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Tallinn as a City Powered by Collaboration: Co-designing a Platform to Improve Citizen-Municipality Interactions

Master's thesis

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Author's declaration of originality

I hereby certify that I am the sole author of this thesis and this thesis has not been presented for examination or submitted for defence anywhere else. All used materials, references to the literature and work of others have been cited.

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Abstract

Tallinn is a modern and rapidly developing city, located in one of the most digitally advanced democracies in the world, Estonia. The transformation from traditional public administration processes into contemporary ones that benefits from the inclusion of ICT technologies involves innovation in multiple levels. Most importantly, it requires constant interaction and inclusion of multiple non-traditional stakeholders in decision-making processes. In this research, the development of a co-design platform for improving citizen-municipality interactions is presented. This artifact takes form as a digital platform based on the contemporary digital service of a complaint system called TalliHagi. A platform that through its development included citizens, experts, and theorical bases to re-think and re-design the interactions between the citizens of Tallinn and their municipal government. TalliHagi is tested and evaluated for utility, usability and effectiveness using Design Science Research evaluation methods. And as a result of the evaluation the final iteration of the research presents TalliHagi 2.0. the citizen-centric platform capable of improving citizen-municipality interactions in Tallinn.

List of abbreviations and terms

IT	Information Technology
ICTs	Information and Computing Technologies
PA	Public Administration
CPA	Collaborative Public Administration
CDG	Collaborative Digital Government
P2P	Peer-to-peer
UTAUT	Unified Theory of Acceptance and Use of Technology
UX	User Experience
UI	User Interface
GDPR	General Data Protection Regulation of the European Union

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1. Introduction

In contemporary healthy democracies, citizens play a major role in the processes of governance. Their inclusion develops the concept understood as citizen participation, being one of the most studied phenomena in public administration nowadays.

The presence of citizens in the decision-making processes on the multiple levels of government is by no means a new concept. It has been significantly studied for decades and has helped to develop a new understanding of bureaucracy that counters the Weberian paradigm of public administration [1]. This paradigm establishes a clear hierarchical order in administration and a strong demarcation between citizens and states' responsibilities. The participation of the public yield an assortment of benefits for both the citizens and the government. Their inclusion, when applied correctly, is translated into improved public services powered and sustained by the feedback received after the deployment of services, procured alongside their consumers.

This interaction between citizens and government constitutes a form of Collaborative Public Administration. A concept studied since the decade of the nineties as a method to address multiple "wicked problems" that conceptually, require multi-faceted and holistic approaches to be solved [2]. There are many types of collaborations, that can involve a miscellaneous variety of configurations from stakeholders ranging from parts of public sector, the private sector and the civil society. Each type of collaboration has its specific agendas, techniques, and layout. But they all share a common denominator which is that each collaboration begins with a shared objective between the stakeholders. The stakeholders have a common issue to be solved, and this fuels the network to work together towards a solution.

The collaboration between governments and their constituents is understood as the concept of citizen participation. The inclusion of citizens in governance processes is witnessed in an exponentially growing number of cities and countries. This growth in the relevance of participation can be explained by the growth of its stimulants that are described by Beresford (2002) being political will, public dissatisfaction, and public interest [3]. The networks formed by the collaboration between citizens and the government benefit from the input of their citizens for the creation of tailored and citizen-centered services. The citizen-government interaction has proven to have the potential of improvement with the inclusion of Information

and Computing Technologies (ICTs) that facilitate efficient and accessible means of communication and exchange of information between the stakeholders [4] [5]. With the incremented outset and delivery of digital services worldwide, the public sector has been on a continuous process towards digitalization, materialized by the networks of collaboration between public managers, system designers, engineers, the citizens and more [6].

The use of ICTs as a mean to help the development and evolution of the public sector is a widely studied phenomena specifically in the area of contemporary Public Sector Innovation (PSI) studies. As a result of these studies, a twofold outcome of ICTs in PSI is found; that technology is itself a key component for innovation, and that technology facilitates the road path towards innovation by providing platforms for information and communication [7]. The mentioned outcomes, overlap with the requirement for collaborative digital government (CDG), the intrinsic need for an efficient linking between the stakeholders that create the network. From this, the concept remains an ever-growing area of study for both public administrators and IT experts working towards the integration and interoperability of processes that facilitate governance [8]. This is done by the inclusion of non-traditional stakeholders in the decision-making internal processes like the public and the private sector. The materialization of Collaborative Digital Government (CDG) is often witnessed as a public digital service, in line with the principles of e-government, and specifically in the municipal level with the adoption of digital services like complaint systems. Public managers have the obligation to provide platforms for efficient interactions between citizens and their municipality, therefore ensuring the citizen's right to participate.

This type of interaction has proven to be enhanced with the use of digital technologies in governance processes, like it was the case of the "Quick and Easy Citizen Response Center" or CCPIS in Seoul, the very first citizen complaint system introduced in 2014. The CCPIS introduced a concept where citizens would be able to informally communicate their general complaints to their municipal representatives. Nowadays, the CCPIS receives thousands of complaints daily and helps the citizens of Seoul maintain a close connection with their municipal government. The simplified manner to communicate their concerns, facilitated by the advancements in ICT and its implementations in the public sector created a platform to involve citizens, manifest their desires and especially their need to participate in governing [9]. Since then, multiple systems with a wide variety of characteristics have appeared throughout

the major cities of the world, becoming the platform to bridge the interactions between citizens and their municipalities.

1.1. Problem Statement

The city of Tallinn has undergone a deep transformation in the past decades, creating an environment that fosters the development of national and attract international companies to work on areas of private sector innovation in IT, fintech, communications, cybersecurity, and more. However, this innovation on the digital sector of the private sphere has not been adequately translated to the public sector in the local government level, that has shown to lack the digital capacity to provide citizen-centric and state-of-the-art digital services. [10]. Nowadays, citizens expect to have accessible high-quality services that in accordance with the current paradigm of public administration should be available digitally. At the same time, one of the most discussed aspects of Smart-city transitions is the existence of high-quality efficient communication platforms between the municipal governments and their citizens.

This communication, in pair to the current standards and stage of e-government in Estonia, can be implemented through a digital service that accommodates the needs of the citizens of Tallinn. The opportunity to implement city-wide digital service in Tallinn is especially unique, as a city with a high-level of trust for technology and specifically mobile data usage [11]. Trust is one of the principal aspects that influences the aim to use a technology system considered on the Unified Theory of Acceptance and Use of Technology (UTAUT). [12] On that account, in the European scope a major powerhouse of trust and engagement in the future smart cities throughout the continent will be the creation of new digital complaint systems [13].

In accordance with the regulations established by § 22 (1) 34), § 532 (2) and § 52 (2) and (7) of the Tallinn Statues Act, the Municipal Police Board is responsible for an assortment of tasks. Among those, indicated by the pre-existing law, this entity is in charge for the development and maintenance of a Citizen Complaint System, as it described in the following clauses: *"participation in ensuring public order, exercising state supervision over the general requirements for conducting in a public place"* [14]. Later, specifying:

"(...) 6) maintenance of the register of misdemeanor matters and other registers and databases necessary for the performance of the functions of the Board; (...) 10) forwarding information to city authorities concerning the need to apply administrative coercion. 11) co-operation within the competence of the Board with other local government units, government agencies, foundations, non-profit associations and relevant agencies of other countries and international organizations" [15].

For a city where trust in technology and digital literacy are high as in Tallinn [11], the number of municipal digital services are scarce. By the current method of communications between the public and the municipal government, pressure is solely on citizens. To reach out and invest effort and time to understand the means of communication, and make their complaints been heard. Currently in the Tallinn official website (Tallinn.ee) the city offers an option for citizens to make complaints and for them to be processed by different departments of the municipality. Although there is no current specific guideline on what are these complaints that one can make or how they will be processed, it requires the citizens to follow a multi-level 5 step process to make one complaint. The city calls this service "Resolving complaints from the citizens" and it first requirement is to "fill an application".

Said application lacks any determined format or structure and it is completely up to the citizen to decide on how to create it. Then the service requires the citizen to sign it digitally, make the decision on which department of the municipality should handle it and send it by email to the that department. It can also be delivered by traditional means of communication like printed in person, by post or over the phone. These multi-levels for complaint application creates a confusing, counter-intuitive, and outdated experience that could be affecting the way the citizens interact with their municipality and in a long run, affecting their living standards by creating a hostile environment for feedback and citizen participation. Ergo, the current system in Tallinn does not comply with the European-wide objectives of modernizing and digitalizing services that enable citizen participation and centricity stipulated in the 2019 Environmental Compliance Assurance [13].

1.2. Research Gap

Tallinn lacks a complaint system that is up to date to the current technologies and applications that are available in the Estonian public sector. By providing the service of complaint gathering and handling only through standard channels[1] the city is neglecting the citizens of Tallinn of a contemporary and thorough mechanism to submit complaints to their municipality. A gap exists in the state-of-the-art about understanding the needs of the public and its interactions with municipal governing body. The gap further develops in the understanding of contemporary technologies and ICT practices that might be able to improve the communications between these two highly important stakeholders. Specifically, the creation of a complaint system that is co-designed with citizens tailored to their needs, and to improve their interaction with municipal governments.

1.3. Research questions

Based on the research gap, the meta research questions (RQ) are formulated as follows:

RQ1: How is the current complaint system of Tallinn working and does it allow for the interaction between citizens and municipality?

And,

RQ2: How would a complaint system that uses the latest technologies and accommodates to the necessities of the people of Tallinn operate?

To further answer and sustain the research questions, the following sub-research questions were formulated:

SQ1: What is the citizens perception of the municipality of Tallinn and their interaction with it?

And,

SQ2: What are the functionalities that a renewed complaint system would need, to improve interactions between the public and the municipality?

[1] The European commission defines channels for lodging citizen complaints as (i) Standard: post, email and phone, (ii) Online gateway and (iii) submission in person.

1.4. Motivation and Relevance

The motivation driving this study comes from the witnessing of an inefficient, outdated an inappropriate communication between the citizens of Tallinn and their municipality, specifically in the concern of public complaints. Along with the understanding of the capabilities of the city's residents to closely interact and benefit from digital services enhanced by current technologies. When faced with a multi-layered problem, like communication in a city between the representatives and their represented, an agile service or product must be developed with constant interaction with the users. This involvement allows for creative solutions supported by service design principles that have the objective of delivering citizen-centered services that not only match citizen needs but also encourage citizens to engage and participate.

This study will contribute to the literature of citizen participation and collaboration, digital service design and smart city technologies development in Estonia. With the engagement of citizens on a concern that affects everyone in Tallinn, their need to be listened and represented. Contributing to everyone's democratic right to raise concerns to their municipality and expect the most appropriate interactions with their elected municipality through the institutions that are there to provide municipal services. Consequently, bringing those citizens who are already engaged or those who aren't, closer to their municipality though a citizen-centered service for the betterment of their city.

2. Research Background

This chapter presents an overview of the existing literature and theories in regard of digital government and the production of digital services. It also provides a special focus on the ways that people interact with digital technologies in the public sector, from adaptation to co-creation. Lastly, this chapter benefits from the online and offline research to lay the ground for the current research to be based on, while identifying relevant gaps in the literature regarding digital complaint systems as a form of CDG.

2.1. Digital government

Digital government is the renewed term for e-government, referring to those governments that use ICTs as means to deliver services to their citizens. The use of digital government techniques has expanded throughout the world, and it is now constituting a new paradigm in the public administration area. This expansion is due to the outcomes of ICT inclusion in the public sector, which have been largely studied and can be summarized as increased efficiency [16], transparency [17], cost-reduction and general service availability [18]. At the same time, the introduction of digital technologies in the public sector has a direct effect over the citizens, by easing their interaction with their representatives, providing a better and more secure experience when using public services [19], while working as a mean of social inclusion [20]. These effects, serve as a demonstration that digital government does not only include the technical aspects of ICTs in public processes, but also have a direct social implication.

While all the previously mentioned research regarding the effect of technology in government processes remain on the optimistic spectrum. More skeptical and critical research has emerged specially in the past few years [21]. This brings up questions on the empirical data as opposed to the idealistic vision for technology implemented in the public sector. Discrepancies range from utilization, adaptation, trust, interest, accessibility, etc. and these issues need to be taken into consideration when discussing digital government and the inclusion of ICTs in the service provision processes.

Tackling and understanding why some services might not be appropriate for a determined target group of users is a necessary step on the area of service development in the digital

government spectrum. With this, an issue of special relevance arises, trust. Without citizens' trust in government or in the services provided by the government, the use of said service will be proportionally affected. According to existing literature about this, there is a clear relation between trust and dissatisfaction. Chanley et al. argue that dissatisfaction is not only an outcome of lack of trust, but it is also a cause for it [22]. This suggests that a decline in satisfaction among citizens leads to less trust and therefore, a reduced usage rate of public services. A government that doesn't work on improving the citizen satisfaction rate will performed weakly in the deployment of digital services due to poor engagement based on the lack of trust.

While more current studies do not contradict what was proposed by Chanley in 2000, the perspectives of the implications of trust and digital technologies have changed. Studies regarding the use of blockchain technologies, transparency enhanced by digitalization and the expansion of Peer-to-Peer (P2P) networks, show that technology can be an enabler for trust. In this sense, governments that are willing to use digital technologies to open to their citizens and therefore, have the capability to increase their trust. And ultimately in accordance with Chaney's suggestion, promote the satisfaction rates among their citizens. This is further studied by Trankhtenber, suggesting that use of digital technologies has the capacity to increase satisfaction through an improvement of quality and availability of services. Resulting in a perceivable increase of trust in authorities and government [23]. While at the same time, increasing the willingness to utilize services and participate in governance procedures.

The application of technology for fostering participation (eParticipation) has been a subject of debate among scholars in the areas of PA and IT. Understanding that participation is one of the core principles of democratic regimes, and that it is enhanced with the use of digital technologies, multiple frameworks are constantly developed to promote eParticipation. These frameworks are often tested by an ever-growing number of governments and municipalities. Yet, the most promising outcomes come from the initiatives on the local scope, showing a higher level of engagement and trust than the larger country-wide initiatives [24]. Participation is studied nowadays as a form of collaboration between the citizens and their governments. The network that is created between the stakeholders is maintained by the building blocks of collaboration: communications and trust.

2.2. Collaborative Public Administration

Collaborative Public Administration (CPA) is the area of studies that looks into the relationships and interactions between the stakeholders that constitute a public network. This network can be formed by citizens, public institutions, NGO's, private businesses, and other relevant stakeholders in public affairs [25]. This morphology allows the decision-making power to be more evenly distributed among the different actors that interact within a country or city [26]. CPA experienced an accelerated growth since the decade of the 90s, since then, its development and transformative nature has accompanied the development of contemporary academic research regarding innovation in the public sector. At the same time, the digitalization of services and governmental processes has yielded an assortment of benefits in terms of internal efficiency and service delivery quality. These two (collaboration & digitalization) have been portrayed as clear examples of innovation in public administration and management studies.

Collaborative processes nurture from the collection of various sources of information, these sources are especially valuable for collaboration when they represent diverse areas of society in terms of culture [27], gender [28], and political views [29]. Along with benefits from diversity, it can also signify a catalyzer for conflict through debate and disagreement. Interestingly, conflict is regarded to be one of the basic issues within bureaucratic theory [30], as one of the main enablers of interaction in contemporary governance in democratic systems.

After considering collaboration as a concept, the digitalization of it can manifest in multiple forms. For instance, the digitalization of networks between internal agencies of a government can be automated through an automated layer of data exchange that inherently contributes to citizen-centered concepts like the "once-only principle" or OOP. An e-government concept that entails that once a citizen has provided with one piece of information to one government agency. The citizen shall never be required to provide the same piece of information to any other institution of the government again. [31] This principle eliminates the citizen and businesses burden to a bureaucratic administration and transfers the pressure to have interconnected and citizen-centered layered platforms to the government. This is only achieved with the collaboration between institutions that share the information and are interconnected by a digital platform.

The current digital infrastructure allows for value-creation though platforms, the digital ecosystems conjoin multiple sources of skills, knowledge, and availability. They can serve as the tools for gathering quality information and feedback from the citizens in regards of public service concerns. The utilization of digital platforms for value-creation has been extensively studied in the private sector, this is because the private sector has had the most access to innovation and capacities to implement new technologies in its processes [32].

At the same time, the incremental growth of the capacities of big data and analytics start to yield benefits on the implementation of technologies in government. In some cases, it allows for improved environments where citizens interact with their government through technologies that work as a path for collaboration between citizens and the state. A government that adopts digital technologies in its practices for the co-creation of services will also need to learn how to manage both traditional bureaucracy and algorithmic bureaucracy.[2] [33] The interaction between the government and the citizens can be enhanced by the usage of social media and the analytics of people's usage of digital technologies. Digital services will transform this interaction through real-time feedback analysis, monitoring, updating of information and raising awareness of the connectedness between the government and their constituents.

But the institutions that implement the usage of digital technologies on their service creation and delivery will need to give special attention to the quality, safety and the focus on citizens, by not implementing these changes on the mere seek for efficiency and time saving purposes. [34] The quality of a service will be largely defined by how useful it is for a citizen, therefore the quality of a service is directly linked to the perceptions and understandings of the public. This is why citizens have to be involved in the creation of said service and play a major role on the deployment of it. For it to be designed by and consequently used by the citizen. Co-creation has many implications and can derive conflicts between the governmental institution in charge of the design of a service and the citizens, the communications between the stakeholders need to maintain a high level of quality and closeness to achieve the best outcomes from the inclusion of citizens in the creation of services.

[2] Socio-technical nature of contemporary public administration that uses digital technologies and artificial intelligence for the management of government.

2.3. Digitalization and Innovation

The objective of innovation the public sector has experienced a shift in the recent years, with a focus on the quality and reason for innovation, rather than the previous focus on rate and amount of quantifiable innovation. [35] The process of digitalization inherently falls in the continuum of innovation, that in it on itself thrives in environments where the exchange of ideas, knowledge and concerns are prioritized to clarify the understanding of multilevel problems in need of holistic solutions. [36] Among many, one of the roles that the public sector has is to procure the wellbeing and resilience of its citizens, through the implementation of policy that is congruent to the current context in which it develops. On the 21st century, this entails that the government will need to be in constant transformation and on the seek for innovation. [37] This has manifested in cases everywhere with the digitalization of the public sector, as the transformation of traditional services into web-based or IoT-based services accelerates.

The inclusion of digital technologies in the processes of governance has enabled the widespread delivery, accessibility and incremental quality of services. This phenomenon can be witnessed everywhere with multiple levels of complexity and involvement of IoT devices, from Nigerian government service portal supported by SMS to the interconnected cross-institutional data exchange software layer "X-road" of the Estonian government. The useation of digital technologies in public administration has become a higher priority for multiple countries in almost every region of the world, each country will have different difficulties regarding the implementation of digital services, like accessibility, capacity of provision, economic situation and socially-bound conflicts like the digital divide.[3] The capacity to implement ICTs in government contributes to the potential of innovation that a country has. [38] But this innovation can be enabled by the ICTs in a twofold manner, becoming the key driver of innovation through the implementation of new routines or facilitating innovation by providing platforms of information exchange and communication. [39]

[3] When different socio/economic factors create a gap between privileged and underprivileged sectors of society. It directly affects the underprivileged groups capacity to access and comprehend the digital era. The members of society principally affected by this are those living in rural areas, those under the poverty line, and the elderly.

2.3.1. Diffusion of Innovations

The diffusion of innovation is a concept presented by Everett Rogers firstly in 1962, that explains the process in which people react to innovation by adopting it through time [40]. The process of adoption of innovation among members of a social system occurs when the public is aware of the innovation and has access to it over time.

There are multiple factors that will affect the rate of adoption but the most important one is the time it takes for the public to adopt an innovation after the communication phase. The differences on the rate of adoption of innovations can be based on social and economic inequality, trust on effectiveness, visibility and accessibility, compatibility with existing services and standards, and ease to understand and use.

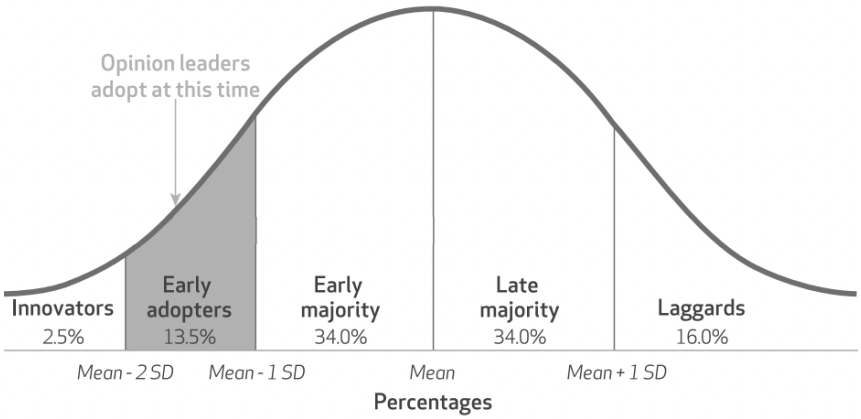


Figure 1 Distribution of adopters of innovation based on time of adoption. Source: Rogers, 2003.

In the diffusion of an innovation the process can be often observed as a normal distribution that can be divided in 5 stages. (See Figure 1) The first one represents the innovators that will adopt the innovation due to excitement and novelty. The second group represents small number of adopters at the beginning of the curve or "early adopters" and are enticed by the innovation's perceivable advantages. These early adopters are followed by the early and late majority groups, that are tempted to adopt the innovation due to social pressures and the perceivable benefits that the early adopters are gaining from the adoption of the innovation. Finally, the last group to adopt the innovation are the "laggards" who are less susceptible to social pressure or do not feel the need to adopt the innovation [41].

The normal curve of diffusion of innovation shows how an innovation starts to gain popularity among the people and later stagnates through time, with the arrival of other innovations that compete and, in some cases, ends up replacing the previous innovation. At the same time, a lot of the innovations that coexist in a competitive environment will stagnate and not manage to mature to the point where it becomes a diffused innovation in society. Still, the process of failure to defuse constitutes a very important part on innovation, since without failure the organizations promoting innovation are not able to test their capacities and the necessities of the public [40]. Understanding the process of gatekeeping and mobility of information within the social system is a priority to ensure the diffusion of innovations. The role of the communications between the innovators, "influencers" and opinion leaders with the public has the power to enhance or impede the innovations diffusion [42].

2.4. Acceptance of Technology

The availability of quality digital services does not ensure that the public will use it. Utilization and acceptance of new technology-enabled services remains as a decision of the intended users, in this case the public. To analyze the user behaviors and the public's acceptance of digital service, the Unified Theory of Acceptance and Use of Technology (UTAUT) is broadly used. This model firstly proposed by Venkatesh et al. (2003), is often regarded as one of the most accurate for understanding the public's behavior towards new technologies. The UTAUT discusses eight prominent models on the acceptance of technology research: model of personal computer use, diffusion of innovations theory, social cognitive theory, motivational model, theory of reasoned action, technology acceptance model, theory of planned behavior, and a combined theory of the last two mentioned [43].

The theory effectively integrates the compatible elements across the models. Thereafter providing a complete theory that has helped academics in a plethora of areas to understand the public behavior toward technology. The four direct determinants of technology acceptance and use in the theory are performance expectancy, effort expectancy, social influence and facilitating conditions [43]. These factors are defined by exploring the empirical and conceptual overlapping concepts in all the eight independent models studied by the authors. At the same time, the four moderators of the theory are defined as gender, age, experience, and voluntary use (See Figure 2).

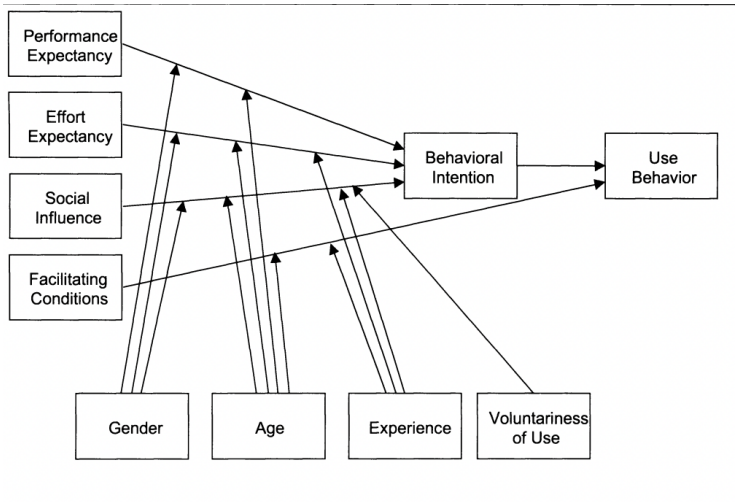


Figure 2: UTAUT model. Source: [43]

When considering the adoption process of a new digital service on the municipal scope, the determinant factors that are defined by the UTAUT are of importance. The performance expectancy factor is related to understanding how the adoption of the new service will help citizens to attain gains. It must be addressed by helping citizens to do tasks more efficiently, helping them to perform their activities better, and generally increasing the quality of their activities. The effort expectancy factor is related to the ease associated to using the new digital service and will need to be addressed by ensuring usability for all or a greater portion of society considering digital divide, digital literacy, usability, and user friendliness.

Social influence is related to the degree to which an individual is expected to use the new system, and this factor does not necessarily need to be addressed by the deployment of a digital service. Finally, the facilitating conditions are defined as the degree to which an individual believes an organizational and technical infrastructure exist to support the system and will need to be addressed by ensuring that the service is widely available and accessible, understandable, and usable for everyone by for example providing appropriate remote coverage and multiple language options.

2.5. Collaborative creation of a complaint system

Smart cities and smart city systems have been pushed by governments throughout the world on a rapid fashion in the recent years [44]. Nowadays the inclusion of a digital complaint system for the collection, processing and resolution of citizens' complaints is almost a universal step that every municipality undergoing transformation towards smart city [45]. Digitalizing

the communications between citizens and municipality allows for easy and efficient exchange of information, that allows the municipality to gather information and solve the issues that re affecting the citizens on a direct communication basis.

The provision of a digital service to gather the citizens' complaints takes the pressure off the citizens from using the traditional means of communications for complaints. These traditional means are email, SMS, and phone calls [13], and are the only platforms that the municipality of Tallinn currently uses for communicating with its citizens regarding public complaints. Complaint systems have shown to foster citizen empowerment [46], citizen participation [47], and as a result improving citizen satisfaction [3].

The development of a complaint system requires a CDG process to unify the main stakeholders. The igniter of a collaborative process is a common goal that multiple stakeholders share. In the area of public complaint systems, the main stakeholders are the citizens (users of municipal services) and the municipality (provider of municipal services). The municipality oversees providing a variety of services that range from transport, education, welfare, environment and more. In accordance with the "Local Government Organization Act" of 1993, the functions and competences of a municipality are:

"Organisation, in the rural municipality or city, of social services and benefits and other social assistance, welfare services for the elderly, youth work, housing and utilities, the supply of water and sewerage, the provision of public services and amenities, waste management, spatial planning, public transportation within the rural municipality or city, and the construction and maintenance of rural municipality roads and city streets unless such functions are assigned by law to other person" [48]

In 2020 the municipality of Tallinn published a book treating the topic of public facilities and maintenance called "The ABC of Urban Maintenance" where the municipality defines its responsibilities on the maintenance and betterment of the environment as: landscaping, maintaining public playgrounds and parks, tree planting, care and cutting and waste management [49] These responsibilities fall in the predefined function of "provision of public services and amenities". At the same time, in the case of Tallinn, the maintenance of roads and road infrastructure (lighting, sidewalks, etc.) is organized by the city district governments. Finally, the institution in charge of managing and communicating the citizens' complaints to

the local government and district offices, in accordance with the regulations established by § 22 (1) 34), § 532 (2) and § 52 (2) and (7) of the Tallinn Statues Act, is the Municipal Police Board [15].

A complaint system that is designed for citizens to communicate their concerns and complaints to the municipality, needs to have the capacity to bridge the different offices in charge of the maintenance of city infrastructure. In the case of Tallinn, this network must communicate the complaints of the citizen to the municipality and their different branches represented by the individual district government through the Municipal Police Board. Therefore, there are four stakeholders in the collaborative network that will need to be established for the complaint system in Tallinn: the citizens, the police board, the central municipal government, and the district governments.

3. Methodology

A thorough overview of the literature was conducted at the beginning stages of the thesis, making clear that ICTs are transforming the way services are provided and the nature of services themselves, collaboration between stakeholders is an ever-growing mechanism to provide co-produced services for the public, adoption of technology and technology-enabled services is a complex process that requires a user centric approach to be tackled, and that complaint systems improve public participation and satisfaction. The thesis will use Design Science Research (DSR) as the logic driving its methodology. DSR uses human and organizational behavior to extend their capabilities with the creation of novel artifacts consisting of "constructs, models, methods, and instantiations" [50]. These artifacts serve as solutions to problems, or they help to upgrade the knowledge of issues within the area of Information Sciences. [50]

3.1. Design Science Research

To achieving the creation of an artifact, a process of defining and understanding the environment and the knowledge base is required. At the same time, the expected outcome of the artifact should be to contribute to both, while being appropriate for the environment and adapting to the knowledge base.

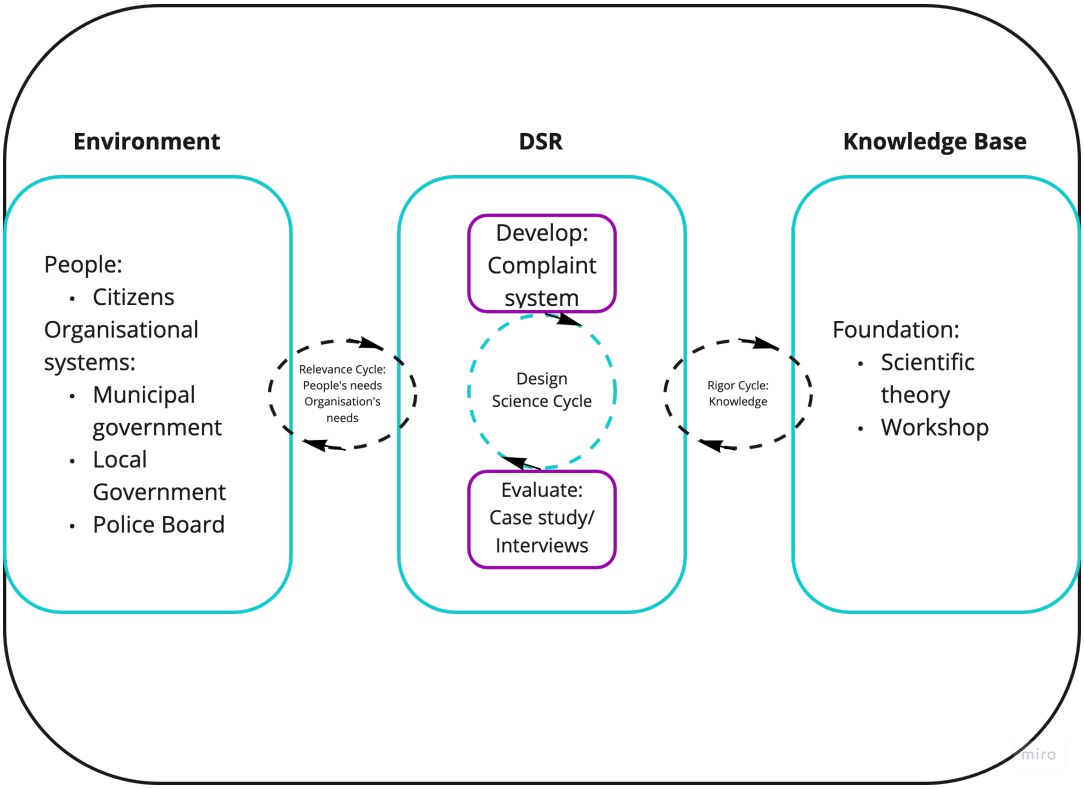


Figure 3 DSR cycle for Tallinn Complaint System Artifact. Source: Martín Peñaherrera

In figure 3, the DSR framework for the development of a complaint system for Tallinn as an artifact is presented. This framework is based on the Three Cycle View of DSR presented by Hevner in 2007 [51]. It allows to visualize the process of DSR and comprehend the interaction between the environment, the knowledge, and the artifact to be created. In this research context, the fist pillar that constitutes the environment is formed by the people involved are the citizens of Tallinn; the organizations are the Municipal Government and its branches of District Governments, and the Police Board.

The middle pillar of the framework contains the development of the artifact or theory, this thesis will develop the artifact of the complaint system for Tallinn, which will be evaluated through exploratory case study throughout the research and with the use of interviews to a non-random sample of both experts and citizens living in Tallinn. The artifact creation will be based on preexisting theoretical knowledge and novel knowledge gained through a workshop organized by the author with the attendance of citizens, designed to understand the citizens needs and expectations regarding communications of their complaints to the municipality of Tallinn.

The output of the artifact will contribute to the base of knowledge and while also provide relevancy to the citizens and the municipal institution's needs. Hevner defined the guidelines for conducting successful DSR on the 2004 "Design Science in Information Systems Research" article and it is defined by the following table:

Design-Science Research Guidelines	
Guideline	Description
Guideline 1: Design as an Artifact	Must produce a viable artifact: construct, model, method, or an instantiation.
Guideline 2: Problem Relevance	Develop technology-based solutions to important and relevant problems
Guideline 3: Design Evaluation	Utility, quality and efficacy of design artifact must be rigorously demonstrated through evaluation methods.
Guideline 4: Research Contribution	Must provide clear and verifiable contribution to the area of design artifact, methodologies, or foundations.
Guideline 5: Research Rigor	DSR relies upon implementing rigorous methods for constructing an evaluating artifacts.
Guideline 6: Design as a Search Process	DSR utilizes available means to satisfy desired ends within the confines of the problem environment
Guideline 7: Communication of Research	Must be presented for technological, managerial, academic and public audiences

Table 1 DSR Guidelines Source: Hevner, 2004.

3.1.1. Design as an artifact

The primary outcome of DSR is to produce an artifact to solve a socio-technical issue with the utilization of ICT's. This thesis will focus on prototyping a digital platform as a conceptual model. This model is produced to understand and improve the interactions between the citizens of Tallinn and their municipality. The complaint system developed on this thesis works as the path towards innovation in Tallinn's public space. It will test the capacity of citizens and municipality to communicate efficiently and effectively.

3.1.2. Problem relevance

The municipality of Tallinn has perceivable issues with the public communications for maintenance and management of infrastructure of the city. These problems are based on the lack of efficient and constant communication from the public. Public participation can help to improve satisfaction, while also tackling the maintenance of infrastructure through collaborative processes. Citizens serve the main actors for reporting and controlling the progress on the maintenance of the public grounds and services. At the same time, the population of Tallinn is specifically a highly educated and digitally friendly population that could potentially adapt easily to new technologies in the municipal space. Especially considering that Estonia is already a country with a highly digitalized public sector.

3.1.3. Design Evaluation

There are 5 methods for evaluation in DSR described by Hevner: Observational, Analytical, Experimental, Testing and Descriptive [50]. Each of the evaluating methods is appliable for different contexts and expected research outcomes. Although a single comprehensive and universal framework for evaluating DSR is not universally accepted Jackson proposes a comprehensive taxonomical mapping of evaluation methods and artifacts in DSR. (See Figure 4)

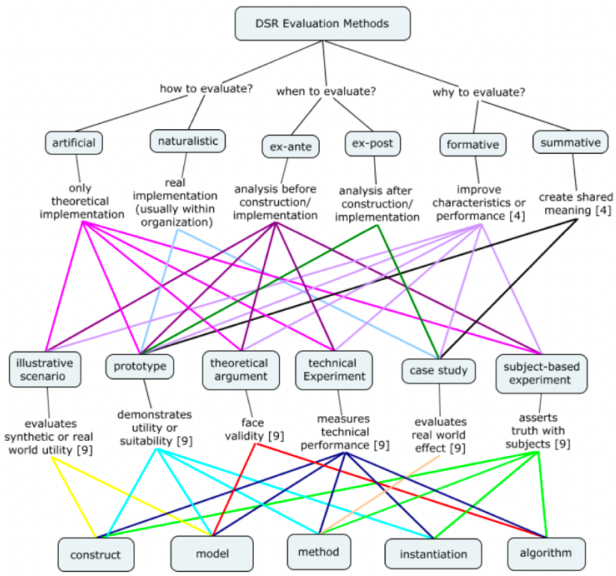


Figure 4 DSR Evaluation Taxonomy. Source: [51]

The evaluation methods for DSR described in figure 4 are partially on the Comprehensive Framework proposed by Venable et al. that divides strategies into naturalistic or artificial and ex-ante and ex-post [52]. For this research, the evaluation method will be artificial. As described by Venable et al. artificial evaluation includes simulations, experiments, and criteria-based analysis. This evaluation is predominantly scientific/rational and provides reliability and ensures repeatability [52]. At the same time, the research evaluation will be done on an instantiated artifact resulting from the citizen-centric study of the citizens needs and usage of digital platforms, therefore making the evaluation ex-post. Finally, the functional purpose of the evaluation is to provide a platform that successfully improves citizen-municipality interactions, which falls into the formative evaluation method described by Venable et al. [53]. Considering all of this, this thesis will use artificial, ex-post, formative evaluation methods.

3.1.4. Research Contributions

This thesis seeks to contribute to the city of Tallinn by bridging the main stakeholders of the public sector in a city, the municipal government, and the citizens. The constitution is achieved by carrying out a deep and comprehensive study of the population of Tallinn, while considering the technical and bureaucratic implications of a new municipal digital service. Introducing a novel technology for the city that will modernize its public sphere and improve the participation and satisfaction rates in Tallinn.

3.1.5. Research Rigor

Rigor is established by the creation of the artifact by contributing to its own knowledge base. This will be backed by the thorough understanding and knowledge gathering on before and after the process of prototyping, in the workshop with citizens and during the interviews of experts and citizens after interacting with the prototyped platform.

3.1.6. Design as a search process

Design is an iterative process, that nurtures from the understanding of users, prototyping, trial, and error, reshaping of services and processes in a constant evolution. This thesis identifies a problem and proposes a solution that instead of forcing users to adapt to the solution, is based and created by the citizens needs and capacities. In the DSR fashion, the study will prototype and test before proposing the distilled solution.

3.1.7. Communication of Research

The communication of Research for the Complaint System of Tallinn occurs on the form of the present thesis. It will therefore be diffused in the written and oral form though the academic community and potentially the relevant stakeholders.

3.2. Data collection

In adamic research the use of multiple sources of evidence ensures the validity, accuracy, and quality of data. Variety of sources allows the researcher to compare and understand from a diverse pool of information. This allows to draw strong conclusions in the study backed with information gathered from the stakeholders. For this thesis, 3 sources of evidence will be used: a workshop, a set of semi-structured non-random interviews, and documents. The participants of the workshop are active citizens living throughout Tallinn, willing to collaborate on projects regarding city infrastructure improvement and mobility. At the same time the interviewees reviewing the prototype created with the information gathered with the workshop will be active citizens of Tallinn that did not take part on the workshop as well as experts on the field of public administration and mobility.

3.3. Risks and Limitations

The risks of the thesis can be summarized as lack of rigor, variety of sources and validity of the theoretical information when applied on real life settings. To address these risks the collection of data shall come from various sources with diverse information and be presented in a similarly neutral fashion.

Availability of data regarding complaint system creation is scarce posing another limitation for the study, but information about service creation and Design Science Research to create artifacts from the information and data collected directly from the users is abundant. This ensures that the artifact creation will not be hampered by the limited number of resources on the creation of complaint systems.

3.4. Thesis structure

The thesis following parts of the current thesis is divided into three parts: identifying, reshaping, and testing data.

1. The identifying section of the thesis is characterized by the identification of the current system working mechanisms, its interactions with the public and the understanding of the citizens day-to-day communications and interactions with the municipality of Tallinn. For this, a user journey of the current complaint system was developed with the inclusion and participation of citizens. And a workshop was also conducted with the physical participation of multiple active citizens interacting and discussing the current situation regarding citizen-municipality integration and possible future solutions.
2. The reshaping section of the thesis is characterized by the transformation of empirical data gathered from the "Identifying" section. It involves transforming the data gathered directly from the citizens into the layout of a citizen-centric complaint system, that understands the current journey a user must take a complaint, simplifies it and reshapes it into what the future citizen-municipality interaction could look like if the knowledge gathered from the citizens would be applied in the creation of a new service.
3. The final section, testing, is characterized by bringing the prototype of the proposed complaint system created in the reshaping section and testing it with a non-random sample of subjects. This sample would be confirmed by both experts in service creation,

human-computer interaction, public administration and of course, the main actors: citizens themselves. After the testing section, with the information gathered from the subjects a final retouching of the prototype leads to the creation of the citizen-cantered designed complaint system as the thesis artifact.

4. Handling complaints in Tallinn

This chapter will thoroughly analyse the communications process and handling of complaints in Tallinn. Going through the current process that the municipality has adopted for handling complaints, analysing the possible solutions for its improvement in the future drawing from the theoretical background and empirical data gathered from citizens themselves. The final objective of this chapter is to provide a strong base for the prototyping of a solution for citizen-municipality collaboration that adapts to the citizen's needs and capabilities while considering the legislative environment in which such a platform would need to be developed.

4.1. Current process for handling complaints (2022)

Since 2014, the municipal police department of Tallinn has had responsibility of gathering and processing the complaints coming from citizens regarding "breaches of order" [15]. These breaches of order have multiple categories, that fall into different jurisdictions and require the person making the complaint to disseminate in which of the three categories their complaint falls into:

Complaints regarding *"uncut grass or untidiness of a land plot or if leaves, snow or ice have not been cleared from a pavement, detected dangerous icicles or problems with a construction or excavation work, cutting of trees, wastes, graffiti or infringements in keeping dogs or cats"* are directed to heakorraavaldused@tallinnlv.ee Complaints regarding parking and car-based mobility issues need to be addressed to parkimine@tallinnlv.ee And the last category of complaints regarding the general observations, remarks, and objections will need to be addressed to munitsipaalpolitsei@tallinnlv.ee [54](See Appendix A for website view). After deciding which of the categories the citizen complaint falls into, the citizen will have to write an application without any specification on how to write it or what to include in the application.

Digitally sign the application with the Estonian digital signature (Digi-ID) and send it to the respective email for processing. After this, the citizen making the complaint will receive a confirmation that the complaint was received and later the citizen will be notified on the decision regarding their complaint. This is the e-government solution that the municipality has adopted to process digital complaints, but other types of traditional means of communication are also available and specified on the website of Tallinn: going to the Municipal Police Department office, making the complaint over the phone through the "Tallinn city helpline" or sending the application via post.

4.1.1. Current User Journey

The current complaint system of Tallinn requires the citizens to not only be engaged enough to be encouraged to communicate their complaints. It requires their willingness to look for the information about making a complaint, formulate an application explaining the problem, signing digitally, discerning in which category their complaint falls into, and sending the application to the appropriate email address that deals with their issue category. A detailed map was developed for the visualization of the current Tallinn complaint system user journey (See Figure 5).

The map was created using Whimsical, a visual online workshop for creating mind maps, flowcharts, and basic prototypes. The user journey was first hypothesised by the author and then tested alongside a citizen of Tallinn who agreed to take part in an interactive semi-structured interview. During this interview the author asked the random sample of an interviewee to narrate from their perspective the journey they would need to take to make a complaint to the municipality of Tallinn. For this, the author established an imaginary background story in which the interviewees would describe their feelings. In this situation they would look for ways to make a complaint about it to have the municipality fix the issue.

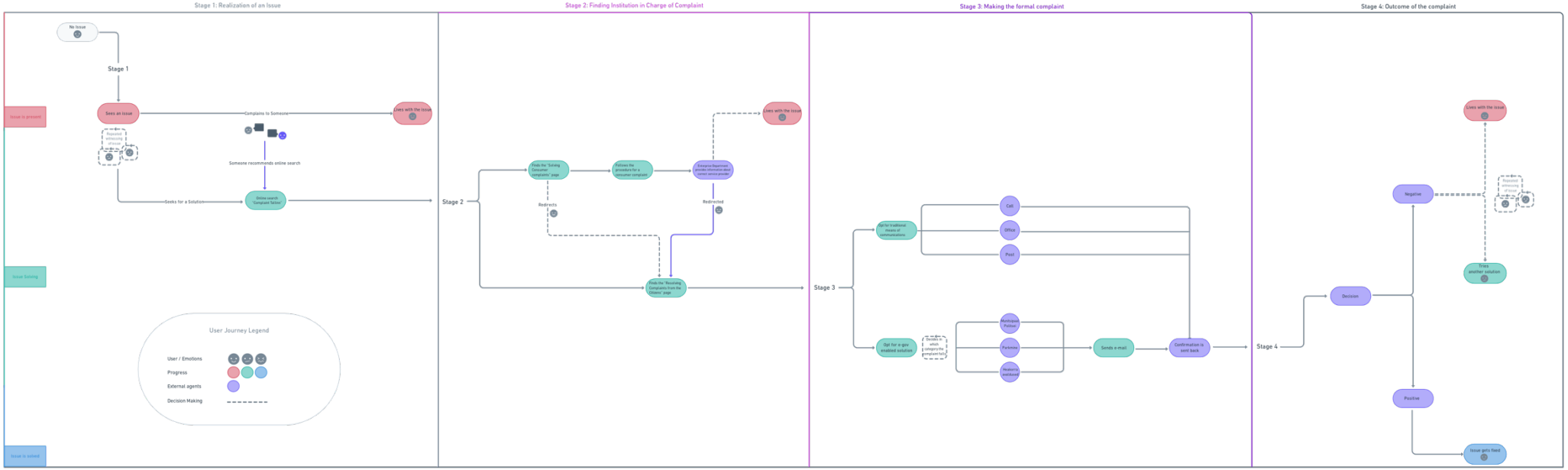


Figure 5 Detailed User Journey for Citizen Complaints in Tallinn. Source: Martín Peñaherrera

Through the interviews the feelings of being annoyed, confused, and frustrated were described by the subject during the current user journey. At the same time, the confusion by the user was primarily witnessed during the second step of the user journey; finding the institution in charge of the complaint. Showing the variety of websites that currently the municipality of Tallinn has touched the issue of complaints from the citizens, despite most these websites do not allow for the actual service that the citizen would be looking for. The hypothesized user journey presented in Figure 5 was largely validated with the interview from the perspective of the random interviewee. Minimal changes in the journey were applied taking in consideration the different paths that the subject took. But generally, the steps and solutions proposed in the first hypothesized user journey were validated and proven. A transcript of the interview can be found in the Appendices chapter of this document (See Appendix B).

4.1.2. Current System Conflict

The current system that Tallinn uses to communicate with the public comply with e-government standards that are more than 10-year-old. Therefore, it does not provide sufficient infrastructure and assurance that the 21st century citizen of a digitally advanced society needs. E-mail communications between governments and citizens have been a long-standing mean for the provision of digital services. The interaction supported by email became a best practice supported and cherished by many scholars in digital innovation in the decade of the 90s. This was because email communications allowed for unprecedented secure and fast interaction between stakeholders [55]. A first step towards digitalization of the public sector that exponentially expanded due to the inherent necessity of communication and collaboration between the citizens and their municipalities.

But this best practice is long outdated and has been replaced with faster, slicker, and more secure technologies that allow increased participation, ease on usability, accessibility, and more. These benefits are achieved though the implementation of contemporary technologies ranging from the now traditional mobile applications [56], the state-of-the-art blockchain technologies [57], to Internet of Things devices implementation like mobile digital service booths [58]. When analysing the current system of Tallinn (Figure 5), one can witness a strong dependence of the municipality on the will, time, and effort of the citizen. This puts the pressure of the complaint system service on the user (the citizens) rather than in the service provider

(the municipality, and legally delegated branches of the municipal police and the district offices).

The steps for making a complaint with the current system provided by the municipality of Tallinn are extensive and highly dependent on citizen decision making. This decision making takes place in two parts of the process. First when of finding the correct platform for making a complaint or even getting the information for the complaint. Secondly, when the platform forces the user to decide which kind of complaint they wish to make, to then send it to the correct email address. The pressure placed on citizens to make a complaint, along with the minimal to no advertisement of the platform could be affecting the usage and awareness by the users. If citizens do not know that they can complain, or the complaining process is too complicated it will hamper the frequency of communications between the citizen and the municipality. Lastly this lack of interaction will affect the citizens living standards that are lowered by a city that does not listen to the citizens and resolve the issues that directly affect them in a day-to-day basis.

When deciding on which of the solutions will provide the best outcomes among a group of people, the UTAUT must be considered. Different societies and sections of societies present different challenges in the adoption of new technologies. These can be based on varied expectations on their performance, their capabilities, and the amount of effort the user will put into understanding the technology and adopt it. While at the same time, societal factors and how available and widely spread or advertised the technology is will also have an important impact on the public's adoption of it [12].

Currently, the average citizen of Tallinn enjoys a high level of digital literacy [11] and exposure to a digital environment that has been brewing in Estonia for over three decades [59]. Tallinn, as a city where an extended part of its population has already adopted digital solutions for public services such as taxation, identification, education, and voting. The deployment of a state-of-the-art digital platform allowing fast and easy communications between the citizen and the municipality is possible. Theoretically, digitalizing the collaboration in maintenance of the city should not encounter difficulties in the adoption of such service based on the UTAUT factors of; social influence, facilitating conditions, experience, and voluntariness of use.

5. Tallinn + U Workshop

The Tallinn + U Workshop took place on the 2nd of April 2022 at the IT department of TalTech. The workshop had 6 attendees, excluding the organizer, with ages ranging from 20 to 33 years. The attendees represented a snapshot of the general young-adult population of Tallinn, with different occupations and countries of origin including Estonia, Russia, Ukraine, Colombia, and Spain. (See Annex C for a detailed list of anonymized participant profiles) The age group for the workshop attendees was based on the literature review. The group that the workshop attempts to represent are the early adopters of technology, outlined by the diffusion of innovations theory [41]. Early adopters of digitally enabled new technologies appear to generally be young adults (19-35) [60] [61] [62] and also this group happens to be the second biggest generational group in Tallinn according to the Statistical Yearbook of Tallinn 2021 [63].

The attendees were greeted and introduced to the topic of the workshop as "understanding and improving the current interactions between citizens and the municipality of Tallinn". The main goals of the workshop are described below, followed by the tools used to achieve those goals respectively.

Goal 1: Understanding individuals' perceptions of their issues and the municipality

a. The issues in the city seen as urgent by the attendants. Set of issues that they could easily remember and express due to their personal biases, needs and exposure.
    i. This was achieved through the first activity in the workshop where the attendees used a semi-structured interview format conformed by three main questions. "What are the 3 things that annoy you the most about Tallinn?", "Why do they annoy you?", and "How could you contribute to solve these problems?".
    ii. The interviewer would ask the questions and take notes of the responses provided by the interviewee. The outcome of this activity was not only limited to gathering information about people's perception, but it also allowed the participants to hear the issues that other citizens are exposed to and possibly sympathize with them.

b. The municipality as an institution and the interaction that the citizen has or has had with the municipality as a public institution.
    i. This was achieved through the second activity, where the attendants had to draw two main concepts. The institution of the municipality of Tallinn as a personified character, and the interaction of the municipality of Tallinn with them as individuals.
    ii. For this, the attendants were asked to first draw the personification of the institution and later, the interaction with them. The attendants were given full creative liberty to represent the municipality according to their perception of it.

Goal 2: Identifying group preferences for communicating and solving the perceived issues in the city

a. The preferred outlets for communicating the general issues that are perceived by the public.
    i. This was achieved by presenting a hypothetical situation to the whole group, where they could communicate directly with the major of Tallinn. The group would have time to consider and discuss the general pressing problems that they all considered relevant enough to communicate them directly to the major.
    ii. After the issues were laid out, the direct line of communication with the major would be cut off and they would need to consider the best outlets to communicating each presented issue to the municipality as an institution. The outlets of communications were a presented to the attendees as: calling, a website, sending an email, a dedicated app, a public discussion, a demonstration, or others, in which the attendees would have the possibility to add different outlets of communication according to what they considered appropriate.

b. The general structure and contents of a digital platform for communicating the issues that were gathered throughout the workshop to the municipality.
    i. This was achieved by splitting the group in two, one group focusing on the necessary features of a mobile app and the other group focusing on a website

platform. The groups were asked to formulate the necessary functionalities (UX) and looks (UI) in those two digital platforms and rank them from most to least important.

ii. Later, the attendees had to imagine and explain how these functionalities would look in the different platforms. For example, fast accessibility to issue report would look like the possibility to have a widget on the home screen of the smartphone.

iii. After this, the groups would present their digital platforms to the other group and the other groups would rank each functionality from 1 to 5, 1 being less useful and 5 being most useful.

5.1. Tallinn + U Workshop results

The results received from the responses provided by the citizens that attended the workshop, generally sustain the theoretical knowledge gathered during the literature review of this thesis. Suggesting that there is a strong disconnect between the citizens and the municipality of Tallinn. And that there are issues that the citizens would like to communicate to the municipality but cannot find suitable communication networks with the municipal institutions. The results will be further analysed and displayed bellow divided by each activity.

5.1.1. First Activity: Interview

All the participants were paired up with one another and had 20 minutes to interview each other with the predetermined set of questions. Along with the questions they were encouraged to discuss the questions and their answers. The expected results from these questions were to understand the individual perspectives of the issues that each of the participant had in mind already. Although, some participants realized that they often ignore these issues, and it was harder to start bringing them out. Once the discussion started with one another, more issues kept on appearing. This brought up the unexpected outcome, which was that the attendees empathized with one another and realized that some of the issues other people were having were also affecting them. (See Appendix D for the list of issues by participant) A list of the most common issues that the attendees perceived as urgent based on their personal experiences is provided in Table 2. These answers were retried from the first question in the activity and are ordered by popularity among the attendees.

Popularity among attendees	Issue	Number of mentions
#1	Poor public transport connections	4
#2	Poor public health	3
#3	- Lack of green spaces - Poor citizen-municipality communications - Poor pedestrian infrastructure - Poor seasonally designed infrastructure	2
#4	- Poor biking infrastructure - Uncontrolled city growth - Poor use of public spaces	1

Table 2 Issues expressed by the attendees by popularity. Source: Martín Peñaherrera

After examining the problems that the attendees identified, all of them fall in the scope of the Tallinn City government responsibilities. These are specified in the "Local government Organization Act" and the "Urban Maintenance" book published by the Tallinn Municipal government itself [49] [48].

The first question served as a baseline to develop the second and third questions, where the attendees had to deepen their perspectives of the issues that surround them in Tallinn reflecting about them and how those issues affect their life. This activity set the ground for the following activities where the attendees will investigate the issues and try to understand them from different perspectives. The general discourse among the participants could be divided into two groups: Those who were unaware of issues on a first thought but after thinking about it and discussing could easily identify multiple underlying issues that the city had. And those who were aware of the issues that the city had and have thought about it but haven't found or haven't given the issues enough importance to complain about it.

*"I haven't given any thought about these issues. My first reaction to these questions was: I like living in Tallinn I don't think anything annoys me. But after discussing it with (*activity partner*) we realized that there are so many issues that the city of Tallinn and I as a person living here could improve"* Klaara, 25.

"Every day that I leave my house and see mud or ice in my doorstep, I know there's someone that should do something about it. I've wanted to complain about it so bad, but never even considered that the city would have tools to hear my complaints out" Viktor, 21.

Klaara's and Viktor's declarations generally represent the discourse distinction between the two different groups of people in the workshop. None of the participants considered that there aren't issues in Tallinn that couldn't be addressed either by the municipality or by them. In the second question, the attendees agreed that most of the issues creates inconveniences in their lives and that nobody is listening to the public regarding these mundane and common issues like poor connections within the city, poor pedestrian, and biking infrastructure and specially the communications with the municipality. Among these issues, the one that attendees agreed that they cannot fix was the communications with the municipality. Since they felt like it wasn't their responsibility to create channels of integration, but their responsibility was to use them. But if the city does not provide appropriate channels to interact and communicate the citizens are left with complaints and no one to hear them or take care about these complaints.

Despite the inefficiencies and outdatedness of the current complaint system of Tallinn already discussed on chapter 4, a channel for communication exists. Theoretically, the public can communicate the issues that the attendees discussed in the first activity of the workshop to the city. But the perception of the public is that there isn't because they simply don't know, or if they know they decide not to use it because of different its structural difficulties.

5.1.2. Second Activity: Visualize

For this activity the participants were handed a blank page, where they would draw the municipality as a person. After drawing the municipality, they would have to draw themselves and the interaction they have with the municipality. For this part of the activity, they initially had five minutes, but after a general consent that visualizing them, and their interaction was a

lot more difficult to imagine and express the time was extended to ten minutes. The extension in time was due to the difficulty to illustrate their interaction with the municipality. It could be based on what the attendees expressed as “knowing there is some interaction but never thinking about it”. This activity allowed for the development of different personas and making the participants’ interactions with the city a user story. Helping them to clearly reflect and consider their needs from the municipality. This exercise followed the framework described by Chamberlain in creating agile and user-centred design [64]

The participants had scattered perceptions of the municipality. Three believed that the institution had too many things to do and therefore could not perform correctly in any of their activities. Referring to the idea of having good intentions but not being able to perform them. At the same time, four of the participants saw the municipality as a formal, corporate, and reluctant to innovation or change. Five out of six viewed the municipality in generally negative perspective. Describing it as outdated, unempathetic, incompetent, and one of the attendees even described it as self-destructive, referring to the prioritization of urbanizing over environmental conservation. In the other hand, one of the participants viewed the municipality in a generally positive perspective. Describing it as having a solid core supported by modern technologies (See Table 3).

Regarding the interaction between the municipality and the citizen, every participant described this interaction as flawed by multiple factors. Three of the participants illustrated no interaction at all. This lack of interaction was originated by two different factors: a solid object (in one case a rock and in the other one a wall) between the two stakeholders impeding any sort of interaction, and lack of interest to from both stakeholders. In the other hand, the rest of the participants described their interaction with the municipality as confusing. The confusion was caused by complicated channels of interaction, excess of weak channels of interaction, and lack of knowledge of the existence of channels of interaction.

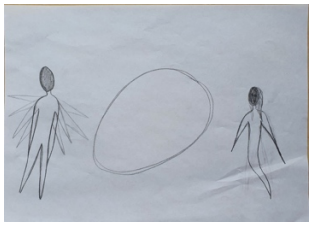
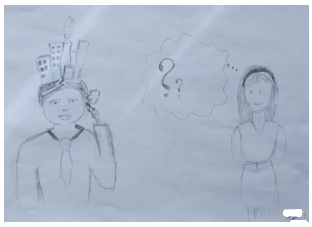
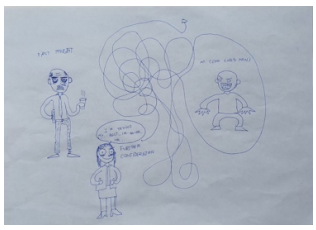
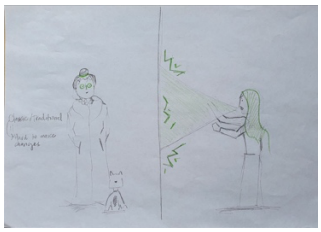
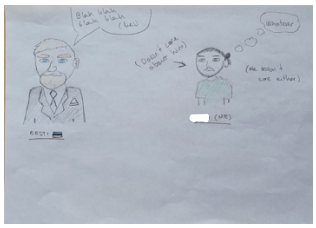
Klaara	Magrit	Leonid
		
Viktor	**Nicole**	**Nilo**
		

Table 3 Visualization of the municipality and its interaction with the citizens by participant. Author: Martín Peñaherrera

The lack of interaction between the municipality and the citizens could be hampering the public's perception of the municipality. Almost all the participants (five out of six) viewed the municipality in a negative way, even though the municipality of Tallinn is a modern institution with high technological capabilities, solid legal bases, and appropriate structural stability. The public clearly does not have trust in the capabilities of the municipality of Tallinn, if trust is hampered, as analysed in the theoretical framework, service utilization could plumet. Therefore, affecting participation and by consequence affecting satisfaction. The municipality of Tallinn will need to work on improving its interactions with the city to improve the public's perception of the institution and improve all the other underlying factors coming from it.

5.1.3. Third activity: Communicate

For the third activities the attendees were introduced to a hypothetical scenario where they would have a direct line to communicate to the major of Tallinn. This line could be used for

any kind of message they would like to communicate to the first authority in the institution of the city of Tallinn. These messages were doing not have any pre-established format, but most of them took the form of complaints. This scenario would later change to not having the direct line and instead of communicating with the major they would have to communicate with the institution of the municipality. For these they would have to find the most appropriate outlets of communication for each specific message. The outlets of communication that the participants' deemed as necessary for the communication of the messages were: mobile apps, demonstrations (protests), emailing, neighbourhood petitions, websites, calling, and citizen consultations.

After reviewing messages/complaints that the participants wanted to communicate to the municipality as a group, categories with main themes emerged. These categories are mobility, infrastructure, communications, and service availability. (See appendix E for the summarized results of the third activity "Communicate"). Most of the messages/complaints addressed to the institution wanted to be directed through a dedicated app. This preference resulting from the attendee's decision communication outlets, is congruent with Julsrud and Krogstad's [11] The activity allowed for the whole group to externalize the issues that they have experienced and put it on a perspective where they would feel listened to. The general reaction to it was an enhanced awareness among the participants. Awareness raising in the city has a big impact potential. Considering what was achieved with a small group of people communicating, a platform allowing city-wide discussion could yield much greater outcomes.

"I think when walking around Tallinn it was always normal to see public spaces being used in a way that I didn't like. But I never considered complaining because that is just normal in this city. Having multiple vans parked in the sidewalks or terraces occupying pedestrian paths it's not nice. It annoys me, but I have always seen it there" - Magrit

At the end of the activity the participants also agreed that complaining and communicating with the municipality is not enough. But they all realized that it would be much more fruitful to be able to participate and propose changes.

"I think we should be able to make proposals, only complaining and hoping stuff to get fixed by others doesn't really work most of the time." – Viktor

The general discourse at the end of the activity shifted from communicating complaints to how communicate their desire to participate and propose solutions to the issues that they have consciously or unconsciously witnessed during the time they have lived in Tallinn. At the same time, some of the participants believed that the current ways to use digital technologies in Estonia felt "cold" and "unhuman". Services in the e-government area are constantly changing, based on citizen's needs, desires, and demands [65].

"I think real innovation would come from being able to participate and give our ideas to the public officials. But an app that helps to send all these messages should not be cold and automatic, but inviting and feel close to the people" - Nicole

The feeling of distance between the citizen and the institutions could be related to the current paradigm on the Estonian e-government agenda of automatization and proactivity in public services [66]. The system would prioritize efficiency over human connections, and the participants agreed that in the case of municipal communications, humanizing interactions is expected. The feeling of not being listened by another person when making a complaint could potentially be another factor contributing to the disuse or distrust into the current complaint system. Humanizing the interaction and portraying the municipality as a caring institution that listens and helps the citizen should become a primary focus to decrease the gap between the citizen and the municipality.

5.1.4. Fourth activity: Ideate

During the fourth activity the participants were asked to consider all the previously discussed issues and solutions proposed by the whole group. After a brief round of discussion, the group was divided into two teams. One would oversee the ideation of a mobile app and the other a website, with the objective of creating communication networks between the citizens and the municipality. For this the participants would need to think in the functionalities (UX) and looks (UI) of their digital platforms and order these from more important to less important in the platform. Later, the groups would present their outlines for the two digital platforms, and they would rank each other functionalities and looks from one to five (See figure 6).

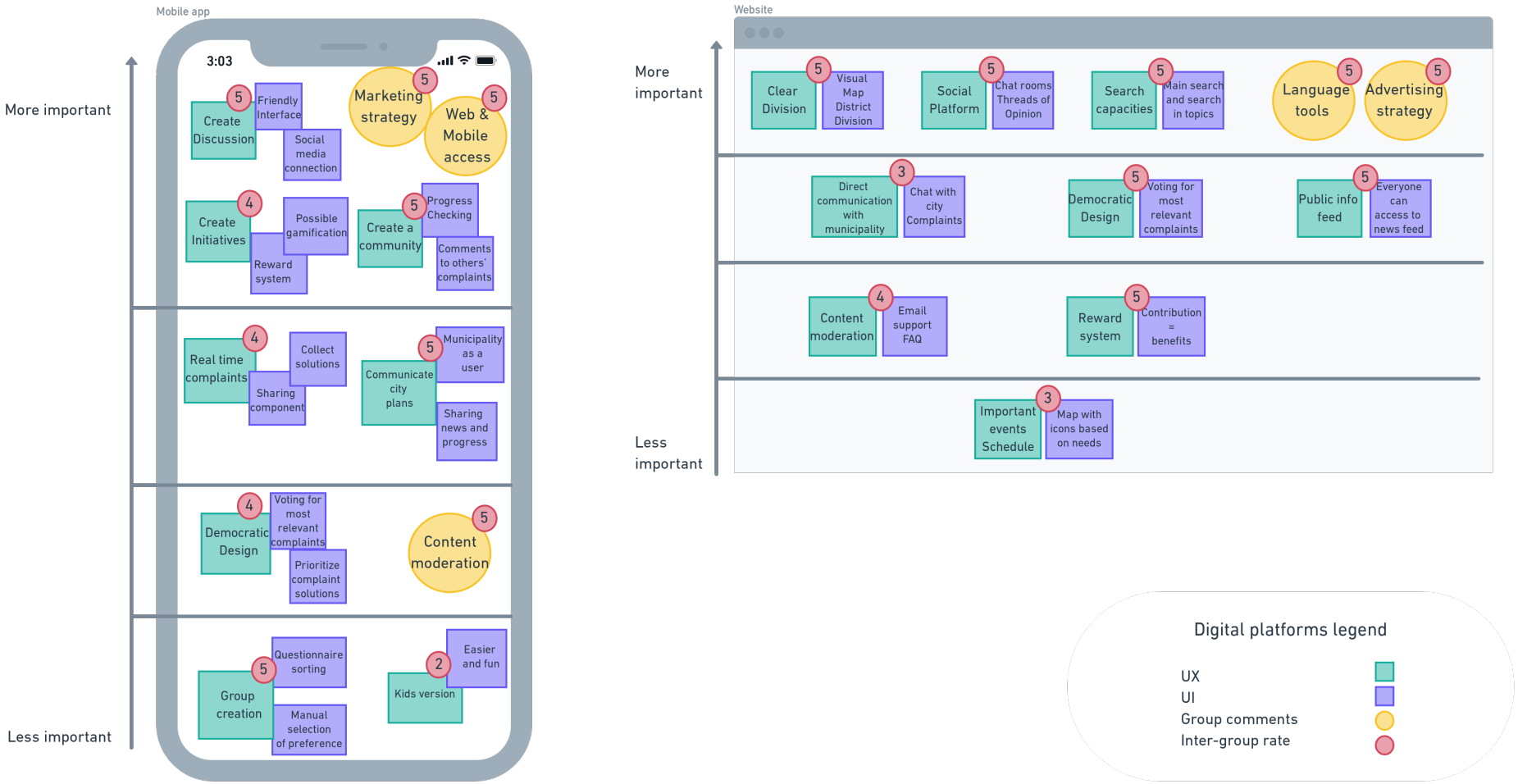


Figure 6 Participants layout of possible digital platforms. Fourth Activity. Author: Martín Peñaherrera

During the last activity, multiple overlapping concepts appeared to be important for the participants when thinking about a digital platform with the objective of interacting with the municipality. One concept that both groups underlined that doesn't fall into the UX and UI of the platform is the necessity to advertise and market the platform among the population of Tallinn. Although this thesis does not attempt to discuss marketing strategies and the diffusion of awareness of the digital platform, it recognizes that it is a necessary step that the municipality should take. To promote the current complaint system and utilize its population to collect complaints and help with the maintenance of the city or to make the possible future platform coming from this thesis useful and understood by the population.

Mobile app: the team in charge of envisioning a mobile app outlined three main functions as the most important and necessary for improving the citizen-municipality interaction.

1. People should be able to contribute and communicate with each other instead of just making complaints. The mere action of complaining would, in their opinion, create another barrier between the city and the public. As the city becomes a distant and technical institution that collects complaints but doesn't understand human discussion and interactions.
2. The app should be able to entice and attract everyone. Gamifying the platform could be a contributor to attracting people from all over the city. The team theorized that coupons, reduced fares, or rewards sustained by public-private alliances with entertainment venues, museums, or restaurants would serve as an incentive for the public to download the app and collaborate with the reporting of issues around the city.
3. Connection with other digital platforms would ensure visibility and accessibility to everyone. According to the team, having a cohesive environment where complaints can be easily shared with platforms like Instagram or Facebook is necessary.

Other functionalities that the team highlighted as less pressing than the previously mentioned were the following; providing a newsfeed with the current projects and future plans of the city, democratic design that allows for up voting and prioritizing complaints that need faster solving, content moderation to avoid violent or dangerous discourses,

personalization through manual or automatic sorting and a kids version of the app that doesn't feature communications capabilities but allows for their input.

Website: the team in charge of envisioning a website also outlined three main functions as the most important and necessary for improving the citizen-municipality interaction.

1. Ease to use and understand, a clear visual map with the 8 districts of Tallinn featuring icons with current projects, plans and complaints. Having a visual tool would make the website more interactive and understandable for the user.
2. Serve as a social platform, where chatrooms are available for everyone to enter, listen other people's complaints and provide feedback, commentary, and possible solutions until the municipality acts. This function would entice people to use the platform and serve to strengthen the network not only between the citizen and the municipality, but between the citizens themselves. Allowing for the public to empathize with other people and share their perspectives on the issues that are affecting the others.
3. Searching capacities to ensure efficient access to important information on the website and within the complaints. The user should be able to investigate the database of previous and current complaints to ensure transparency and continuity. At the same time this functionality would allow the citizen to observe and investigate the process of a complaint and if whether the situation improved or deteriorated.

Other functionalities that the team highlighted as less pressing than the previously mentioned were the following; allowing direct communications with the municipality as a private chat with the representatives of the city, voting for the visibility of more relevant complaints, public information feed where everyone can see current and future projects, content moderation supported by reporting and FAQ, a similar reward system as described by the mobile app team, and a schedule featuring important upcoming events. Both teams approached the task of outlining a digital platform for the same purpose in different manners. Yet, multiple overlapping concepts can be retrieved from both that can serve for the construction of a citizen-centered digital platform that helps to bring together the public and the municipality of Tallinn.

5.2. Tallinn + U Workshop Conclusions

After reflecting upon the two goals that were laid out in the beginning of this chapter, the workshop was concluded with success, and these were achieved. The main conclusions that are retrieved from the workshop are discussed in the following section.

1. The public has mixed views of the municipality as an institution. Generally, people perceive a flawed interaction between them and the municipality. Most of the cases perceive that the municipality is not doing enough to interact with the public, while the public is looking for improved means of interactions.
2. This flawed interaction that is either confusing or non-existent, prevents the communication of issues that are pressing for the citizens and are affecting their living standards, well-being, emotions, and daily-life.
3. Issues in need for solutions are happening regardless of peoples' awareness of them. Some citizens are aware but feel like they can't do anything to improve the situation. While others have grown to be used to the situation to the point, they don't perceive the issues any longer.
4. When there are spaces for dialogue and there is openness to listen to the citizen, complaints and issues that need fixing appear. The public is willing to communicate their needs and complaints to the city if the city is willing to listen and help to solve them.
5. A mobile app seems to be the most generally accepted form of digital solution for improving citizen-municipality interactions. This is the case for the generally young-adult population spectrum of Tallinn.
6. The public feels the need to create a community, not only complain but to contribute with the solutions for issues that affect the city.
7. If a digital platform was to improve the citizen-municipality interaction in Tallinn, it would need to be one that reduces the gap between these stakeholders. It should be usable, efficient but most importantly it should be human-centric and a network to bridge the differences between the public and the municipal institutions.

The workshop created a platform, from which empirical information about the citizen of Tallinn was retrieved. The creation of a digital service based on peoples' needs and adapted to the legal and structural constraints of the municipality of Tallinn is plausible. Collaboration between the citizens and the city will be necessary to improve the

interactions between them. A digital platform with the current capabilities of data collection, data analysis, diffusion, and capacities to congregate stakeholders could play a major role in improving citizen-municipality interactions. This conclusion is drawn from theoretical and practical data that has been gathered throughout the thesis up to this point. In the following chapters, a prototype of the possible digital platform is developed and tested with citizens and experts.[4]

6. TalliHagi: prototyping a citizen-centric solution for collaboration with the municipality

After collecting and analyzing data from the Tallinn + U Workshop, a prototype of a digital service was developed and presented in this chapter. The digital service was designed with the intention of improving the interactions between the citizens of Tallinn and the municipality. The name of this prototype is TalliHagi, a compound word from the combination of Tallinn (the city where the service would be based on) and "*Hagi*" or the legal equivalent to civil complaint in the Estonian language.

The prototype provides a brief snapshot of what a digital service that attempts to improve the interactions between the city and its citizens must do. TalliHagi was based on the tools necessary to solve the issues that the participants mentioned with the municipality, the functions that the participants of the workshop described as important to have, along with information gathered in the literature review of this thesis. The prototype is conformed around the legal and constitutional constraints of the current structure of the municipality of Tallinn. The prototype was developed in Figma a web-based graphic editor and prototyping design tool. Figma also allows for animation and phone mirroring necessary to test the prototype with citizens and experts to simulate the interaction with a finished digital application.

[4] For pictures of the Tallinn + U Workshop and evidence of the raw activity material outcomes visit: https://flic.kr/s/aHBqjzKmAy

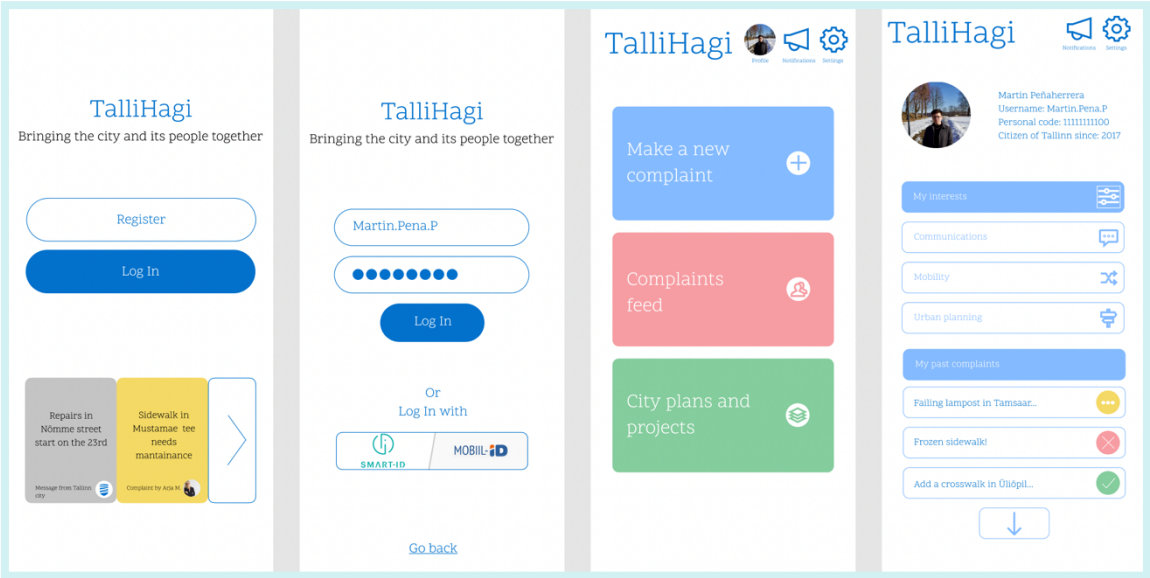


Figure 7 TalliHagi Log In, main menu and user profile

6.1. TalliHagi User-experience (UX)

As a user of TalliHagi, the citizen of Tallinn should have easy access to making complaints, observing complaints from others, communicating with the city officials through a specialized platform, and seeing the progress of the city. These main UX factors contribute to the possibility to improve communications between the community of people that is aware of the city issues and those who aren't. At the same time, it contributes to closing the gaps of communication between the institutional body of the city and the factual body of the city, its people. This is achieved by the prototype in the following ways:

1. Replacing the outdated web-based system that the Tallinn city website has by simplifying the journey that a person must take to make a complaint. This process was explained in the current user journey section (See Figure 5). And is achieved by using Smart-ID and Mobile-ID as the authentication method for making an account in TalliHagi. Therefore, when someone wants to make a complaint, they don't have to digitally sign the application, just follow in-app built instructions to make a complaint that would be pre-authenticated with the citizens information.
2. Easing the pressure on the citizen when choosing the correct institution to address the complaint. Under the current system, the citizen would have to first find the correct outlet for making the complaint which is already a first constraint. When

they find the “Resolving complaints from the citizens” website they still need to discern to which institution they need to address the application and send an email with the complaint out of three available options. This is a stage that can easily be automatized by giving the citizen a tool to mark their problem and automatically sort their complaint to the corresponding institution in charge.

3. Improving the quality of complaints gathered by the municipal offices, by allowing the citizen to make complaints with a high level of accuracy and description. This is possible by the sorting of categories of complaints, an in-app map with the capacity to locate a pin on the specific location of the complaint and providing the option to attach visual evidence of the issue as a picture.

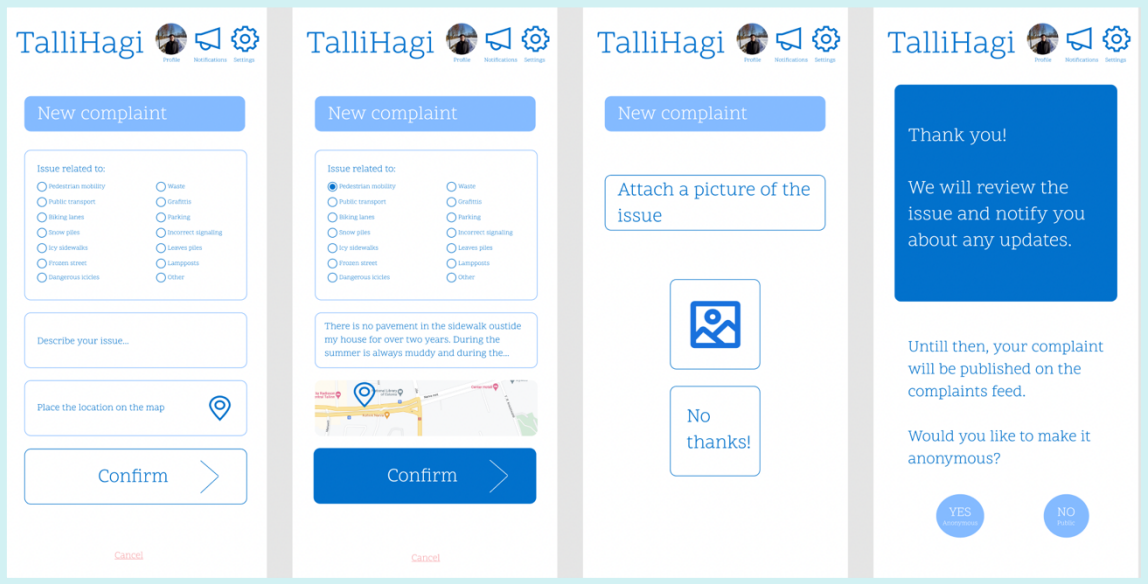


Figure 8 TalliHagi complaint procedure

4. Providing a platform to collaborate and interact with others about the city’s issues and how to fix them. The prototype features a complaint feed as one of the main functions of the application. In the complaint feed, a mix of public and anonymous complaints is visible for everyone in the platform, where people would be able to see the problems of the city from others’ perspectives while creating a community. In the complaint feed, people would be able to agree with a complaint to give it more visibility and helping to bring attention to certain issues. At the same time, the user would be able to interact through a comment section to suggest possible solutions until a response from the municipality is given. The public would be able to track the development of a complaint with a tag showing the status the

complaint as: under review, resolved or declined. Finally, the complaint feed can be sorted by personal interest, popularity, location, and status, so the user has more control over what they see in their personalized complaint feed.

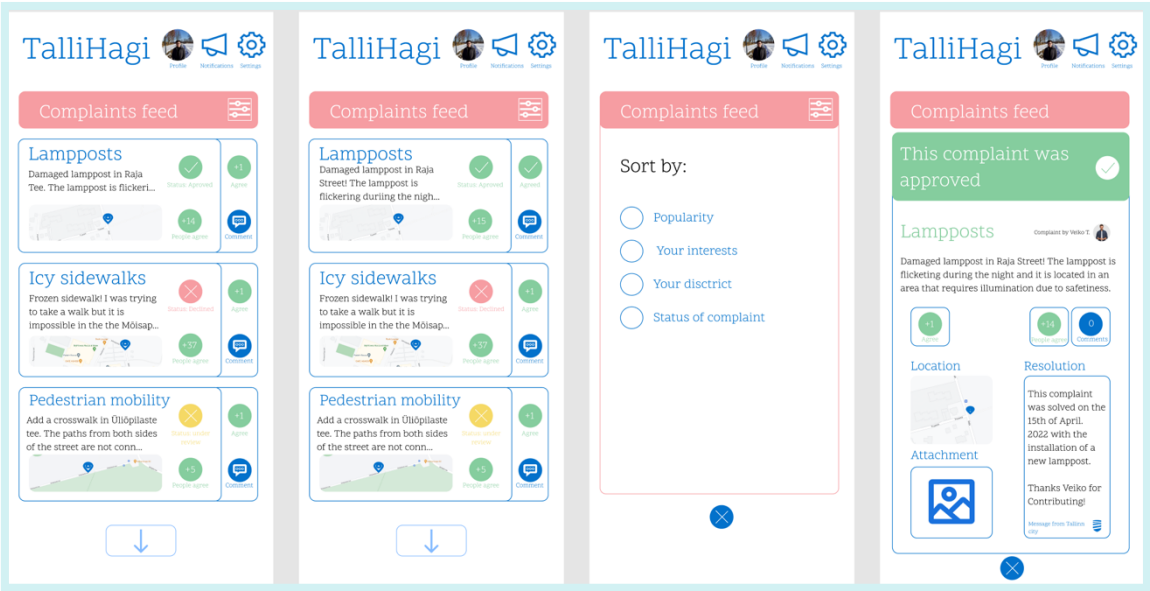


Figure 9 TalliHagi complaints feed view

5. Providing visibility to the current projects and plans that the city has for the future. During the workshop the participants expressed the need for a space to see the progress and plans for the city, and although some of the news are displayed in the city website, smaller projects like the re-pavement of small streets or the adding of signaling is not featured by the city in the current outlets. This is a one of the main functions that that TalliHagi incorporates in the prototype.

Figure 10 TalliHagi future plans and projects view

TalliHagi is the first prototype product of this DSR research. As part of DSR, multiple iterations of data and knowledge are required on the road towards the final artifact that seeks to solve a socio-technical problem. Because of this, TalliHagi was tested with a non-random sample of experts and citizens. This new iteration is necessary for testing and validating the effectiveness of TalliHagi to achieve its goals of increasing complaints availability and visibility while creating a community of citizens to collaborate with the municipality. The feedback coming from the non-random sample of interviewees helps to finalize and clean up the UX aspects of TalliHagi, providing a refined and final experience for artifact for the research. While at the same time, correcting some of the UI aspects that the first prototype lacked refinement in.

6.2. Testing & Validating TalliHagi

The developed platform TalliHagi was tested with a non-random sample of six user-subjects. The group of users was composed by a mix of experts and citizens. The expert group was formed by one human-computer interaction scientist, a politician working in the municipality of Tallinn, and a Service Designer specialized in digital services and design technologies. These experts are also citizens of Tallinn, so their perceptions will be accounting as both experts and citizens of the districts of Mustamäe, Kesklinn, and Kristiine. The group of citizens was formed by three people living in the city of Tallinn

without any age specification and coming from the districts of Haabersti, Nõmme and Mustamäe.

The testing method used to analyze TalliHagi's effectiveness, usability and utility was thematic analysis. Thematic analysis is a type of qualitative method used to identify recurring patterns throughout individuals' discourses. Thematic analysis is also described by Braun and Clarke as "a method for systematically identifying, organising, and offering insight into, patterns of meaning (themes) across a dataset" [67]. For this analysis, the dataset that will be used is the natural text transcriptions of the semi-structured interviews conducted with the six test-subjects. The semi-structured interview was formulated with seven open ended question. Two of them setting the interviewee tone regarding their perspectives about citizen-municipality integrations and the rest tackling aspects of the prototype (See Appendix F for Interviewee questions).

The interviews audios were transcribed and later theme-coded in the software Dovetail, a platform that allows management and analysis of data for qualitative research. The themes that were identified and organized with the platform were: usability, utility, and effectiveness. Under these main themes, a tagging system with components of the themes was used to analyze the interviews (See Figure 11). The themes chosen to analyze the interviews were usability, utility, and effectiveness. The usability theme is to understand to the degree that TalliHagi can be used. The utility theme is to understand the degree of usefulness and whether TalliHagi has a purpose. And the effectiveness theme is to understand the interviewees perspectives of the success of TalliHagi to achieve its purpose.

Usability	Utility	Effectiveness
Interest to use	Needs	Communication
Ease to use	Features	Information delivery
	Usefulness	Complaint issuing
		Visibility

Table 4 Interviews thematic analysis theme tags

6.2.1. Usability

During the interviews, the interviewees were able to address the theme of usability or the degree to which TalliHagi can be used through multiple lenses.

Interest: In a commonsensical order, the usability of a service or the degree to which a service can be used, starts with the interest or willingness of the public to use it. To this aspect, every interviewee, except the politician expert, addressed the interest to be used either by themselves or the public of Tallinn from their perspectives. The opinions of why they or the public would be tempted to use the platform were varied. To some the app was attractive due to its innovative approach to communications, and for others it was more of a mix of looks and simplicity.

> *I would use it in the sense that I sort of do the most outside work activities during the day. I would definitely be able to, or would want to be able to use something like this. - Citizen A*

> *I definitely think there are going to be people who use it a lot. Maybe even more than needed. They would complain about literally, every single thing. - Human-Computer Interaction Expert*

> *Yeah, I would see myself using it. For me it would be a combination of specific location-based fixes, which I think the app now is mostly optimized for. (...) also, to make a platform for broader, more structural feedback - Service Design Expert*

In the other hand, the of one citizen who lives almost in the outskirts of Tallinn, felt like most of the complaints they could make were related to issues happening in more central areas of the city. Therefore, they expressed that currently they would not *"care enough to make any complaints"* but if they were living in districts like Kristiine or Kesklinn they would. They also expressed that they think people in those areas using the service on a regular basis. The other actor that expressed uncertainty about interest of using the service was the politician expert. They mentioned the interest of people would be on using traditional social media to communicate complaints and said it is easier to report issues through the current method that doesn't involve downloading an app but instead sending emails to the correct offices. At the same time, they would have to think through before

using a service like this, since as a politician they already have a pre-existing audience that supports them in places like Facebook and opening a profile in TalliHagi could hamper their public view by creating a platform for critiques.

One can conclude that it is in the public interest to use a service like TalliHagi, at least for most interviewees. This perception can vary from district to district, based on the possible existence of a city centre – city outer district cleavage [68]. At the same time, the perception of the city politician could represent a disconnect of the publics wants and the politician's perception of it. This disconnect is plausible since four out of five interviewed citizens have a direct interest to use the platform, and the last one has an indirect intent if living closer to the city centre.

Ease to use: the next aspect to be analysed is the interviewees degree to which TalliHagi was usable. To this aspect, two citizens and two experts mentioned that the service is easy to use and understandable.

> *Yeah. It's it would be way easier than you having to send an email. Correct. So if you have an app, just open it and you can put in your complaint super easy, super fast. -Citizen B*
>
> *In general apps sometimes are confusing or difficult to navigate, but this one seems pretty easy. Like everything do you want to see or need to see is visible - Citizen C*
>
> *Complaint systems should be as easy as possible in the sense that you could use it instinctually like in space and time, where things bother you. And I think the app allows it. - Human-Computer Interaction Expert*
>
> *Your district's is good. Your interest, good. Status, popularity. Okay. Popularity could be interesting from browsing makes it more usable. - Service Design Expert*

While the same expert latter expressed that the service was putting too many "frictions" to make a complaint, and that could reduce the number of steps before making a complaint.

> *My first concern is that the app gives too many, too many obstacles on my way to make a complaint. I would tap inspiration from apps like even Tiktok (...) So I would try to strive to achieve three clicks to post a complaint - Human-Computer Interaction Expert*

Generally, the users think that the app is easy to use but can be improved to be more focused on delivering complaints easily and efficiently. This can be achieved by automating some of the processes towards complaint issuing. For instance, under the current design of TalliHagi, the person would have to place the location of the complaint manually, but it is a process that can be automatized if the terms and conditions of using the app addressed the automatic collection of location data on the background. Another solution for this would be the use of widgets in the main screen of the mobile, that allows for a fast track towards making a complaint without finding the application and opening the "make a new complaint" option.

6.2.2. Utility

During the interviews the interviewees addressed the theme of utility, or to what degree TalliHagi is useful and has a purpose, in multiple levels.

Needs: The interviewees expressed an assortment of needs of the public that should be addressed by the municipality. At the same time, addressing why a platform like TalliHagi is needed in Tallinn. Five out of six interviewees thought that there needs to be a two-way channel of communication between the citizens and the municipality. The interviewees highlighted the necessity to have a "two-way road" of communications that allow citizens to express their issues, but also makes the municipality to actively reach the citizens to get to know and help to solve their issues.

> *Well, there should (...) be some sort of two-way channel. So it's a reciprocal kind of thing. It's not a one way street. - Citizen A*

> *The responsibility is on both sides. I believe people should reach out to the municipality because that's the best way to get their voices heard (...) But I think the municipality has a responsibility to provide a good framework and platform. (...) It's people's responsibility to speak and the municipalty's to encourage people to speak and to listen. - Service Design Expert*

While every other actor interviewed believed that there was a need for improving two-way communication resiliency in Tallinn, the expert politician believes that the city and

explicitly their district is already successfully having two-ways communications with the citizens. While they expressed that *"more channels are always better",* they also expressed:

> *This is both ways and we do it regularly. We ask what people think. We collect feedback ourselves. We use a lot of social media platforms. We, we make public meetings(…)So would the city want to have extra tool for first question? Second question. Would the citizens use it? - Politician expert*

This introduces a perspective that, at least in the sample of citizens that were interviewed, was not expressed. It provides a different approach to how the city has been communicating with at some portions of the population. At the same time, this perspective helps to bring visibility to the shortcomings of the communication streams of the municipality that seems to not reach everyone in the city. At the same time, the politician expert said that it would be important to maintain a channel between the citizen and the specific correct office that oversees the issues that citizens might have.

> *for a citizen, it is most important that it goes to the right worker of the city. So at least I would think it does the citizens of talent. It is not important for me that my complaint would be sent to the mayor of Tallinn – Politician Expert*

What the politician expresses is that the interest of the citizen is not into getting into political discussion, but instead getting issues fixed. This idea is materialized in the "make a new complaint" section, where the people would automatically send their issues directly to the office in charge of solving the complaint, rather than making the citizen choose the appropriate office by themselves as it is happening in the current model. Taking pressure from the citizen, but apparently also taking pressure away from the politicians who are currently collecting complaints manually through comment sections and forums in social media.

At the same time two citizens and one expert said that the voices of the public are either partially or not heard by the municipality. This perception was also witnessed during the workshop (See Table 3) and shows that the public is looking for an outlet to be heard by their local government.

> *I think the municipality is good at listening to a very selective (...) target group, (...) people that like driving around in cars and people that are slightly conservative (...) maybe the younger population groups in the city need a place to be heard – Service Design Expert*

> *There are some pressing issues and people need a platform to voice them since there isn't one, I think an app like this would be very useful – Citizen A*

There is a perceived need for a platform to voice people issues, and that has been acknowledged throughout this thesis. The new perspective that the service design expert brought is that the city has methods to hear selective groups of the public. TalliHagi must be a platform that encourages everyone in the city to voice pressing city concerns, without any discrimination. This needs to happen to obtain a variety of agreeing and opposing views that contribute to public debate and participation.

Usefulness of the app: the interviewees highlighted some of the useful factors of TalliHagi. Its analysis is necessary to maintain them and try to mitigate the extensive adaptation or change of useful aspects of the app perceived by the users. The aspects that were discussed as useful according to the discourse by the interviewees specifically in the function of making a complaint were: possibility to submit it anonymously, allowing the posting of pictures and allowing accurate location dropping.

> *I really enjoy the fact that I can post anonymously thing, but then it's even more appreciate if things are by default anonymous. – Human-Computer Interaction expert*

> *It is good that you have the text part that the complaint is somehow described and there is a location and a photo that is a good part. Sometimes this complaints are very general, so it is not understandable where exactly is a problem. – Politician Expert*

The aspects that were considered useful by the interviewees of the TalliHagi function of the complaint feed were: filtering capabilities, witnessing of other perspectives, seeing the progress of public complaints, and the ability to communicate and provide visibility on other's complaints through the "agree" button.

> *Filter by range, kind of like to see what's going on in all of Tallinn, and I like to be able to tell what's in my immediate surroundings. – Citizen A*

> *Kind of introduces people to what is happening and what bothers the other people. On the other hand, might bias other people in a way that they might not be bothered by certain issue, but they still can complain about it. Which is, well, little thing to reality, but it's nice that the app allows you to do that. – Human-Computer Interaction Expert*

At the same time, some interviewees thought it could be less beneficial to have large numbers of complaints in the complaint feed, mentioning that sorting and filtering in this area should be more capable and personalized.

> *If there are like hundreds and thousands of them, then it's not the best way, but if they're like a reasonable amount of them, then you can see them all or look into that. – Citizen C*

The general perception of usefulness of the complaint feed was validated by every actor interviewed, with discourses implying that the feature is novel and useful in different levels. At the same time, it is improvable especially in the UI spectrum, to make the function more attractive and understandable.

Finally, the useful aspects described by the interviewees of the projects and future feed were awareness raising, visibility, improving accessibility to information, and allowing the flow of information from the municipality into the public in a controlled manner.

Features: during the interviews the interviewees mentioned some features that TalliHagi could support, or that it didn't need. This tag fits in the utility theme since features of an app can be a determinant factor in terms of its purpose.

Among the lacking features that the app should support were analytics capacity, a map to help visualize the complaint feed, a more thorough personalization, default anonymity of the complaints, signing of petitions, voting procedures for projects, and compatibility to share with other planforms. In the author's opinion, almost all these features have a

possible space in TalliHagi, if implemented correctly and without overcomplicating the simple and understandable layout of the current app.

One specific lacking feature that could be interesting and fundamentally add to the UX of TalliHagi is an interactive map that visualizes the locations of the complaints. This map would fit in the complaint feed as a different way to browse through the existing and past complaints. At the same time, a feature like this would have filtering capabilities to personalize and target each of the user's needs. The idea of allowing signing of petitions and voting procedures for projects in the app could potentially overflow the scope of TalliHagi. Transforming its communication platform between stakeholders' nature into a more political and procedural atmosphere. While these capabilities are very relevant for the city, they already partially tackled by projects like the Tallinn participatory budget that periodically takes place in the city or even platforms like Change.org.

Finally, the politician expert also expressed that a mean for citizens to express positive public feedback should be added. This can be addressed through the comment section already supported by the current design. At the same time, positive feedback would arrive once the citizens' complaints are addressed by the municipality. A response from the citizen that makes the complaint could be allowed to ensure a feedback loop coming from the main addressee of a complaint.

6.2.3. Effectiveness

During the interviews, the interviewees were able to address the theme of the effectiveness of TalliHagi in achieving its purpose. This theme was divided into multiple tags that helped to evaluate the degree of effectiveness of the platform.

Allowing communication: the interviewees perception of the effectiveness of TalliHagi in allowing citizen-municipality communications was generally positive. Five out of six interviewees considered that the format of communications that the platform presents is accurate and effective.

> *I would see such a platform of such an useful to address the pressing issues, because it gives some and people have a platform to voice them. – Citizen A*

> *It creates a platform, a communication place between citizens and the city government to open the conversation, to, to discuss what people want to see. – Service Design Expert*

At the same time, while the Service Design Expert believes that the communication streams that TalliHagi serve their purpose, they also propose that citizens should be able to take more action in the decision-making process of how to solve issues.

> *And then as far as I understand the complaints will be handled by the city governments. They will decide if it's valid or not, and then if they decide to fix it. – Service Design Expert*

This is a fundamental challenge to be addressed by the municipality in how to involve the people in decision-making processes. TalliHagi would serve as a platform to inform the complaints, but it could be used by the municipality as an analysis tool on how to solve issues through the constant surveillance of comment sections and the types of complaints that are submitted by the citizens. Ultimately, in the authors opinion, the scope on how to solve the issues presented by the citizens should not be under the TalliHagi functions. This is due to the nature of TalliHagi, being a digital service based on peoples' needs but adapted to the legal and structural constraints of the municipality of Tallinn.

The interviewee that thought that the communication mechanism of TalliHagi wasn't effective enough was the Politician Expert, expressing those communications between the public and the public workers, and between the public and the politicians should be strictly separated.

> *Regular workers of a city do not want to attend in a debate of politicians. So, it would not work when you, when you say that all the counterparts will be commenting and arguing and making, making arguments about a problem (...) there will be a huge conflict. – Politician Expert*

This consideration brought by the politician makes sense as the users of TalliHagi might not be using the platform to witness a political debate between public figures in the comment section of the complaints feed. This would need to be regulated and understood by the municipality when deciding on whether politicians should use TalliHagi as a

political tool. As of the current design, everyone living in Tallinn should be able to enter TalliHagi, authenticate their citizenship through Smart-ID and participate in the debate. But it is an important consideration to be aware of in the case of actual implementation of such a service.

Informing the public: the effectiveness of TalliHagi evaluated by the interviewees was positive. Every interviewee agreed that the public requires better methods of information about what is happening in the city.

> *I have no clue what's going on except from word of mouth for sort of seeing things on construction. So I don't know if there's another official source to get this information. – Service Design Expert*

> *The projects and plans in the app is cool, because otherwise, I wouldnt know what's happening like I don't know right now. The municipality is really bad at communicating these. – Citizen B*

When asking about their awareness regarding the current projects and future plans, every interviewee except for the politician expert expressed that they had "no idea" about the city's plans and projects. At the same time, some of the interviewees saw the platform as a possible solution for this phenomenon.

> *The city has development projects and plans for specific areas and this sort of needs to be discussed with the people who are affected by the decisions that are being made, so that's, I think a very cool aspect of the app. – Citizen A*

The politician expert was aware due to their occupation in the city government. Under the current complaint system of Tallinn, all the complaints are handled by email and are never posted in a public platform, therefore there is no way that the citizens can be informed about them in the current layout.

Complaint issuing: The discourse about the effectiveness of TalliHagi on issuing complaints was divided. While the citizens thought that the current functionality was serving its purpose, the experts had diverging opinions. The politician expert expressed that the complaint issuing was effective and thorough, pointing out that the map location, description, and picture attachment were necessary and worked with the intended

purpose. This was a similar discourse shared by the Service Design expert, that expressed its currently optimized for delivering complaints, but would like to see a broader reach of the system into the political realm. The Human-Computer Interaction expert, in the other hand, thought that there were too many steps, and this could affect the willingness of the public on making a complaint.

> *But just move as many frictions. Well, because the more buttons I press, the less likely I'm going to leave a complaint. – Human-Computer Interaction Expert*

This issue needs to be tackled in the design of TalliHagi, some of the steps towards complaint issuing could be automated and simplified. Since one of the main purposes of the platform is to issue complaints, the design needs to ensure the publics easy accessibility and understandability towards it. Automatization could happen in the location selection, and simplification in the order of actions before making a complaint.
Providing visibility: the interviewees perspectives on TalliHagi's effectiveness at providing visibility to the city's issues and public complaints was unanimous. Every interviewee agreed that the complaint feed function serve in a correct manner to provide public visibility. Visibility of issues is important because it raises awareness and consolidates the necessity for a platform like TalliHagi in Tallinn.

> *I would also like to see other people's complaints, so I will also know what this happening around, so I will know if the place or what to expect. – Citizen B*

Generally, the citizens expressed that they expect to be able to see other people's problems and hope to interact with others to increase the empathy regarding issues in the city. At the same time, the experts agreed that people need to witness the issues to start a conversation about how to solve them. Visibility in this case equals awareness.

> *What I feel is that we know very well, the people who work in local muncipal government know very well, what are the problems. So it is not necessary to, to public invite them up about this because we already know that these are the issues. – Politician Expert*

Finally, the Politician expert expressed that while the visibility factor of TalliHagi is effective, the local municipal governments are often more aware about the issues in the

city than the citizens. This perspective is especially interesting because it brings up questions in transparency and communication between what the municipality knows and how it informs the public about it.

6.2.4. Testing and Validating Conclusion

The interviews and their respective thematic analysis, served to understand the users' perspectives on TalliHagi. Three main themes (Utility, Usability and Effectiveness) were analyzed with the support of nine tags in the qualitative analysis platform Dovetail. After having analyzed the six different perspectives coming from experts and citizens, TalliHagi proved to have a purpose, be usable and be effective at achieving its purpose. See Appendix G for a summarized table of the material from the interviews with their respective tags used for the thematic analysis.
The aspects of TalliHagi that could be improved were highlighted during the analysis. These will be addressed in the next chapter, to present a finalized artifact that doesn't fundamentally change the general structure of TalliHagi's usability, utility, and effectiveness. But uses the input from citizens and experts during the validation to finalize the citizen-centric digital service that can improve citizen-municipality interactions in Tallinn.

6.3. TalliHagi 2.0.: The Artifact

After taking into consideration the feedback and reactions from the interviewees during the testing and validation of TalliHagi, some adaptations on the app's UX and UI were implemented. The objective of this is to obtain a refined artifact product of multiple iterations on the research and evaluation of the citizen-municipality interaction improvement in Tallinn. The differences in between the original TalliHagi prototype and the one presented in this chapter don't fundamentally change the functionalities of the app but attempt to enhance the experience and looks of it.

Log In: No changes in the looks or procedure of Log In. User registration procedure and Smart-ID Log In was added during the development of the 2.0. prototype version.

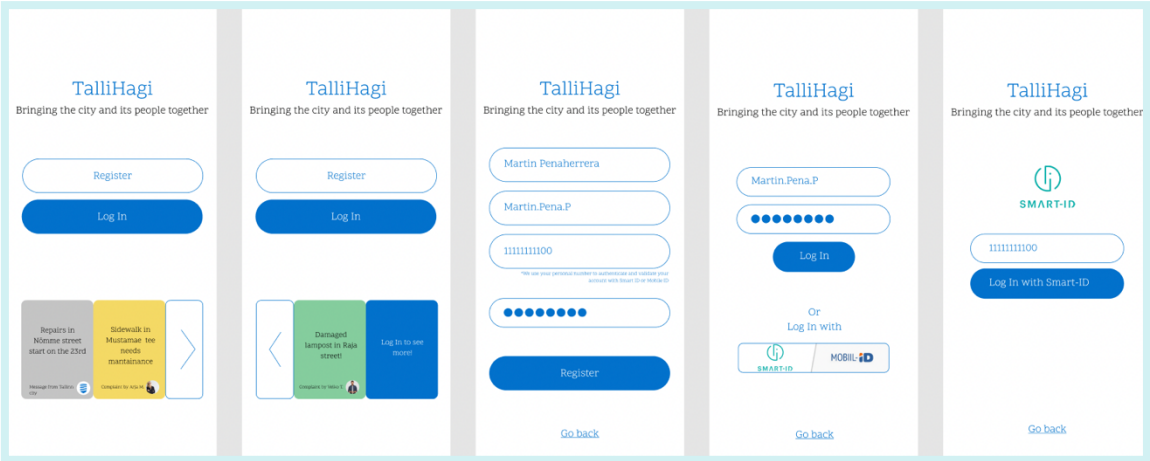


Figure 11TalliHagi 2.0. Log In

Profile: Changes in UI in the user profile, including changes in the color of "edit interest" function and a "view past complaints" function was added. The addition of a "Back to Home" or "Back to Main Menu" button was also added in the profile section.

Figure 12 TalliHagi 2.0. Profile

Main Menu: The Main Menu had important changes in both UI and UX. This includes a new layout for the "Complaints Feed" function and the "City projects and plans" function. A preview section is available for both in the Main Menu, this ensure that visibility and access to both other people's complaints and the city projects are prioritized as a main feature in the app. The preview shows a summarized version of the complaints and plans with their titles, authors, and status in the case of the complaints. The "New Complaint" function is still the first action button in the Main Menu.

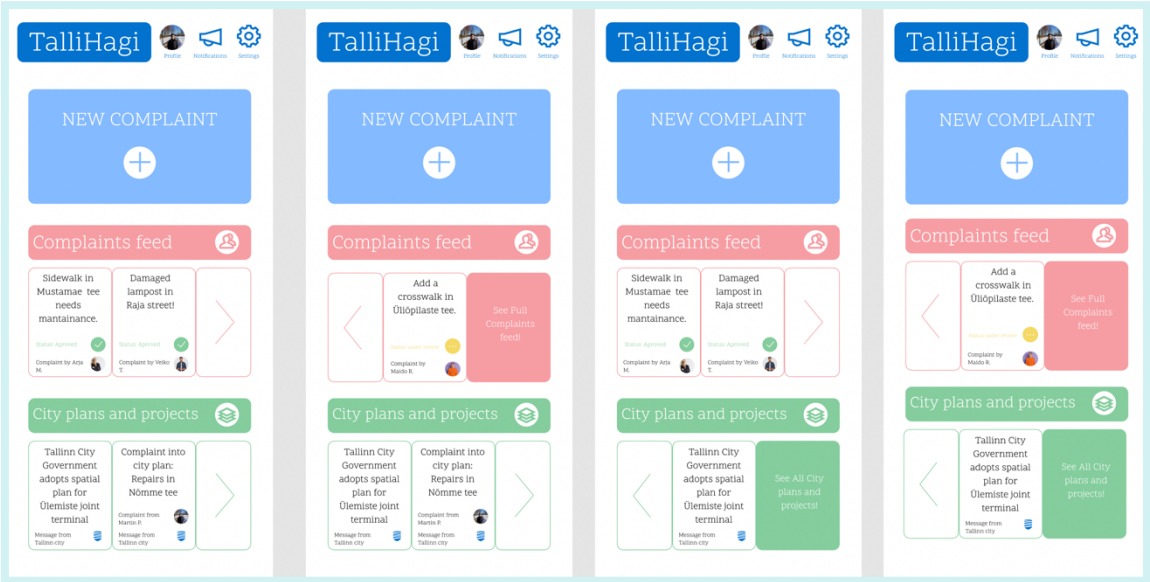


Figure 13 TalliHagi 2.0. Main Menu

New Complaint: The "New Complaint" function had changes mainly in UI and some slight simplifications in the UX. The function now features automated location pinning to simplify the road towards making a complaint. This change is based on the obeservations from one interviewee during testing and validation. Another change is made in the publishing in the complaints feed. Under the current design, complaints will be published anonymously by default and it is up to the user to decide if they want to make the complaint public. At the same time, if the user decides not to publish their complaint in the feed at all, the app also allows it. Making the complaint only visible for the workers in charge of the complaint in the respective municipal office.

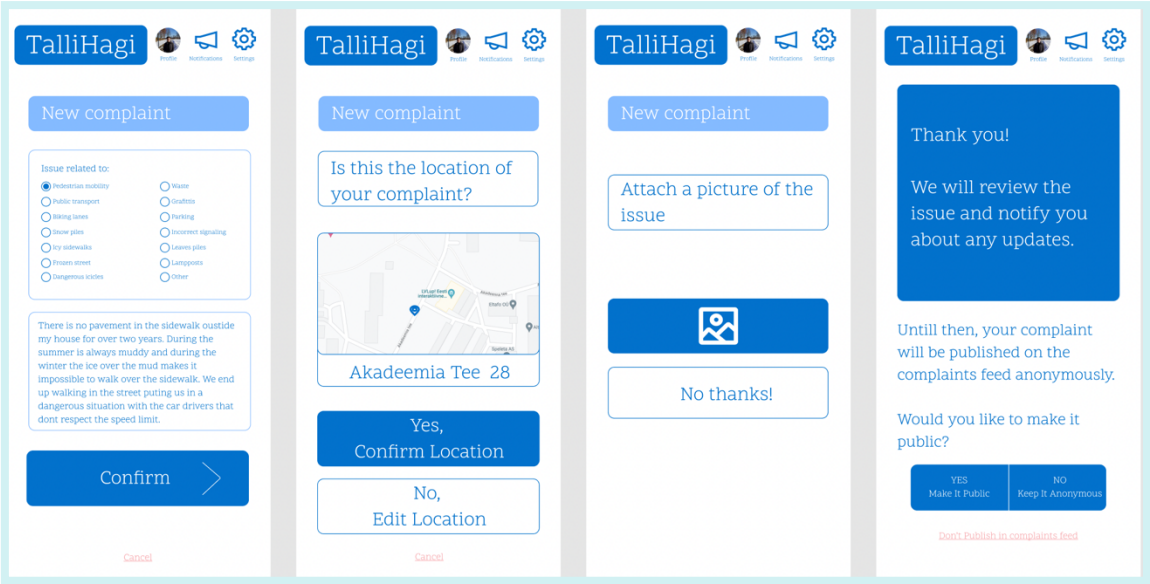


Figure 14 TalliHagi 2.0. New Complaint Function

Complaints Feed: The “Complaints feed” feed function features changes in the UI exclusively in the 2.0. design. UX wasn’t affected since the interviewees agreed that the function was working appropriately. The changes are made for cleaning up the order and looks of the function. The objective of simplifying the existing capabilities of the function is to make it more understandable to users. At the same time, a “Back to Main Menu” button used in the profile was also added to the complaints feed. The addition of a map version of the complaints feed was considered. But it wasn’t included in the 2.0. version because it would fundamentally change the utility, usability, and effectiveness of the app, therefore requiring a new round of testing and validation.

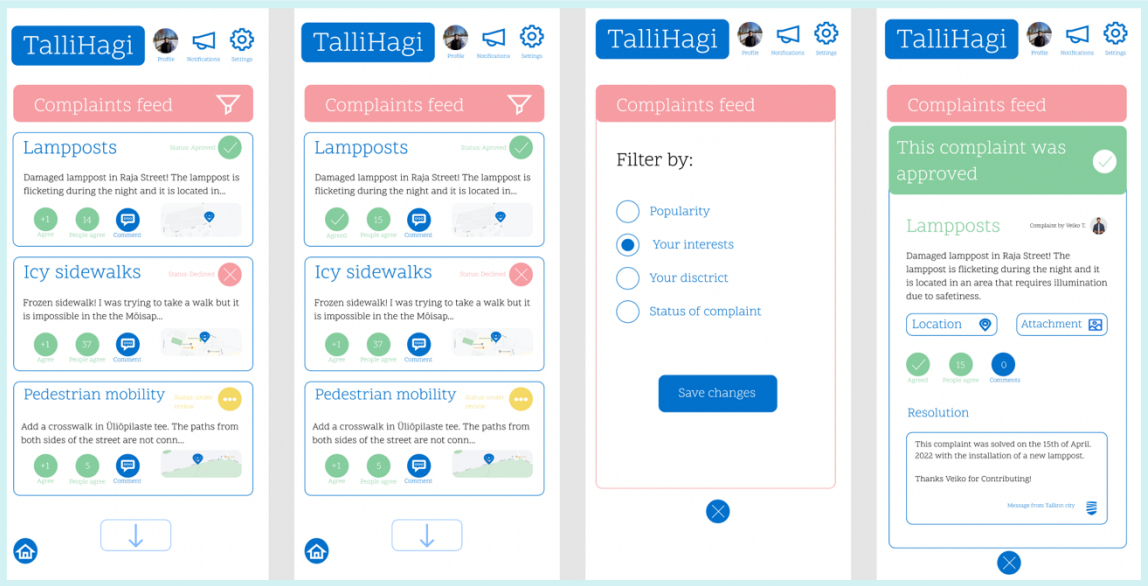


Figure 15 TalliHagi 2.0. New Complaints Feed Function

City plans and Projects: No major changes in the “City plans and projects” function, the first design proved to be functional and usable by the interviewees. Some minimal changes in color for readability of the content were made and the addition of the necessary interaction buttons similar to the ones featured in the “Complaints feed” function. But in the city plans and projects instead of agreeing to someone else’s complaint, the user can support and comment on the city’s plans. This adds to the level communication and debate layer of the app and helps to keep this function different from a mere news delivery to projects and plans discussion between stakeholders.

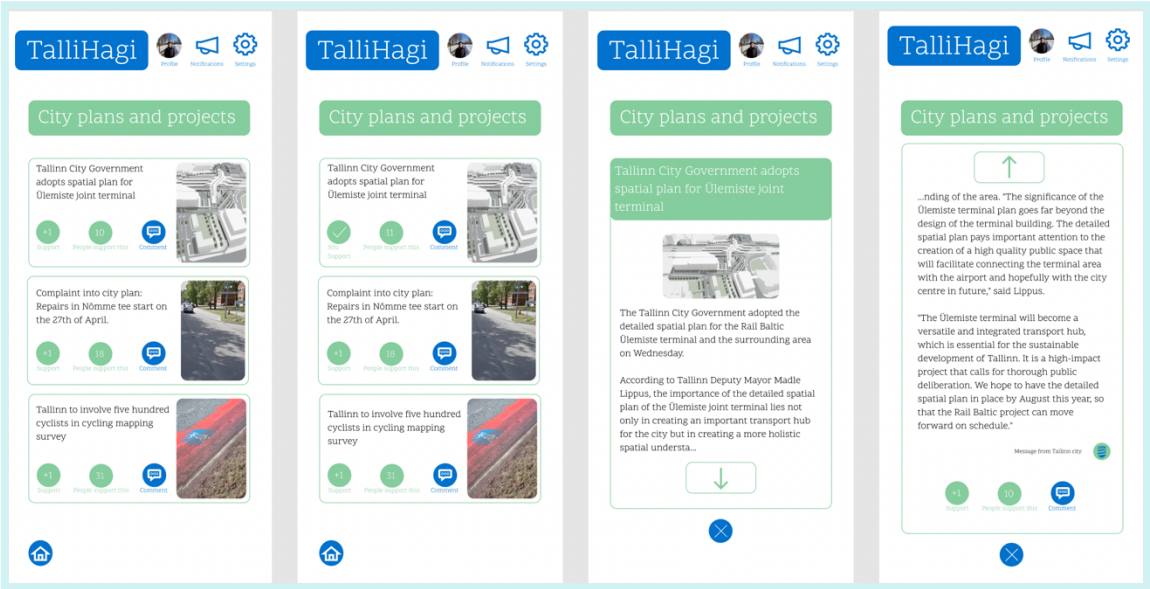


Figure 16 TalliHagi 2.0. City plans and projects

Additional features: a notifications page and a settings page were added in the design of the 2.0. version for cohesiveness and finalizing the prototype with all the necessary features.

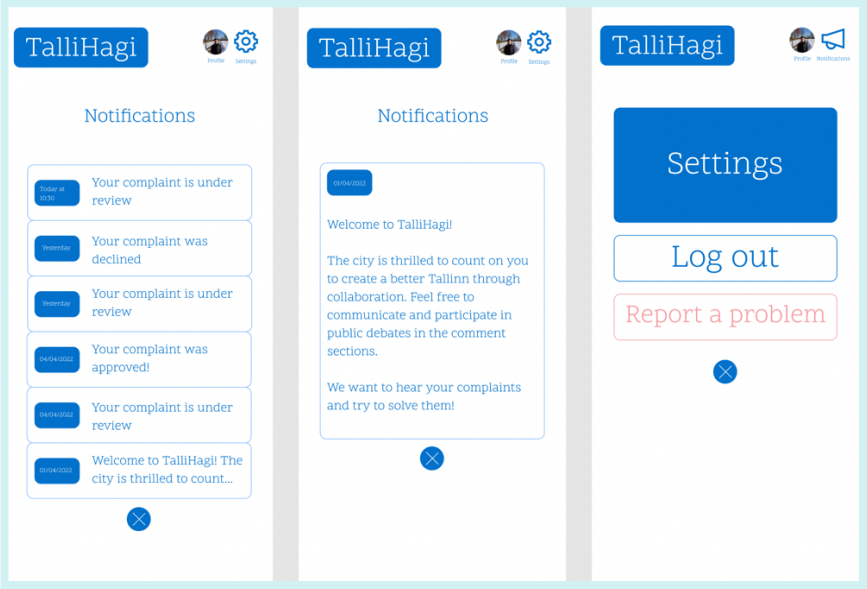


Figure 17 TalliHagi 2.0. Additional features

6.3.1. TalliHagi 2.0. Complaint User Journey

The final prototype proposed in this thesis, redesigns the user journey a citizen must take to make a complaint in Tallinn. As demonstrated in "4.1.1. Current User Journey" the citizen of Tallinn currently needs to go through an inefficient and confusing procedure to

make one complaint. TalliHagi has more functionalities other than complaint issuing that attempt to improve the citizen-municipality interactions in the city. But specifically, complaint issuing would experience a drastic shift if TalliHagi was implemented. For the visualization of this change the user journey of a citizen who's a user of TalliHagi was developed according to the presented structure. In comparison to the current one that Tallinn supports (See Figure 5), TalliHagi removes steps and reliefs the pressure that is put onto the citizen to make a complaint. The presented user journey (See Figure18) for TalliHagi complaint issuing was also developed in Whimsical as it was done previously with the user journey presented in 4.1.1.

6.3.2. Data Management, Privacy and Protection.

TalliHagi as a part of the Estonian public sector services must be linked to the interoperable software of X-Road. The inclusion of an API that connects the platform with the government data backbone allows a smooth authentication of users of the platform.

At the same time, the Smart-ID authentication will be used to ensure that the platform remains a safe space for communication and debate. As every user is authenticated as a citizen of Tallinn, the trackability and restriction of access to users that breach the community and platform guidelines is ensured. The platform guidelines need to be decided by the legislative body in the municipal government and created in accordance with the municipal and national law. The platform guidelines need to be created around the Public Information Act [69], and the GDPR [70] considering the data published in the platform will be public and need to be based on democratic principles and the rule of law. While taking in consideration that the platform will require the user's permission to collect and store data, location information, and camera access for the different functionalities of the app. Regarding protection of data, the platform must be congruent to the current standards laid out by ISO/IEC 27001 and the E-ITS or Estonian Information Security standards by the Information Systems Authority RIA. By obliging to this, TalliHagi can provide a cybersecure space for people to share information safely among citizens and the municipality.

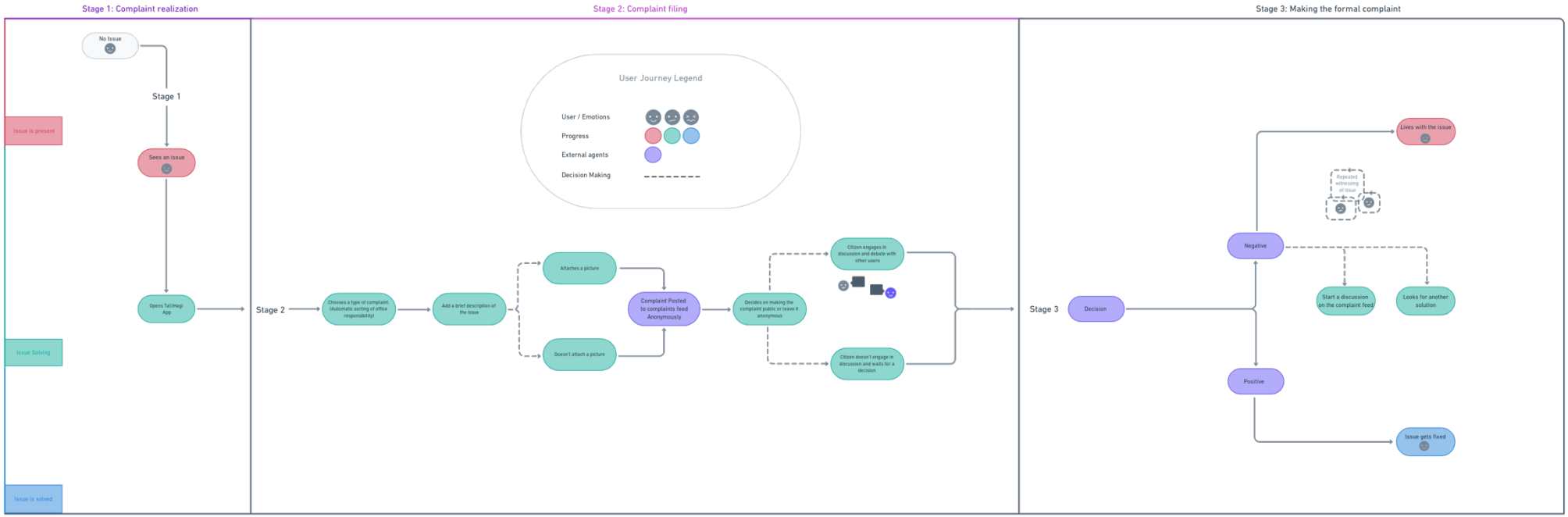


Figure 18 TalliHagi 2.0. Complaint Issuing User Journey

7. Conclusion and Future Work

Collaborative digital government processes ensure the inclusion of multiple stakeholders in the solution of a common issue. In the case of Tallinn, the public perceives the municipality's lack of high-quality interactions and communication methods. This research constructed a co-designed digital service that has the capability to bridge the interaction gaps between the citizens and the municipal government. This service is the novel artifact that was developed using DSR techniques and evaluation methods, in collaboration with the citizens of Tallinn and experts from a wide variety of backgrounds. Tallinn served as a specifically unique environment due to its people's high digital literacy and trust in technology, accompanied by a strong country-wide digital framework that is not being translated appropriately to the local-government sphere.

"The government closest to the people is the most effective type of Government"
– Nancy Mace [71]

To achieve the construction of the final artifact, TalliHagi, a thorough understanding of the public's journey under the current complaint system was needed. Alongside the background information of the environment in which improved citizen-municipality interactions are needed, a workshop was conducted with citizens of Tallinn to better understand their perspectives, needs, and expectation. From this, a first prototype was developed and tested, and from the feedback gathered from the evaluation of the first prototype a final artifact was presented as TalliHagi 2.0. This final artifact is largely based on the public's perspective, as its nature of a citizen-centric service is organically preserved through its development.

The meta research questions and sub-research questions were answered throughout the research successfully. A summary of how these questions were answered is presented below:

RQ1: How is the current complaint system of Tallinn working and does it allow for the interaction between citizens and municipality?

Answered in chapter 4, the current system complies with outdated digital service standards working in a hostile environment that pressures the citizen to seek the service rather than offering it to the user. The system allows interactions in an inefficient manner that is weakening interactions between the citizens and the municipality. At the same time, these interactions are low-quality, based on unstructured e-mail communications, pressure on the complaint issuer on multiple decision-making steps and nonexistent feedback and public communication mechanisms.

RQ2: How would a complaint system that uses the latest technologies and accommodates to the necessities of the people of Tallinn operate?

Answered throughout chapter 5, 6, and 7. The presented artifact is a complaint system that adapts and transforms through iterations benefitting from people's perspectives and expectations alongside with the theoretical background provided by the author. A complaint system that accommodates to the people of Tallinn and uses the latest technologies need to be simple, efficient, publicly available, and most importantly allow for communication and feedback regarding the people's complaints. At the same time, a system that allows these functions is expected to also bring the municipality and the public together by providing access to public information easily to everyone.

SQ1: What is the citizens perception of the municipality of Tallinn and their interaction with it?

Answered in chapter 5 during the Tallinn + U workshop, the public expressed that the municipality has major interaction flaws with the public, that directly hampers communication and blinds the municipality of what is pressing and dear to the citizens. The public, at least on the random sample of citizens that attended the workshop, perceive the municipality as a traditional and outdated institution that has good intentions in working but lacks communication skills to interact with the public. Although this perception cannot be proven and is solely based on people's feelings towards the city government, it is relevant to study it on the way to figuring out how to improve interactions with the city. This lack of attention into the people's issues perceived by the attendants has had a direct effect over their perceptions of the city and its municipal government.

SQ2: What are the functionalities that a renewed complaint system would need, to improve interactions between the public and the municipality?

Answered throughout chapter 5, 6, and 7. The functionalities that a complaint system will need are: the ability to efficiently make complaints and communicate issues to the adequate city office in charge of solving them, a public feed of information regarding other people's complaints that have been made throughout the city with the capacity to personalize the feed based on the user's needs, and accessible and easy way to see the current plans and projects of the municipality with the capacity for people to support and comment of said plans and projects.

7.1. Limitations

The limitations in this research are the sample size for the workshop that had six attendants and focused on the perspectives of younger people. Although younger populations are regarded as the ignitors of innovation in mobile services, the perspectives of a wider variety of perspectives could have benefitted the development of a platform that's understandable for all the age groups living and interacting in Tallinn. At the same time, during the testing of the prototype the research could've benefited from another politician expert, that was the more divergent opinion regarding the usability, utility, and effectiveness of TalliHagi. Another politician expert could have broadened this very important perspective in the administration of public municipal services. The other limitation that is not related to the research methods on this study, is that there is an inherent lack of available sources about the creation of complaint systems in academia. While the creation of services and co-designing services sources are widely available there is no universally accepted method for developing a complaint system. And as a service that most municipalities transitioning towards smart cities will need to adopt or at least consider, a thorough methodology would have benefited this research.

7.2. Future work

The future work regarding citizen-municipality interactions in Tallinn, and how ICTs can improve them, has the potential to explore other age groups preferences for interacting with the city. Another issue for future work would be using different methods for data gathering to target larger and wider populations, like city-wide surveys that would

provide larger quantities of information with the trade-off quality and deepness of the information content. Future work may also explore an expansion or edition of the capabilities and functions that TalliHagi 2.0. presented, with another round of testing and validation. This would explore possible functions that further improve the apps usability, utility, and effectiveness. At the same time, this study can be used as a reference for developing citizen-centric complaint systems in other cities, validating, or disproving the method a method for complaint system creation that worked with the group of tested citizens in Tallinn.

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9. Appendices

Appendix A: Estonian webpage dedicated to "Resolving Citizen Complaints"

Kodanike kaebuste lahendamine

est rus eng

Avaldused, vastulaused/vaidlustused ja info korrarikkumistest palume teavitada järgnevalt:

Kui kinnistu on niitmata ja korrastamata või kõnnitee on lehtedest, lumest ja jäärst puhastamata või on ohtlikud jääpurikad või on probleemiks ehitus- ja kaevetööd, puude lõikamine, jäätmed, grafiti või eksimused koerte ja kasside pidamisel, siis palume saata teavitus aadressile heakorraavaldused@tallinnlv.ee

Aadressile parkimine@tallinnlv.ee palume saata **AINULT parkimistrahvide vaided ja vastulaused**. Parkimisega seotud küsimuste korral palume helistada tööpäeviti kell 09.00-16.00 numbril 53003103.

Aadressile munitsipaalpolitsei@tallinnlv.ee palume saata tähelepanekud järgmistel juhtudel:

- valesti pargitud sõiduk (kõnniteel, rohealal, invakohal, ülekäigurajale liialt lähedal)
- valesti paigaldatud liiklusmärk
- probleemid taksoga
- tubakatooteid või alkoholi tarbivad noored

Samale aadressile munitsipaalpolitsei@tallinnlv.ee saata oma tähelepanekud, ettepanekud, märkused, vastulaused ja kaebused.

Küsimuste ja kiiret lahendust vajavate olukordade puhul korral palume helistada mupo korrapidamise infotelefonil 14410, mis töötab ööpäevaringselt või telefonil 661 9860.

Trahvide tasumine

Tallinna linna veebilehel on võimalik määratud hoiatustrahvi eest tasuda iseteeninduspportaalis. Trahvi tasumisel avaneb maksjal juba pooleldi eel-täidetud makseblankett, kus on kirjas valitud panga nimi, viitenumber ja konto, kuhu maksta. Uude keskkonda saate sisse logida ID-kaardi, Mobiil-ID või Smart-ID abil.
Tallinna e-teeninduses aadress on: https://taotlen.tallinn.ee/

Kui Teile on koostatud väärteootsus rahalise trahviga, siis määratud trahv tuleb tasuda ainult pangaülekandega, väärteootsuses märgitud tähtaja jooksul ning maksekorralduses peavad olema korrektselt märgitud alljärgnevad makserekvisiidid:

Appendix B: Interview with a citizen regarding the current user journey of the complaint system of Tallinn. For access to the recording of the interview contact the author of this thesis.

Interview legend: M = Author. IA = Interviewee

M: Hello thank you for agreeing to this interview. Would it be OK if I record this?
IA: Yes.
M: all right so what I want to do today is go through the current user journey of the Tallinn complaint system so I would like to start by setting up an environment, a background for you to understand what I would like you to do. Let's imagine you live in a street in Tallinn and this street has a sidewalk that it's always cracked and they're always dirty. So, what would you feel about this situation?
IA: I will think that probably my tax money goes the other way so I would see that maybe contributions doesn't have an impact. I would always compare it to other streets that would better annoy be a bit jealous probably.
M: alright so let's imagine you have witnessed this issue repeatedly through a couple of months and you have three options: you can either live with it, you can complain about it with someone for example your friends your partner etc. or you would look for a solution. Which one would you take?
IA: I depends on the on the context in minor things I would suggest ignoring them I guess but if it's something that bothers me or my commute to work or other places, I think I'd complain.
M: Okay. Let's go to your laptop and try to look for a solution online. Let's say that you want to find, what would you look for in your Web search.
IA: City municipality office maybe? Municipality… Police even… (reading through web options…) Guarding the property in the possession of the city of Tallinn. That should be fine I would go there.
M: Okay and what can you find in that website?
IA: Email It's to the head of municipality. He would ignore my message. So, I would go to city district find mine so is Kesklinn and… and it's not the English… oh well there is Russian I can read this, and I will press on complaints.
IA: And… 0 results. OK then the results. Maybe there is a chat somewhere… Oh there's a Facebook there so I would write them on Facebook.
M: Alright so yeah you found one of the solutions for the complaining although, it's not the one that the municipality would like you to use. Actually, right now the municipality has a complaint system that you can access through the web search of "complaints Tallinn" and it's called "citizen complaints" In there you would find different ways to submit your complaint and those are divided between 2 types. The traditional means of complaining and the e-governance enabled solution which is sending an email. Which one would you use?
IA: the second one.
M: okay so whenever you would send your email you would get a confirmation and then the decision about the complaint. These decisions can be either you live with the issue because it cannot be solved by the municipality, the second is you look for another solution which means you will continue to witness the issue or finally you get a solution. Could you give me in one word a feeling that you would get from each of those solutions?

IA: I think the three of them would be frustrating. What were the three solutions again?
M: the first one would be living with the issue.
IA: Frustration.
M: the second would be look for another solution.
IA: this is what I'm getting?
M: if the result is negative.
IA: Okay the result is negative, and I look for another solution I would be disappointed I guess maybe, I'd just feel down.
M: Okay and if the decision is positive, you would have your issue solved.
IA: Oh, awesome That's cool.
M: Alright that would be it. Thank you very much.
IA: Thank you!

Appendix C: Detailed list of anonymized participant profiles of Tallinn + U workshop

Name	Age	Occupation	Country of origin
Klaara	25	Employed / Retail sales	Estonia
Magrit	27	Employed / Customer service	Estonia
Leonid	29	Employed / Media production	Estonian - Russian
Viktor	21	Employed / Marketing	Ukraine
Nicole	33	Employed / Service design	Colombia
Nilo	20	Student / Audio-visual media	Spain

Appendix D: Summarized responses from the Tallinn + U Workshop individual activities by participant

	Interviews: Ask each other main concerns & Issues in Tallinn	**Visualize**: Draw a personified version of Tallinn Municipality, and its interaction with you
Klaara	- Bicycle lanes are bad - Bad connections within the city - Bad public health	- Municipality: Tries to do a lot, but doesn't get things done - Interaction: Solid rock between the municipality and the participant. No interaction.
Magrit	- Noise - Lack of green spaces - Bad connections within the city	- Municipality: corporate, incompetent official, cuts down trees to pave and construct "grey stuff" - Interaction: unclear, doesn't know how to communicate. Confusing interaction.
Leonid	- Bad connections within the city - Uncontrolled growth of the city - Bad public health	- Municipality: duality, some people don't care, some people care about the city and the public. - Interaction: unclear, hard to understand and uncertain ways of communication. Confusing interaction.
Viktor	- Tenant logistics and communications - Bad connections within the city - E-gov tools feel outdated	- Municipality: solid and modern core, with weak and too many outlets of communication - Interaction: Too many tools that are not comprehensible hamper the interaction specially with non-Estonian speakers. Confusing interaction.
Nicole	- Car-centric - Lack of green spaces - No communal spaces during the winter	- Municipality: traditional, capitalist, and conservative. Stubborn and hard to convince to change. - Interaction: Solid wall between the municipality and the participant. No interaction.
Nilo	- Bad use of public space - Bad pedestrian connections - No communal spaces during the winter	- Municipality: corporate, incompetent, traditional official who lies often. - Interaction: No communication intends from both sides, indifference. No interaction.

Appendix E: Summarized results of the third activity "Communicate" of the Tallinn + U Workshop by outlets of communication and categories

	APP	Citizen consultation	Demonstration	Neighbour Petition	e-mail	Calling	Website
Mobility	- Bad biking rotes - Bad positioning of crosswalks - Improve walkability	- Improve walkability					
Infrastructure	- Bad siting areas - High noise pollution - Seasonally bound public areas		- Bad use of public space	- Bad use of public space - Increase sitting areas	- Noise pollution	- Bad use of public space	
Communication	- Future plans are unknown - No foreign inclusion - No municipal communication - Distance between citizens and municipality - No information on project status	- Bring citizens and the institution closer			- Future plans communication with elder		- Bad access to information for elderly
Service availability	- Increase trash bins			- Increase public restrooms	- Increase trash bins		

Appendix F: Interviewee Questions

- Do you think the municipality is good at listening people's needs and complaints?
- Do you think people should reach the municipality to communicate their issues, or should the municipality reach the people to listen and solve their issues?
- Do you see people in Tallinn communicating their complaints though an app like this?
- What are your thoughts on the complaint feed function?
- What are your thoughts on the projects and plan's function?
- Do you see yourself using an app like this? What for?
- What kind of concerns arise from your perspective when seeing an app like this?

Appendix G: Thematic Analysis Table

User interviews - Utility		
Tag	**Note - Title**	**Text**
Features	HCI Expert Interview	too many obstacles on my way to make a complaint
Features	HCI Expert Interview	I would love when opening an app to see, see the, find some projects as the main feed
Features	HCI Expert Interview	QR codes you can scan
Features	HCI Expert Interview	appreciate if things are by default anonymous
Features	HCI Expert Interview	I would automate the other things
Features	HCI Expert Interview	sort features is very nice
Features	Citizen A Interview	I'm not sure if that would, I mean, it fits into the theme, but it might be sort of like an overload
Features	Citizen A Interview	concerns anonymously
Features	Citizen B Interview	So if you have an app, just open it and you can put in your complaint
Features	Politician Interview	positive feedback
Features	Politician Interview	with all the, all the other tools and channels.
Features	Politician Interview	commenting and arguing
Features	Citizen C Interview	they're like a reasonable amount of them

Features	Citizen C Interview	through an app where it can like collect the signatures
Features	Citizen C Interview	people post pictures, like what is going on here?
Features	SD expert interview	ut it seems like there's no, nor there's not much input after that
Features	SD expert interview	I don't think I see a system at the moment for citizens to have extra influenc
Features	SD expert interview	it's public and you can vote for i
Features	SD expert interview	personalized a little bit
Features	SD expert interview	it doesn't really involve you much in implementing or validating the solution.
Features	SD expert interview	way to take the feedback and analyze i
Features	SD expert interview	sort of vote or judge
Features	SD expert interview	preferred locations like your home address or your work address or your gym
Features	SD expert interview	I want to know if something is being done in my area already
Features	SD expert interview	gain people's trust and actually convince them that someone is on the other side of this app
Needed	HCI Expert Interview	I think because how hard it is to find i
Needed	HCI Expert Interview	So they tried to reach you and you try to reach them
Needed	Citizen A Interview	two-way channe
Needed	Citizen A Interview	voice their concerns
Needed	Citizen A Interview	platform to voice
Needed	Politician Interview	right worker of the city
Needed	Politician Interview	always some more channels
Needed	Politician Interview	both ways and we do it regularly
Needed	Citizen C Interview	I think it should go both ways
Needed	SD expert interview	responsibility is on both sides
Needed	SD expert interview	always a feedback
Needed	SD expert interview	not doing as good of a job as listening to
Needed	SD expert interview	I think the municipality is good at listening to a very selective type of needs and complaints from people. I think at the moment, they're very biased to a certain target group, which mostly includes for example…

Usefulness	HCI Expert Interview	city plans
Usefulness	HCI Expert Interview	eally enjoy the fact that I can post anonymously
Usefulness	Citizen A Interview	anonymity
Usefulness	Citizen A Interview	address the pressing issues
Usefulness	Citizen A Interview	useful function
Usefulness	Citizen B Interview	I think I would also use it for, you know, just to see what's happening,
Usefulness	Citizen B Interview	I think right now it's useful as it
Usefulness	Citizen B Interview	definitely start using
Usefulness	Citizen B Interview	would be super easier than you have to send an email
Usefulness	Politician Interview	picture and the location they already
Usefulness	Politician Interview	photo that is a good part
Usefulness	SD expert interview	obvious things that are broken that needs to be fixed or off, he thinks that are missing. That needs to be at us. I think it's good.
User interviews - Usability		
Tag	**Note - Title**	**Text**
Interest to use	HCI Expert Interview	know city plans
Interest to use	HCI Expert Interview	That's an interesting model
Interest to use	HCI Expert Interview	definitely think there are going to be people who use it A lot
Interest to use	Citizen A Interview	cool aspect
Interest to use	Citizen A Interview	I would definitely use it
Interest to use	Citizen A Interview	I would like to have such a function or just a way to be able to communicate some things
Interest to use	Citizen B Interview	I think the like the in the app is cool
Interest to use	Citizen B Interview	I would definitely use it.
Interest to use	Politician Interview	citizens do not cannot tell it directed us
Interest to use	Citizen C Interview	I don't care enough to make a complaint about it
Interest to use	SD expert interview	think to people in Tallinn, in general are very used to using technology
Interest to use	SD expert interview	Yeah, I would see myself using it

Ease to use	HCI Expert Interview	it's only three clicks away that you post something
Ease to use	HCI Expert Interview	easy as possible
Ease to use	HCI Expert Interview	It's readable. It's also the map thing has the map, which is pretty good
Ease to use	Citizen B Interview	super easy, super fast
Ease to use	Citizen C Interview	this one seems pretty easy
Ease to use	Citizen C Interview	It's always there like the button
Ease to use	SD expert interview	your district's is good
Ease to use	SD expert interview	make a complaint, I should be able to see if the complaint has already been made or if there's already a similar complaints

User interviews - Effectiveness

Tag	Note - Title	Text
Informs the public	HCI Expert Interview	status is visible
Informs the public	HCI Expert Interview	I absolutely didn't know the aware
Informs the public	Citizen A Interview	discussed with the people
Informs the public	Citizen A Interview	pretty cool
Informs the public	Citizen A Interview	filter by range
Informs the public	Citizen B Interview	I will also know what this happening around
Informs the public	Citizen B Interview	I wouldnt know what's happening
Informs the public	SD expert interview	So I think the complaints feed is good.
Informs the public	SD expert interview	Popularity could be interesting from browsing
Informs the public	SD expert interview	I have no clue what's going on except from word of mouth
Visibility	HCI Expert Interview	people to what is happening
Visibility	Citizen A Interview	expect to have
Visibility	Citizen B Interview	I will know if the place or what to expect.
Visibility	Politician Interview	local muncipal government know very well
Allows communication	HCI Expert Interview	two lanes
Allows communication	Citizen A Interview	I would see such a platform of such an useful to address
Allows communication	Politician Interview	So we take all this feedback into account and change our plans

Allows communication	SD expert interview	make a platform for broader there, more structural feedback, but that, that goes more in the area of politics
Allows communication	SD expert interview	open the conversation
Complaint issuing	HCI Expert Interview	Well, because the more buttons I press, the less likely I'm going to leave a complaint
Complaint issuing	Politician Interview	text part that the complaint is somehow described
Complaint issuing	SD expert interview	location-based fixes, which I think the app at the moment is mostly optimized for
Complaint issuing	SD expert interview	point of interaction is making a complaint describing

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