variables, acceptance and quality of life, 43,3% were agreeing with acceptance related questions. Quality of life containing 15 questions, 42,4% of the answers weren't agreeing nor disagreeing.

The third part was the IDM and the factors for innovation. With price value 54,1% were agreeing, with relative advantage 41,3% were agreeing and with compatibility 42,8% were agreeing. Complexity showed similar positive trend with 35,9% disagreeing as well as trialability agreeing with 39,3%. The last question about observability was agreed with 43,5% of respondents.

Fourth part of the questionnaire was about the IRM. Usage barriers had a positive outcome with 40,2% agreeing and value barriers the same with 40,9% agreeing. Risk barriers continued with the same trend with 26,9% of answers disagreeing with risks. Tradition barriers were met with opinion of valuing more non-traditional ways with 34,2% of answers disagreeing with traditional ways. The respondents also disagreed with having image barriers (41,5%).

Fifth part consisted of additional factors like trust and forced trust. The first factor trust in technology was met with median answer to be 3. This cut the

answers in half with people neither agreeing nor disagreeing (fig 5.4). Trust in government was again viewed as positive with 40,8% agreeing to trust in government. Forced trust showed most of the participants feeling they should trust in smart city innovations nevertheless with 41,4% agreeing the statements (fig 5.5). Perceived security was viewed with mixed state with most respondents neither agreeing nor disagreeing (fig 5.6). Then again perceived privacy was viewed more positively with 41,3% trusting their private information would be safe with smart city innovations and applications (fig 5.7). The last factor social influence was met with mixed feelings and people agreed nor disagreed with 56,5%.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I trust the security of the SC services/ technologies.	7.1%	32.3%	25.3%	32.3%	3.0%	2.9	3.0
I trust the legal/technical infrastructure of SC services/technologies is sufficient in protecting my information.	16.2%	31.3%	18.2%	30.3%	4.0%	2.7	3.0
I trust the devices that collect and process my data while I am using SC services/ technologies.	16.1%	26.3%	28.3%	26.3%	3.0%	2.7	3.0
I can count on SC services/technologies to protect my information.	17.2%	27.3%	19.2%	34.3%	2.0%	2.8	3.0
Total	**14.2%**	**29.3%**	**22.8%**	**30.8%**	**3.0%**	**2.8**	**3.0**

Figure 5.4: Trust in Technology from Additional factors

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I will have to trust the SC services/ technologies no matter what.	9.1%	11.1%	23.2%	48.5%	8.1%	3.4	4.0
I will have to count on SC services/ technologies to protect my personal information nonetheless.	11.1%	13.1%	21.2%	45.5%	9.1%	3.3	4.0
I will have no option but to trust SC services/ technologies.	10.1%	17.2%	30.3%	35.3%	7.1%	3.1	3.0
There is no option but to trust the public departments when it comes to SC services/ technologies.	8.1%	18.2%	23.2%	42.4%	8.1%	3.2	4.0
No matter what, I will end up trusting city's procedures to protect my privacy while using SC services/technologies.	10.1%	20.2%	23.2%	35.4%	11.1%	3.2	3.0
Total	**9.7%**	**16.0%**	**24.2%**	**41.4%**	**8.7%**	**3.2**	**4.0**

Figure 5.5: Forced Trust from Additional factors

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I am confident that the private information I provide with SC services/technologies will be secured.	22.2%	30.3%	22.2%	24.3%	1.0%	2.5	2.0
I believe that inappropriate parties may deliberately view the information I provide to SC services/technologies.	1.0%	18.2%	26.3%	40.4%	14.1%	3.5	4.0
I believe the information I provide with SC services/technologies will not be manipulated by inappropriate parties.	23.3%	41.4%	21.2%	13.1%	1.0%	2.3	2.0
Total	**15.5%**	**30.0%**	**23.2%**	**25.9%**	**5.4%**	**2.8**	**3.0**

Figure 5.6: Perceived Security from Additional factors

When viewing the answers the notable thing is, that the respondents had an overall positive view towards technology and smart city innovations. However the respondents had mixed responses with trusting the security of smart city applications but still they trusted their private information to be safe with the possible smart city applications which was contradictory. Forced trust was seen as a supposition and people felt they would have to trust smart city innovations no matter what.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I think that he SC services/technologies wil not provide my personal information to other entities without my consent.	12.1%	19.2%	15.1%	38.4%	15.2%	3.3	4.0
I think that the SC services/technologies wil not use my personal information for other purposes without my authorization.	12.1%	21.2%	17.2%	40.4%	9.1%	3.1	3.0
I think that the SC services/technologies show concern for the privacy of its users.	14.1%	17.2%	19.2%	45.5%	4.0%	3.1	3.0
Total	**12.8%**	**19.2%**	**17.2%**	**41.4%**	**9.4%**	**3.2**	**4.0**

Figure 5.7: Perceived Privacy from Additional factors

5.1.1 Gender comparison

When viewing the answers given by males, factors that stood out were insecurity from the TRI 2.0 (median 4.0 agreeing in fig 5.8) and perceived security was also met with distrust by 34,3% disagreeing. Again in contradiction, perceived privacy was met with most men agreeing. Trust in technology from additional factors was met not disagreeing nor agreeing as we can see from figure 5.9. Forced trust was met with the median answer of 4, and the participants saw that they would have to trust the technologies nevertheless (fig 5.10).

When viewing the answers by women, insecurity was pointing out again like with the overall score and with men's score with 36% agreeing to be insecure with technologies (fig 5.11). Trust in technology was met with more negativity and 36,9% were disagreeing with the trust while the median answer was still 3, not agreeing nor disagreeing (fig 5.12). And again like with men perceived privacy was met with most women agreeing that the systems would keep their private information safe (50% agreeing). Forced trust was seen as a must be supposition again with most women agreeing they should trust the applications and innovations nevertheless as represented in figure 5.13.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
People are too dependent on technologies to do things for them.	2.9%	14.7%	26.5%	26.5%	29.4%	3.6	4.0
Too much technology distracts people to a point that is harmful.	5.9%	2.9%	20.6%	41.2%	29.4%	3.9	4.0
Technology lowers the quality of relationships by reducing personal interaction.	0.0%	26.5%	23.5%	26.5%	23.5%	3.5	3.5
The human touch is very important when doing business with a company	20.6%	38.2%	20.6%	17.7%	2.9%	2.4	2.0
New technology makes it too easy for governments and companies to spy on people.	3.0%	0.0%	14.7%	23.5%	58.8%	4.4	5.0
Total	**6.5%**	**16.5%**	**21.2%**	**27.1%**	**28.8%**	**3.6**	**4.0**

Figure 5.8: Men's view on Insecurity

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I trust the security of the SC services/ technologies.	5.9%	41.2%	23.5%	23.5%	5.9%	2.8	3.0
I trust the legal/technical infrastructure of SC services/technologies is sufficient in protecting my information.	11.8%	35.3%	17.6%	29.4%	5.9%	2.8	3.0
I trust the devices that collect and process my data while I am using SC services/ technologies.	20.6%	23.5%	26.5%	23.5%	5.9%	2.7	3.0
I can count on SC services/technologies to protect my information.	23.5%	17.7%	23.5%	32.4%	2.9%	2.7	3.0
Total	**15.5%**	**29.4%**	**22.8%**	**27.2%**	**5.2%**	**2.8**	**3.0**

Figure 5.9: Men's view on Trust in Technology

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I will have to trust the SC services/ technologies no matter what.	14.7%	11.8%	17.6%	47.1%	8.8%
I will have to count on SC services/ technologies to protect my personal information nonetheless.	20.6%	14.7%	14.7%	41.2%	8.8%
I will have no option but to trust SC services/ technologies.	20.6%	17.7%	14.7%	38.2%	8.8%
There is no option but to trust the public departments when it comes to SC services/ technologies.	14.7%	23.5%	14.7%	38.3%	8.8%
No matter what, I will end up trusting City's procedures to protect my privacy while using SC services/technologies.	14.7%	26.5%	23.5%	26.5%	8.8%
Total	**17.1%**	**18.8%**	**17.0%**	**38.3%**	**8.8%**

Figure 5.10: Men's view on Forced Trust

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
People are too dependent on technologies to do things for them.	2.5%	35.0%	17.5%	37.5%	7.5%	3.1	3.0
Too much technology distracts people to a point that is harmful.	2.5%	7.5%	17.5%	42.5%	30.0%	3.9	4.0
Technology lowers the quality of relationships by reducing personal interaction.	5.0%	27.5%	20.0%	32.5%	15.0%	3.3	3.0
The human touch is very important when doing business with a company	17.5%	27.5%	27.5%	22.5%	5.0%	2.7	3.0
New technology makes it too easy for governments and companies to spy on people.	0.0%	5.0%	20.0%	45.0%	30.0%	4.0	4.0
Total	**5.5%**	**20.5%**	**20.5%**	**36.0%**	**17.5%**	**3.4**	**4.0**

Figure 5.11: Women on Insecurity

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I trust the security of the SC services/ technologies.	2.5%	30.0%	27.5%	37.5%	2.5%	3.1	3.0
I trust the legal/technical infrastructure of SC services/technologies is sufficient in protecting my information.	15.0%	37.5%	12.5%	32.5%	2.5%	2.7	2.0
I trust the devices that collect and process my data while I am using SC services/ technologies.	5.0%	37.5%	32.5%	22.5%	2.5%	2.8	3.0
I can count on SC services/technologies to protect my information.	5.0%	42.5%	15.0%	35.0%	2.5%	2.9	3.0
Total	**6.9%**	**36.9%**	**21.9%**	**31.9%**	**2.5%**	**2.9**	**3.0**

Figure 5.12: Women on Trust in Technology

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I will have to trust the SC services/technologies no matter what.	2.5%	10.0%	22.5%	57.5%	7.5%	3.6	4.0
I will have to count on SC services/technologies to protect my personal information nonetheless.	2.5%	10.0%	15.0%	62.5%	10.0%	3.7	4.0
I will have no option but to trust SC services/ technologies.	2.5%	15.0%	32.5%	45.0%	5.0%	3.4	3.5
There is no option but to trust the public departments when it comes to SC services/technologies.	0.0%	12.5%	20.0%	60.0%	7.5%	3.6	4.0
No matter what, I will end up trusting City's procedures to protect my privacy while using SC services/technologies.	2.5%	15.0%	10.0%	57.5%	15.0%	3.7	4.0
Total	**2.0%**	**12.5%**	**20.0%**	**56.5%**	**9.0%**	**3.6**	**4.0**

Figure 5.13: Women on Forced Trust

With both gender groups factors that stood out was insecurity and forced trust. The participants had trust issues towards the systems and that malicious parties would not misuse the information. In contradiction perceived privacy from additional factors was met with approval and both genders agreed to believe their private information would however be kept safe in smart applications and systems. With the factor of forced trust neither groups had any disagreement and forced trust was seen as a supposition.

5.1.2 Age groups

The second comparison was made between three different age groups: 20 to 29, 30 to 39 and 40 to 78. Within the age group of 20 to 29 years old the first question that stood out was insecurity from the TRI 2.0 with 31,5% of answerers agreeing to the harms of technologies (fig 5.14). The second strongest opinion was strongly agreeing with 24,2%.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
People are too dependent on technologies to do things for them.	1.9%	26.9%	17.3%	34.6%	19.3%	3.4	4.0
Too much technology distracts people to a point that is harmful.	5.8%	5.8%	17.3%	36.5%	34.6%	3.9	4.0
Technology lowers the quality of relationships by reducing personal interaction.	3.8%	26.9%	15.4%	30.8%	23.1%	3.4	4.0
The human touch is very important when doing business with a company	26.9%	26.9%	23.1%	21.2%	1.9%	2.4	2.0
New technology makes it too easy for governments and companies to spy on people.	1.9%	1.9%	19.3%	34.6%	42.3%	4.1	4.0
Total	**8.1%**	**17.7%**	**18.5%**	**31.5%**	**24.2%**	**3.5**	**4.0**

Figure 5.14: Ages 20 to 29 on Insecurity

Again like in the other comparisons, trust in technology was met in neutral way with most participants neither agreeing nor disagreeing as pictured in the figure 5.15.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I trust the security of the SC services/technologies.	7.7%	34.6%	23.1%	28.8%	5.8%	2.9	3.0
I trust the legal/technical infrastructure of SC services/technologies is sufficient in protecting my information.	15.4%	42.3%	9.6%	26.9%	5.8%	2.7	2.0
I trust the devices that collect and process my data while I am using SC services/technologies.	13.5%	34.6%	25.0%	21.1%	5.8%	2.7	3.0
I can count on SC services/technologies to protect my information.	13.5%	32.7%	17.3%	32.7%	3.8%	2.8	3.0
Total	**12.5%**	**36.1%**	**18.8%**	**27.4%**	**5.3%**	**2.8**	**3.0**

Figure 5.15: Ages 20 to 29 on Trust in Technology

Trust in government was again agreed with most participants trusting and the participants saw forced trust as a must (fig 5.16). Perceived security was seen in a

negative way like in the overall score of all participants (fig 5.17). However perceived privacy was met with agreement with most of the respondents trusting their private information to be safe with smart technologies.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I will have to trust the SC services/technologies no matter what.	9.6%	13.5%	25.0%	48.1%	3.8%	3.2	4.0
I will have to count on SC services/technologies to protect my personal information nonetheless.	13.4%	15.4%	17.3%	48.1%	5.8%	3.2	4.0
I will have no option but to trust SC services/technologies.	9.6%	21.2%	30.8%	34.6%	3.8%	3.0	3.0
There is no option but to trust the public departments when it comes to SC services/technologies.	5.8%	21.2%	23.1%	46.1%	3.8%	3.2	3.5
No matter what, I will end up trusting City's procedures to protect my privacy while using SC services/technologies.	7.7%	21.2%	19.2%	42.3%	9.6%	3.3	4.0
Total	**9.2%**	**18.5%**	**23.1%**	**43.8%**	**5.4%**	**3.2**	**3.0**

Figure 5.16: Ages 20 to 29 on Forced Trust

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I am confident that the private information I provide with SC services/ technologies will be secured.	19.2%	36.6%	19.2%	23.1%	1.9%	2.5	2.0
I believe that inappropriate parties may deliberately view the information I provide to SC services/Technologies.	1.9%	23.1%	25.0%	44.2%	5.8%	3.3	3.5
I believe the information I provide with SC services/technologies will not be manipulated by inappropriate parties.	21.2%	46.1%	17.3%	13.5%	1.9%	2.3	2.0
Total	**14.1%**	**35.3%**	**20.5%**	**26.9%**	**3.2%**	**2.7**	**3.0**

Figure 5.17: Ages 20 to 29 on Perceived Security

The age group 30 to 39 years old showed similar trend with insecurity. With trust in technology this age group showed results of most of the people neither agreeing nor disagreeing with the questions like the previous groups. This is portrayed in the figure 5.18.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I trust the security of the SC services/ technologies.	5.6%	33.3%	27.8%	33.3%	0.0%	2.9	3.0
I trust the legal/technical infrastructure of SC services/technologies is sufficient in protecting my information.	11.1%	33.3%	16.7%	38.9%	0.0%	2.8	3.0
I trust the devices that collect and process my data while I am using SC services/ technologies.	11.1%	16.7%	50.0%	22.2%	0.0%	2.8	3.0
I can count on SC services/technologies to protect my information.	11.1%	22.2%	33.4%	33.3%	0.0%	2.9	3.0
Total	**9.7%**	**26.4%**	**32.0%**	**31.9%**	**0.0%**	**2.9**	**3.0**

Figure 5.18: Ages 30 to 39 on Trust in Technology

Forced trust was also met with most people agreeing they would have to trust smart city innovations nevertheless, as seen in the figure 5.19.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I will have to trust the SC services/ technologies no matter what.	5.5%	11.1%	16.7%	50.0%	16.7%	3.6	4.0
I will have to count on SC services/ technologies to protect my personal information nonetheless.	5.5%	16.7%	11.1%	50.0%	16.7%	3.6	4.0
I will have no option but to trust SC services/ technologies.	16.7%	11.1%	5.5%	55.6%	11.1%	3.3	4.0
There is no option but to trust the public departments when it comes to SC services/ technologies.	11.1%	16.7%	5.5%	50.0%	16.7%	3.4	4.0
No matter what, I will end up trusting City's procedures to protect my privacy while using SC services/technologies.	5.6%	22.2%	16.7%	33.3%	22.2%	3.4	4.0
Total	**8.9%**	**15.6%**	**11.1%**	**47.8%**	**16.7%**	**3.5**	**4.0**

Figure 5.19: Ages 30 to 39 on Forced Trust

Same trend continued with this age group when it came to perceived security (most people disagreeing) but surprisingly perceived privacy showed mixed results with neither agreeing nor disagreeing (fig 5.20).

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I think that the SC services/technologies will not provide my personal information to other entities without my consent.	11.1%	27.8%	16.7%	22.2%	22.2%	3.2	3.0
I think that the SC services/technologies will not use my personal information for other purposes without my authorization.	11.1%	38.9%	11.1%	27.8%	11.1%	2.9	2.5
I think that the SC services/technologies show concern for the privacy of its users.	16.7%	27.8%	11.1%	44.4%	0.0%	2.8	3.0
Total	**13.0%**	**31.5%**	**13.0%**	**31.5%**	**11.1%**	**3.0**	**3.0**

Figure 5.20: Ages 30 to 39 on Perceived Privacy

The last comparison was made in the age group of 40 to 78 years old. The first surprising result was with the factor insecurity which showed most participants strongly agreeing and agreeing with insecurity (the other groups just agreeing). This is portrayed in the figure 5.21.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
People are too dependent on technologies to do things for them.	6.6%	26.7%	26.7%	13.3%	26.7%	3.3	3.0
Too much technology distracts people to a point that is harmful.	6.7%	13.3%	13.3%	40.0%	26.7%	3.7	4.0
Technology lowers the quality of relationships by reducing personal interaction.	0.0%	26.7%	13.3%	26.7%	33.3%	3.7	4.0
The human touch is very important when doing business with a company.	0.0%	26.7%	33.3%	13.3%	26.7%	3.4	3.0
New technology makes it too easy for governments and companies to spy on people.	6.6%	6.7%	20.0%	26.7%	40.0%	3.9	4.0
Yhteensä	**4.0%**	**20.0%**	**21.3%**	**24.0%**	**30.7%**	**3.6**	**4.0**

Figure 5.21: Ages 40 to 78 on Insecurity

Another surprising element was that the older participants had an overall more positive view on trust in technology (fig 5.22). This age group was also the first to

show that they weren't agreeing nor disagreeing with forced trust by 32,0% being neutral about the forced trust statements (fig 5.23).

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I trust the security of the SC services/ technologies.	13.3%	20.0%	20.0%	46.7%	0.0%	3.0	3.0
I trust the legal/technical infrastructure of SC services/technologies is sufficient in protecting my information.	20.0%	6.6%	26.7%	40.0%	6.7%	3.1	3.0
I trust the devices that collect and process my data while I am using SC services/technologies.	20.0%	0.0%	26.7%	53.3%	0.0%	3.1	4.0
I can count on SC services/technologies to protect my information.	20.0%	20.0%	13.3%	46.7%	0.0%	2.9	3.0
Yhteensä	**18.3%**	**11.7%**	**21.7%**	**46.7%**	**1.7%**	**3.0**	**3.0**

Figure 5.22: Ages 40 to 78 on Trust in Technology

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I will have to trust the SC services/ technologies no matter what.	13.4%	13.3%	13.3%	46.7%	13.3%	3.3	4.0
I wil have to count on SC services technologies to protect my personal information nonetheles.	13.4%	13.3%	20.0%	40.0%	13.3%	3.3	4.0
I wil have no option but to trust SC services/technologies.	6.7%	13.3%	53.4%	13.3%	13.3%	3.1	3.0
There is no option but to trust the public departments when it comes to SC services/technologies.	13.4%	20.0%	33.3%	20.0%	13.3%	3.0	3.0
No matter what, I will end up trusting city's procedures to protect my privacy while using SC services/technologies.	13.4%	20.0%	40.0%	13.3%	13.3%	2.9	3.0
Yhteensä	**12.1%**	**16.0%**	**32.0%**	**26.7%**	**13.3%**	**3.1**	**3.0**

Figure 5.23: Ages 40 to 78 on Forced Trust

This was also the first group that didn't agree nor disagree with perceived security, as seen with figure 5.24. With perceived privacy the results were same as with other age groups and they mostly agreed (46,7%).

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Average	Median
I am confident that the private information I provide with SC services/ technologies will be secured.	33.4%	0.0%	33.3%	33.3%	0.0%	2.7	3.0
I believe that inappropriate parties may deliberately view the information I provide to SC services/technologies.	0.0%	20.0%	33.3%	20.0%	26.7%	3.5	3.0
I believe the information I provide with SC services/technologies will not be manipulated by inappropriate parties.	20.0%	20.0%	40.0%	20.0%	0.0%	2.6	3.0
Yhteensä	**17.8%**	**13.3%**	**35.5%**	**24.4%**	**8.9%**	**2.9**	**3.0**

Figure 5.24: Ages 40 to 78 on Perceived Security

5.2 DISCUSSION

At first we need to identify the fact that our sample size from the questionnaire was low (n=99). Most of the participants were also relatively young and only 3 participants were over 61 years old so observing the results from senior citizens' point of view could not be done so in depth we wanted. The amount of participants who were Salo city-workers or who lived in rural areas was also low so comparison of these groups could not be done.

There weren't any differences when it came to the gender groups and perceived security was seen in a negative way. However most of the respondents trusted their private information to be safe with smart city innovations and they had mixed overall trust in technology. With the factor of forced trust there weren't any disagreement and both of the groups believed they would have to trust the systems nevertheless.

When it came to age groups the results followed the same trend as with the gender groups. The only thing that stood out was that the last age group 40-79 trusted more in technology. This was also the only group that answered not agreeing nor disagreeing to the forced trust statements.

5.3 OTHER STUDIES ON SMALL SMART CITIES AND THE CITIZEN PERSPECTIVES

One interesting study that touches our topic is by Suopajärvi [43] and it ponders the question of how the senior citizens handle the aspect of being a smart city citizens in the city of Oulu in Northern Finland. The main point of the study is that the elder citizens want to be included within the aspects of a smart city ideology but on their own terms and to make the decision of being a smart city citizen voluntarily and not by being forced to it. [43]

In the study Suopajärvi interviewed senior citizens aged 61 to 87. Most of the participants were women and recruited from computer courses. With interviews Suopajärvi found out that most women seniors were concerned about the decreasing amount of human interaction when using for instance online services like banking. Going to a physical bank also affected their physical exercising which decreased with the use of online services. Through their discussions they also found out two things that were missing from Oulu: cross-generational sense of community, as well as communication between the city and the senior citizens. Some notions were made by the elderly and they suggested that teenagers could teach them computer skills. The elderly could then teach the teenagers some other skills like baking. This way the senior citizens could have face-to-face learning and physical exercise going to classes as well. [43]

With our study of the smart city of Salo we didn't have enough senior citizens to answer to our questionnaire. We can then conclude that more research should be done and more citizens from different backgrounds and age groups should be taken into consideration when building smart city applications. For instance Suopajärvi arranged workshops with some of the senior citizens of Oulu which meant many things for the elderly: "making a difference, belonging to a community and receiv-

ing information". It was also concluded that the senior citizens perceive high-tech innovations in a good manner but would not like to be forced to use the new systems. "By respecting the history of the city through the infrastructure, the current city would simultaneously respect the life histories of its elderly citizens." [43]

6 CONCLUSIONS

6.1 ANSWERS TO RESEARCH QUESTIONS

In Chapter 2 we defined what is trust, forced trust and the ethics of these. We determined that to trust is to put belief in something, to put value in something. With forced trust we observed the idea of Panopticon and the example of waste management in a smart city. We also considered privacy as a part of the ethicality of forced trust.

In Chapter 3 we took a look on digital transformation, smart cities and small smart cities. We defined the factors that must be present for a city to be smart. The factors included for instance smart governance and smart infrastructure. When it comes to small smart cities we made the conclusion, that Salo is a small smart city on the world's scale where the population is aging. This can lead to better communication between city's decision makers and/or to some resistance when implementing new smart applications and ideologies.

In Chapter 5 we took a look on our questionnaire and how the survey participants reacted to forced trust and other factors we handled in our questionnaire. Within the gender groups there weren't a lot of differences with the results. Within the age groups there were some differences and surprisingly older participants were more trusting towards technology. They also didn't see forced trust in as agreeing manner as the younger age groups.

6.2 POTENTIAL FUTURE WORK

When discussing about the future work for smart cities and the citizens' trust and attitudes towards these cities, we have to acknowledge that there aren't any prior work handling this aspect. When more studies are being done and the more reliability is got with more studies and amount of respondents in studies, the more accurate answers and conclusions are get from these studies.

Since there is no prior work done about the subject handled in this thesis it is hard to compare the results to anything. Also the low amount of responses to the survey questionnaire doesn't create dependability usually required for qualitative research. Cultural differences and age cohorts must be included in the discussion as well since these could not be handled with our study. The opinions and attitudes could differ a lot in western cultures and for instance in eastern cultures. Some other differences could also appear with cultures more religious or when talking about collectivity of eastern cultures versus individualism linked to western cultures.

After these aspects we can conclude that altogether more research about this subject is required. More cross-cultural surveys and more surveys in general is recommended. This thesis and survey can however act as a good basis for future research and the models used in the questionnaire survey can probably be used in other surveys handling the same subject.

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Appendix A Research questionnaire

People’s views toward Smart City Services and Technologies

☐ Mandatory questions are marked with a star (*)

Hi you!

I am a master degree student at the Department of Computing, University of Turku. As a part of my thesis, I am studying citizens' views towards smart city services and technologies, and through the survey, I will collect data that will provide insights into citizens' perceptions regarding smart city services and technologies. The results from the study will also be used for research and to generate strategic insights that will be taken into consideration by the City of Salo for their smart city project.

Your participation is of utmost importance to me. So, spare 15-20 minutes of your time and participate in this study by completing this survey. There is no right or wrong answer to any question. Please, read the instructions in each part to answer the question options

No identifying information is being collected, so we cannot know who answered what in this survey. The data collection is anonymized and, thus, cannot and will not be used to identify you from the responses. Therefore, we request you to answer the questions as honestly as possible.

The data will be analyzed by our research team mentioned below and will be used for research publications. In case you have any queries, kindly direct them to me at stmhyv@utu.fi (thesis worker and research assistant).

Thank you in advance!

Research Team:

- Seppo Virtanen, Associate Professor
- Ali Farooq, Postdoctoral Researcher
- Antti Hakkala, University Teacher
- Suvi-Tuuli Hyvönen, Research Assistant

1. Please, fill out the following to participate the study. *

	Yes	No
I understand the purpose of this study. *	○	○
I understand that my answers are used anonymously in the study. *	○	○
I'm participating this study voluntarily. *	○	○

Part 1:

In this part, you can tell with your own words, what smart services/technologies you know that exists already.

2. What smart services/technologies do you know already? Write freely in the text field below.

3. What smart services/technologies do you wish more to your city of resedence? Write freely in the text field below.

4. What smart services/technologies do you believe people would need? Write freely in the text field below.

Part 2:

In this part, we present some common statements about technolgy in general to understand you as a user of technology.

Please, read every statement and choose one, which describes you the best. As a scale we are using the following:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

5. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Technology gives me more freedom of mobility. *	○	○	○	○	○
Technology gives people more control over their daily lives. *	○	○	○	○	○
Technology makes me more productive in my personal life. *	○	○	○	○	○
Products and services that use the newest technologies are much more convenient to use. *	○	○	○	○	○
Communications technology and the Internet help people build stronger relationships. *	○	○	○	○	○

6. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Other people come to me for advice on new technologies. *	○	○	○	○	○
In general, I am among the first in my circle of friends to acquire a new technology when it appears. *	○	○	○	○	○
I keep up with the latest technological developments in my areas of interest. *	○	○	○	○	○
I can usually figure out new high-tech products and services without help from others. *	○	○	○	○	○

7. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Technical support lines/support staff are generally not helpful because they don’t explain things in terms I understand. *	○	○	○	○	○
Sometimes, I think that technology services are not designed for use by ordinary people. *	○	○	○	○	○

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
There is no such thing as a manual for high-tech technologies that is written in plain language. *	○	○	○	○	○
Many new technologies have health or safety risks that are not discovered until after people have used them. *	○	○	○	○	○

8. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
People are too dependent on technologies to do things for them. *	○	○	○	○	○
Too much technology distracts people to a point that is harmful. *	○	○	○	○	○
Technology lowers the quality of relationships by reducing personal interaction. *	○	○	○	○	○
The human touch is very important when doing business with a company *	○	○	○	○	○
New technology makes it too easy for governments and companies to spy on people. *	○	○	○	○	○

What does a smart city mean?

Smart city can cover, for instance, the following:

- Smart government and education (A city's governance and citizens' education is organized in a smart way)
- Smart building (New building projects in a city have been organized in a smart way)
- Smart traffic (For instance, a city's public transportation has been organized in a smart way)
- Smart infrastructure (For instance, a city's waste management has been organized in a smart way)
- Smart technology (For example, a city is using smart technology in their projects)
- Smart energy distribution (For example, a city's energy distribution has been organized in a smart way)
- Smart citizens (For example, the citizens have a possibility to use smart applications, like mobile apps for handling their city-related matters)

Please, keep in mind the definition of a smart city when answering to the following questions. We are referencing to this definition of a smart city in the following statements when talking about smart services and technologies.

Part 3:

Now that you know the definition of a smart city, we would like to know your opinion about smart cities.

Please, read every statement and choose one, which describes you the best. As a scale we are using the following:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

9. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I would consider using SC services/technologies when they are available in the market. *	○	○	○	○	○
I would recommend SC services/technologies to my family and peers. *	○	○	○	○	○
I would encourage others to use SC services/technologies. *	○	○	○	○	○
I have positive things to say about SC services/technologies. *	○	○	○	○	○

10. Due to SC services/technologies, *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
A city will become a safer place to live in. *	○	○	○	○	○
The administrative services will help people efficiently. *	○	○	○	○	○
The state of the streets and buildings will become better. *	○	○	○	○	○
The mobility infrastructure will improve. *	○	○	○	○	○
There will be more green spaces (parks, plantations, etc.). *	○	○	○	○	○
There will be better cleanliness. *	○	○	○	○	○
There will be better cultural facilities. *	○	○	○	○	○
The trust between people would improve. *	○	○	○	○	○
The quality of the air will improve. *	○	○	○	○	○

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I will lead a satisfied life. *	○	○	○	○	○
My household financial situation will improve. *	○	○	○	○	○
I will be satisfied with the place where I live. *	○	○	○	○	○
the trusting environment among people will improve. *	○	○	○	○	○
People will be more united. *	○	○	○	○	○
The public administration of a city can be trusted. *	○	○	○	○	○

Part 4:

In this part we present some statements to understand your opinions towards SC services/technologies.

Please, read every statement and choose one, which describes you the best. As a scale we are using the following:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

11. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I feel that using SC services/technologies can better cater to my living requirements (e.g. safety, reliability, security or convenience needs). *	○	○	○	○	○
I feel that using SC services/technologies can confer cost-savings. *	○	○	○	○	○
I feel that using SC services/technologies can be pleasant. *	○	○	○	○	○
I feel that using SC services/technologies can have positive effects on the environment and society. *	○	○	○	○	○

12.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Using SC services/technologies would enable me to accomplish tasks more quickly. *	○	○	○	○	○
Using SC services/technologies would improve my quality of life. *	○	○	○	○	○
Using SC services/technologies would make my work easier. *	○	○	○	○	○
Using SC services/technologies would be more advantageous compared to conventual city services. *	○	○	○	○	○
Using SC services/technologies would be environmentally friendly option. *	○	○	○	○	○

13. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Using SC services/technologies would be compatible with my lifestyle. *	○	○	○	○	○
Using SC services/technologies would fit well with my current living habits. *	○	○	○	○	○
Using SC services/technologies would be compatible with my needs. *	○	○	○	○	○
Using SC services/technologies would suit me well. *	○	○	○	○	○
Using SC services/technologies would be in line with my everyday life. *	○	○	○	○	○

14. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
SC services/technologies would be difficult to use. *	○	○	○	○	○
SC services/technologies would be frustrating to use. *	○	○	○	○	○
SC services/technologies would require a lot of effort to use. *	○	○	○	○	○

15. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I feel it is would be easy to try out SC services/technologies. *	○	○	○	○	○
I know where I could go to try out various functions of SC services/technologies. *	○	○	○	○	○
I could be permitted to try out with SC services/technologies for long enough period. *	○	○	○	○	○
I would be able to experiment with SC services/technologies when necessary. *	○	○	○	○	○

16. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I believe I could explain to others how to use SC services/technologies. *	○	○	○	○	○
I would have no difficulty telling others about the process of using SC services/technologies. *	○	○	○	○	○
I believe I could communicate to others about the benefits of using SC services/technologies. *	○	○	○	○	○

Part 5:

In this part, we present more statements to understand your opinions towards SC services/technologies.

Please, read every statement and choose one, which describes you the best. As a scale we are using the following:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

17. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
The use of SC services/technologies would be convenient for me. *	○	○	○	○	○
Using SC services/technologies would require new behavior/s. *	○	○	○	○	○
SC services/technologies would fit well with the way I like to get things done. *	○	○	○	○	○
Use of SC services/technologies would be completely compatible with my needs. *	○	○	○	○	○

18. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
SC services/technologies would not offer any advantage or benefit compared to the services I am currently using. *	○	○	○	○	○
In my view, SC services/technologies are superior to current city services/technologies products. *	○	○	○	○	○
SC services/technologies would offer advantages not offered by current city services/technologies. *	○	○	○	○	○
SC services/technologies would solve problems that cannot be solved with current city services/technologies. *	○	○	○	○	○

19. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I fear that others might judge me for using SC services/technologies. *	○	○	○	○	○
SC services/technologies will increase my household budget. *	○	○	○	○	○
I have some doubts about SC services/technologies. *	○	○	○	○	○
Using SC services/technologies might result in negative consequences. *	○	○	○	○	○

20. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I find the traditional ways of living better than living would be with SC services/technologies. *	○	○	○	○	○
I would prefer to carry out my everyday chores through traditional means rather than using SC services/technologies. *	○	○	○	○	○
I am so used to traditional means to do my everyday living that I could find it difficult to move to SC services/technologies *	○	○	○	○	○
The SC services/technologies match my values and norms. *	○	○	○	○	○

21. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
SC services/technologies will be too complicated to be useful. *	○	○	○	○	○
I believe SC services/technologies will be difficult to use. *	○	○	○	○	○
I have only positive feelings towards SC services/technologies *	○	○	○	○	○
I don't like SC services/technologies. *	○	○	○	○	○

Part 6:

In this part, we present again more statements to understand your opinions towards SC services/technologies.

Please, read every statement and choose one, which describes you the best. As a scale we are using the following:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

22.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I trust the security of the SC services/technologies. *	○	○	○	○	○
I trust the legal/technical infrastructure of SC services/technologies is sufficient in protecting my information. *	○	○	○	○	○
I trust the devices that collect and process my data while I am using SC services/technologies. *	○	○	○	○	○
I can count on SC services/technologies to protect my information. *	○	○	○	○	○

23. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I trust in public departments and institutions. *	○	○	○	○	○
I trust in city's capabilities in providing safe SC services/technologies. *	○	○	○	○	○
I trust that citizens' interest is city's first priority. *	○	○	○	○	○
I trust city's procedures to protect my personal information. *	○	○	○	○	○

24. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I will have to trust the SC services/technologies no matter what. *	○	○	○	○	○
I will have to count on SC services/technologies to protect my personal information nonetheless. *	○	○	○	○	○
I will have no option but to trust SC services/technologies. *	○	○	○	○	○
There is no option but to trust the public departments when it comes to SC services/technologies. *	○	○	○	○	○

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
No matter what, I will end up trusting City's procedures to protect my privacy while using SC services/technologies. *	○	○	○	○	○

25. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I am confident that the private information I provide with SC services/technologies will be secured. *	○	○	○	○	○
I believe that inappropriate parties may deliberately view the information I provide to SC services/Technologies. *	○	○	○	○	○
I believe the information I provide with SC services/technologies will not be manipulated by inappropriate parties. *	○	○	○	○	○

26. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I think that the SC services/technologies will not provide my personal information to other entities without my consent. *	○	○	○	○	○
I think that the SC services/technologies will not use my personal information for other purposes without my authorization. *	○	○	○	○	○
I think that the SC services/technologies show concern for the privacy of its users. *	○	○	○	○	○

27. *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
People who are important to me think that I should use SC services/technologies. *	○	○	○	○	○
People who influence my behavior think that I should use SC services/technologies. *	○	○	○	○	○

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
People whose opinions I value prefer that I use SC services/technologies. *	○	○	○	○	○

Part 7: Demographics

Please, fill out the following information about yourself. The data collection is done anonymously so you cannot and will not be connected to the answers you provide.

28. Your gender: *

	Male	Female	Other / Prefer not to tell
*	○	○	○

29. If you chose the option "Other", you can fill in additional information below:

_____

30. Your age: *

Please, write your age in numbers, like 18 or 36. Do not write your year of birth.

_____

31. Choose your highest level of education: *

- ○ Elementary school
- ○ Vocational school/trade school
- ○ High school
- ○ Lower university degree
- ○ Higher university degree
- ○ Doctoral degree
- ○ Other

32. If you chose the option "Other", you can fill in additional information below:

33. Are you: *

- ◯ Student
- ◯ Employed
- ◯ Enterpreneur
- ◯ Unemployed
- ◯ Pensioner
- ◯ Other

34. If you chose the option "Other", you can fill in additional information below:

35. Do you live: *

	In a city area	In sparsely populated area	Other
*	◯	◯	◯

36. If you chose the option "Other", you can fill in additional information below:

37. Your housing situation: *

	Living alone	Living with family	Other form of housing
*	◯	◯	◯

38. If you chose the option "Other", you can fill in additional information below: