TALLINN UNIVERSITY OF TECHNOLOGY
School of Business and Governance

Yelyzaveta Kukovska

TRANSFORMING GOVERNANCE: THE EVOLUTION OF DIIA APP IN UKRAINE AND THE ROLE OF INTERNATIONAL COLLABORATION

Master's thesis
Programme HAGM,
specialisation Technology Governance & Digital Transformation.

Supervisor: Egert Juuse, PhD

Tallinn 2023

I hereby declare that I have compiled the thesis independently
and all works, important standpoints and data by other authors
have been properly referenced and the same paper
has not been previously presented for grading.

The document length is 23252 words from the introduction to the end of the conclusion.

Yelyzaveta Kukovska ……07.08.2023…….
(date)

TABLE OF CONTENTS

ABSTRACT 5
INTRODUCTION 6
1. E-GOVERNMENT DEVELOPMENT OVERVIEW 9
1.1. Ukrainian digitalization journey 9
1.2. Evaluation of the factors behind the creation of the state web portal and mobile application of electronic services of Ukraine (Diia) 12
1.3. Development process of Diia 16
2. THEORETICAL OVERVIEW 20
2.1. Establishing dimensions for analysis of the user perception of Diia 20
2.1.1. The Technology Acceptance Model (TAM) 22
2.1.2. Actor-Network Theory (ANT) 23
2.1.3. The Social Construction of Technology (SCOT) 25
2.1.4. The Institutional Theory 27
2.1.5. Diffusion of Innovations (DOI) 28
3. METHODOLOGY 29
3.1. Data collection and analysis 29
3.1.1. Collecting the information on the background and historical development of Diia 29
3.1.2. Conducting the survey on the usage of and satisfaction with Diia 29
3.1.3. Conducting interviews on inner workings of web-portals and citizen apps 30
3.2. Research Limitations 30
4. ANALYSIS 32
4.1. Survey of Ukrainian citizens on their usage of Diia 32
4.1.1. Perception of Diia through TAM 32
4.1.2. Evolution of Diia through ANT 34
4.1.3. Context in which Diia through DOI and Institutional Theory 37
4.1.4. Adopter Category of Diia users through DOI 42
4.1.5. Discourse around Diia through ANT 44
4.2. A look through collaborations in the digital transformation field between EU countries 49
4.2.1. Perspective in EU cooperation for Ukraine and Diia 53
4.2.2. Special case of collaboration between Estonia and Ukraine on mRiik 55

5. DISCUSSION....57
5.1. Discussing the results of the survey with the Diia team....57
5.2. Discussing Diia's possible future features....58
5.2.1. Challenging requests....59
5.2.2. Innovative Possibilities....61
CONCLUSION....63
LIST OF REFERENCES....67
APPENDICES....72
Appendix 1. Questionnaire for users of Diia....70
Appendix 2. Interview Questions for Diia and mRiik teams....79
Appendix 3. Non-exclusive licence....81

ABSTRACT

This MA thesis presents a comprehensive analysis of the implementation and impact of Diia, the citizen app and the only state web portal of electronic services in Ukraine. Diia has only been available to the public for around 4 years, making it a relatively new addition to the landscape of digital governance in Ukraine and a new important area for academic research. The author recognizes the importance of combining various research methods and theoretical frameworks, as well as engaging with international indexes, in order to gain a comprehensive understanding of complex phenomena and the potential to facilitate social, economic, and political development. Throughout this study, an exploration of Diia's evolution and its impact on Ukraine's and the world's digital governance landscapes has been undertaken. The analysis delved into the factors that influenced the creation and development of Diia, shedding light on its growth trajectory and the role of Ukraine's robust IT sector, innovative image, and prior success in digital solutions across sectors. This research also shows the dynamic collaboration between international teams, exemplified by discussions and cooperation between the Ukrainian Diia team and counterparts from countries such as Estonia. In addition to contributing to the understanding of Diia's evolution and impact, this thesis initiates direct engagement between academic researcher and development teams of citizen apps in different countries by live interviewing Ukrainian Diia and Estonian mRiik teams. Moreover, in order to analyse research questions, a survey among Ukrainian users was conducted alongside extensive complementary desk research.

Keywords: *Diia app, electronic identity, state portal, public services, adoption stages, citizen engagement, government digitalization, user perception, technology adoption, international collaboration, policy diffusion*

INTRODUCTION

How to get 19 million users in 3 years and keep them
all safe and satisfied through worldwide pandemic and war?

With "Action", or as it's known in Ukraine, Diia! It is a webportal of electronic services of Ukraine as well as a mobile app, which gives the citizens access to their 14 digital documents and 30 governmental services anywhere in the world through their smartphones. Within three years since its launch, Diia collected numerous awards, ranging from the Cannes Lions Festival's Creative Business Transformation category to two Red Dot awards for Best Mobile User Interface and Service App, Diia has become a symbol of Ukrainian innovation, showcasing the country's technological advancements and accomplishments. In a landmark move, Ukraine legally recognized the e-passport without the need for a physical copy in 2020 (E-Governance Academy, 2021). Moreover, since 2021, Ukrainian refugees have played a pivotal role in spreading the word about Diia, further enhancing its global recognition and impact. So the project captured the attention of countries with higher digitalization levels, like Estonia, which became the first international partner to adopt Diia components in their National Mobile Application, mRiik. Another compelling evidence for the significance of studying Ukraine and its flagship digital solution, Diia, is the country's proven rapid digital development. The E-Government Development Index (EGDI) is a vital indicator used to evaluate the adoption and advancement of e-government services globally. It assesses the availability and quality of online public services, digital literacy and infrastructure, and citizen-government online engagement. Notably, Ukraine has significantly improved its ranking from #82 in 2018 to #46 in 2022, a remarkable achievement recognized by the United Nations (2020 & 2022 United Nations E-Government Surveys). It is plausible that Diia's implementation has played a pivotal role in propelling Ukraine's e-government progress, making it an intriguing case for further exploration.

The importance of this research lies in unique circumstances Diia was created and adopted by Ukrainian citizens: COVID-19 pandemic and the ongoing full scale war with the neighbouring country, which are ultimate testers for any digital product possibilities. By providing accessible theoretical knowledge, this study aims to enhance the understanding of citizens and

policymakers alike regarding the potential of digital solutions to facilitate social, economic, and political development in Ukraine. Moreover, the findings of this research could have wider implications for other countries seeking to adopt similar e-government solutions, making this Master Thesis an essential addition to the growing body of research on digital governance.

With Diia being a relatively novel project since its inception in 2019, there is little to no academic research on it. However, various studies have analysed governmental digital solutions in different countries, including technical reports and articles on social determinants. One professional evaluation of Diia was conducted by the E-Governance Academy in 2021, but in contrast, this thesis takes a descriptive academic approach, by also acknowledging changes since the report's publication and providing a comparative analysis with similar international digital products, exploring potential future developments of Diia. Moreover, the TalTech department of Information Security has conducted research on eID acceptance (Tsap, 2022), which serves as a backbone to this MA Thesis. Unlike many technical reviews and analyses of eID acceptance in various countries, this work specifically delves into the appeal of Diia to Ukrainian citizens. Furthermore, this study emphasises the importance of collaboration in creating Diia, drawing comparisons with European Union (EU) member states due to Ukraine's decades-long pursuit of EU membership. Examples of value in these comparisons include Estonia's digital development and its EU membership correlation (Velmet, 2016), and the e-development of Turkey, another aspiring EU member, in the 2010s (Kutlu et al., 2010).

"To speak about collaboration between different countries it's really important as well, because there is a huge value in such solutions, which are being extended from one country to another and such success stories should be mentioned worldwide." from the interview with Nikolai Kornõshev, project manager of Estonian citizen app mRiik (Appendix 2).

The Research Plan for this Master Thesis is to focus on Diia and its role in Ukraine's e-government development and look for possible future development as EU membership, for example. Using a combination of research methods and theoretical frameworks, the author aims to provide a comprehensive analysis of Diia's design and features, as well as its achievements in improving citizen access to government services and promoting transparency. Furthermore, the study explores the reasons behind Ukraine's rapid success in government digitalization and compares the development of e-government in Ukraine to that of EU member states. The most important thing is to deliver accessible theoretical knowledge so the citizens will understand

what they are dealing with. Moreover, the author of this thesis is Ukrainian, who for 2 years lived in Estonia and got the opportunity to talk to a lot of country's leaders and specialists who used to work on cooperative projects with Ukraine. The aim is to share some valuable insights from those dialogs, University classes, work experiences, conference presentations, etc.

RQ1: How has Diia evolved since its launch, and what factors have influenced its development & success?
RQ2: What discourses exist around Diia in Ukraine, and how do they shape the app's adoption and use?
RQ3: How does the collaboration between countries help Ukraine in creating digital solutions and e-government initiatives?

For this research, interviews were conducted with representatives of Diia developing team as well as with the project manager of mRiik (from Estonian translates to "mobile country" and is the same type of app as Diia). Additionally the survey was conducted among Ukrainian users asking their thoughts on the county's digitization process and Diia through five dimensions: 1) perception, 2) evolution, 3) context, 4) adoption category and 5) discourse. Each section is designed to later provide answers for description of the app through theoretical frameworks such as Technology Adaptation Model, Diffusion of Innovation, Social Construction of Technology, Institutional Theory and Actor-Network Theory. Overall 215 users got through the whole survey while being different ages, coming from diverse locations and education backgrounds. By delving deeper into the discourse surrounding e-government in Ukraine, there is aim to identify key stakeholders and understand their perspectives, recognizing that this dialogue is essential for driving meaningful progress and ensuring Diia's continued success in fostering a more efficient, transparent, and citizen-centric digital governance experience.

This thesis is structured as follows: the first chapter provides an overview of Ukraine's journey towards e-government and development of Diia, while the second is depicting the theoretical framework that guides this whole research; the third chapter presents the methodology; and the fourth chapter shows the breakdown of conducted poll and analyses the findings through already explained models and frameworks as well as bringing up international collaboration influences. Then, chapter five discusses the results, while also bringing comparison with other EU member countries, which are high in EGDI and pushes the discussion further by giving ideas for future development of the app.

1. E-GOVERNMENT DEVELOPMENT OVERVIEW

For the beginning of this thesis the aim is to provide a comprehensive understanding of Diia's implementation and its significance in Ukraine's digital landscape, going over the steps taken by the Ukrainian government over the years to achieve e-government. Specifically this chapter's overview is giving light on the mechanisms that enabled Diia to emerge as a transformative force in Ukraine's governance, thereby addressing RQ1. It also set a precedent for other countries seeking to embark on a similar path.

1.1. Ukrainian digitalization journey

1998 is the year when the formation of the regulatory framework for informatization began and the Law of Ukraine "On the National Program of Informatization" was adopted. After that, laws were also passed on "Electronic Documents and Electronic Document Flow," "Electronic Digital Signature," and a series of Government acts. However, this was only an unsuccessful attempt to shape state policy for the implementation of e-governance within the framework of the "Electronic Ukraine" program. In terms of organisation, from 1998 to 2006, during the first stage, the National Agency for Informatization under the President of Ukraine was established. (Emelyanov et al., 2016). And then at the start of 2010s Ukrainian bureaucrats in ministries were still carrying huge folders around. Nonetheless, some local municipal leaders, such as mayor of Vinnytsia and later prime minister Volodymyr Groysman, were keen to update their governance systems (Vihma, 2023). As early as 2008, Mr. Groysman established the first "Transparent Office" in Ukraine, providing administrative services to the population based on digital solutions. Subsequently, the system of "Transparent Offices," created on the basis of former district executive committees in Vinnytsia, served as a model for replication throughout Ukraine. After the Revolution of Dignity of 2013-2014, the focus of digitalization immediately shifted to the central government as a new government of Ukraine was formed led by then President Petro Poroshenko, which from the very beginning paid significant attention to digitalization issues. As the core group of digital enthusiasts ascended from municipal administrations to national ones, Ukraine was able to get an excellent start (Vihma, 2023) In 2014, the State Agency for E-Government was established within the structure of the Cabinet of Ministers of Ukraine,

responsible for implementing policies related to e-government, informatization, development of the information society, formation, and use of national electronic information resources, and digitalization of state authorities. On September 2, 2019, this agency was transformed into the Ministry of Digital Transformation of Ukraine and on September 18, during its meeting, the Cabinet of Ministers approved a resolution on the activities of the Ministry of Digital Transformation, which also regulates its powers and areas of competence (Verkhovna Rada of Ukraine, 2019). From the start of their work they set many ambitious goals to accomplish by 2024: make 100% public services available to citizens and businesses online; settlement and their social facilities must have access to high-speed Internet; 6 million Ukrainian citizens should be involved in the Digital Skills Development Program; 10% share of IT in the country's GDP (Shkarlet et al., 2020). Since 2014, simultaneously with the government, the parliament – Verkhovna Rada of Ukraine – began to pay key attention to the issue of digitalization, by at first establishing the Parliamentary Committee on Informatization and Communication, and in 2019, in the subsequent parliamentary convocation, forming Committee on Digital Transformation. And by the end of 2019 the mobile application Diia became officially one of the components of the information and communication system of the Diia Portal. It offers users convenient access to services and functions that are organised and provided within this system. The application interacts with the Registry of administrative services, the user's electronic cabinet, the data verification subsystem, as well as with other subsystems and software modules that form an integrated functional system of the Diia Portal (Verkhovna Rada of Ukraine, 2019).

Ukraine's journey towards e-government and digitalization development has been characterised by drawing upon the experiences of other countries and embracing the process of policy diffusion and imitation. Diffusion is the transfer of innovations through communication channels within a social system over time (Rogers, 2003). In the context of governance and policy making, policy diffusion refers to the adoption or imitation of successful policies or practices from other countries, serving as mechanisms for positive change and development (Graham et al., 2012). With the strategic goal of fostering innovation as a fundamental element of the national economy, Ukraine recognized the need for a robust innovative model. However, achieving successful implementation requires not only identifying specific innovations but also establishing conducive conditions and mechanisms to stimulate innovative activities. Policy imitation becomes a crucial aspect of this journey, enabling the replication and adaptation of successful e-government policies and practices from other nations (Shamota, 2011). Let's explore this notion in the context of the international projects in the mid to late 2010s: In 2016, Ukraine's

progress in the public sector received a significant boost with the backing of a major European program called U-LEAD with Europe. A crucial part of this new initiative, EGOV4UKRAINE, was ICT. Joining forces with Denmark, Estonia, Germany, Poland, Sweden, and Slovenia, the project started in November 2016 with an end date set for June 2021 (E-Governance Academy, 2021). The Republic of Estonia's contribution to Ukraine's digital transformation has been both significant and impactful, serving as a case study for policy diffusion in the realm of e-government. The collaboration started with Ukraine adopting Estonia's data exchange platform, X-Road, and developing sectoral registers based on Estonia's frameworks (Ilves, 2023). Under EU financial support notable outcomes come to life, such as the Trembita system, aptly named after the Ukrainian word for “alpine horn”, and Vulyk. The first one serves as a data exchange layer that fosters interoperability between authorities and local governments that interconnects over 80 diverse organisations and facilitates over 200 distinct processes, while Vulyk was the information system being designed to support the digitisation of activities within local Administrative Service Centres (Vihma, 2023). The ideal of decentralisation has been at the core of Ukrainian efforts of policymakers to empower local municipalities and strengthen regional governance. So the overall project of Trembita started in 2017 and launched in 2018 in collaboration with Estonian IT company Cybernetica (E-Governance Academy, 2021). Providing essential support to Diia's functioning and local authorities, Trembita achieved a remarkable milestone in 2021, conducting a staggering 860 million operations, marking a tenfold increase compared to the previous year (E-Governance Academy, 2021). The development of Trembita 2.0 was planned at Cybernetica but had to be postponed due to the impact of the war.

These cooperations with Estonia and the adoption of their successful practices demonstrate both policy diffusion and policy learning. Policy diffusion is evident through the work between Ukraine and Estonia under the European program U-LEAD with Europe, where Ukraine adopted Estonia's data exchange platform and developed sectoral registers based on Estonia's frameworks. Policy learning can also be observed as Ukraine learned from Estonia's experiences and expertise in digital transformation, using them to inform its own digitalization efforts. Legislative approaches to identity in Ukraine were also heavily influenced by Estonia's experiences, as Estonian experts and institutions, such as the eGovernance-Academy and Cybernetica, played pivotal roles in advising and supporting Ukraine's digital journey. What sets Ukraine's adoption apart the most is the use of contemporary "2020 ingredients" in following Estonia's recipe book, by emphasising a "mobile-first" approach that prioritised seamless mobile device integration (Ilves, 2023). Ukraine's focus on iterative innovation allowed rapid

development and launch of new services, even amid the many challenges. This agility proved to be an invaluable asset during the conflict, enabling the Ukrainian government to swiftly adapt and provide essential services to citizens, both within the conflict areas and in territories outside government control (Ilves, 2023). So by collaborating with Estonia and adopting its successful models and platforms, Ukraine gained insights and knowledge to strengthen its e-government initiatives, demonstrated through the development and successful implementation of the Trembita system, which significantly improved public service delivery in Ukraine. The planned development of Trembita 2.0 further illustrates Ukraine's efforts to continually learn and advance its digital transformation initiatives.

1.2. Evaluation of the factors behind the creation of the state web portal and mobile application of electronic services of Ukraine (Diia)

There is an interesting insight from mid 2010s Estonia, which reveals a global shift towards treating citizens as customers in e-government applications, emphasising individual relationships with the state rather than collective participation (Velmet, 2016). While some reasons behind the creation of Diia in Ukraine are apparent, such as the environmental impact of digitalization or the temporary urgency to prevent the spread of COVID-19, a more comprehensive examination reveals six primary factors that have shaped the development and quick adoption of Diia. These motivations are drawn from extensive desk research and insights from various articles, podcasts, and interviews with key stakeholders. From addressing the pressing challenges of the war to embracing innovation for Western alignment and achieving a more secure and resilient digital future, each factor played a pivotal role in shaping the vision and aspirations of Diia.

1. Clean state. Ukraine's status as a newcomer in creating electronic IDs is a crucial factor. Unlike other countries, Ukraine had not heavily invested in rapidly changing technologies in the past. In some ways, this may have made it easier to create a centralised, digital system from scratch, without the need to navigate complex legacy systems and regulations. This evident advantage became apparent during discussions between the Diia team and representatives from other countries who shared their experiences with implementing eIDs. While some countries boast startups, innovators, and artificial intelligence capabilities, such advancements often remain limited to small groups. Implementing a large-scale system at the national government level, even for major businesses or conservative industries, poses significant challenges. Even if

they recognize the potential cost savings and increased efficiency, they are reluctant to undergo such tectonic changes as it requires stepping out of their comfort zones. The current conditions may suit them well, and they are unwilling to sacrifice their comfort for innovative solutions. Therefore, introducing large-scale innovations demands significant transformative efforts and a strong commitment to change (Banik et al., 2023). As revealed in interviews conducted for this thesis, the notion of "legacy" was a common theme and the CIO of the Estonian Government acknowledging that their delay in embracing a “mobile revolution” was attributed to a fully-featured digital government system already in place by the mid-2010s (Ilves, 2023). This indicates that reliance on existing digital infrastructures can hinder progress towards mobile innovations. Moreover, some countries may rely on the absence of social demand, where people seem content, unaware of the precise potential and possibilities the technology can offer.

2. Change of power. Throughout the year of 2019, the country was focused on changing political leadership, with election campaigns for both the presidency and the parliament. Although various initiatives for the creation of Diia had been in progress before the Servant of the People political party assumed office, it was the new administration, led by President Volodymyr Zelensky, that truly pushed for its realisation. The idea of having the entire state accessible through a smartphone became part of President Zelensky's vision for Ukraine's future. Subsequently, after the parliamentary elections, the future government was formed, and the responsibility for the Diia project fell into the hands of Mykhailo Fedorov, who began overseeing its implementation and development (Banik, 2023). This change in political leadership aligns with the observation that the goals of policy makers often fall into two categories: political goals, such as maintenance of power, and appearing legitimate; and policy goals, such as adopting beneficial policies and attracting large tax bases (Graham et al., 2012).

3. Image. To beat corruption and build a more innovative brand, to be more than just an agricultural nation. Ukraine may have been motivated to implement Diia as part of a broader effort to improve its image and reputation as a modern, innovative country. The Center for Strategic and International Studies in their Brief states digitalization in Ukraine have helped enhance transparency and accountability, reducing corruption risks in service delivery. “For example, the mobile application and website Diia has allowed citizens to access dozens of administrative services over the internet, increasing administrative efficiency and reducing the role of public officials who might otherwise seek or accept “facilitation payments”, or bribes, to perform the same task” (Fenton et al., 2022). However, it's important to note that corruption is a

complex issue that requires more than just a single project to solve. Furthermore, as Diia expands globally, its influence reaches beyond Ukraine's borders, with countries like the Baltic states and Canada adopting the innovations developed by Diia team. While financial considerations play a significant role, there is also a vital aspect related to the country's image - the aspiration to become a leader in digitalization. Estonia, a frontrunner in this domain for decades, has publicly acknowledged Ukraine's rapid progress. Notably, amidst ongoing war, Ukraine has received substantial assistance from numerous countries, further strengthening its reputation as a resilient and determined nation. As Ukraine gains recognition for its innovative products internationally, it not only demonstrates capacity to receive support but also showcases its ability to contribute meaningfully in return. This aspect of Ukraine's image is a critical component of its global engagement and development as a progressive nation (Banik et al., 2023).

4. Western alignment. Ukraine's desire to align itself with Western Europe and adopt more innovative practices, including digitalization of the government. Many countries in the region have invested heavily in digitalization and innovation, and Ukraine felt pressure to keep up with top European countries mentioned in international ratings (2020 & 2022 United Nations E-Government Surveys). Diia may have been seen as a way to demonstrate the country's commitment to modernization. And it’s paying off as in September of 2022 Association Council meeting between the EU and Ukraine have noted the success in digitalization of the government, the country's ongoing engagement in implementing commitments in the telecommunication services sector and its association with the EU's Digital Europe Programme. That showcased efforts towards fast-forwarding the green, climate resilient, and digital transitions. Most importantly these initiatives demonstrated Ukraine's readiness to take a leading role in the digital transformations, emphasising its commitment to modernization and alignment with European standards (Lenzu, 2022). Moving away from image-related aspects, there is another important factor in the context of Western Alignment. Diia's vision goes beyond just national implementation, aiming to establish a global network of trust and interoperability for electronic identification and verification. The team envisions that Diia will have a shared architecture where each country deploys its own system, but all systems can read and validate each other's documents seamlessly, akin to the current process with physical passports. This long-term vision reflects the objective of making Diia a universally recognized technology, ensuring transparency and validation of documents by authorised representatives from any country. Though it is known that countries like Estonia will launch mRiik in the near future, the ultimate goal is to enable citizens to use Diia internationally, irrespective of their location. For example, in Spain they can

have their own system, and the same applies to Poland or Portugal or others, but they should be able to validate and share documents of Ukrainian citizens in their own information system. So when visiting the migration service, one can simply press "share", and the entire profile will be filled in three clicks, whether it is happening in Greece or the Czech Republic (Banik et al., 2023). Consequently, Diia's ambition is to become an indispensable tool for travellers worldwide, simplifying and streamlining bureaucratic processes and ultimately strengthening Ukraine's alignment with Western partners.

5. IT sector. Ukraine's strong IT sector, fueled by a large pool of talented individuals in this field, has influenced the creation and implementation of Diia. With numerous skilled software developers in big amounts, the country's IT industry has a possibility of going beyond outsourcing to foster the development of homegrown products, including globally recognized projects like Reface and Grammarly (Banik, 2023). There is also Ukraine's success in developing innovative digital solutions for other sectors, which are related to governmental work: such as Nova Poshta for postal services, Monobank for finance, and Helsi for healthcare. It is important to acknowledge that these exemplified projects are independent of the government and often directly compete with nation-state products. Nonetheless, this track record of user satisfaction with previous IT innovations in the country may have given officials confidence in the feasibility of the Diia project being a hit too.

6. Security. The creation of Diia can be attributed to a range of security reasons, with the ongoing war in Ukraine since 2014 being a significant catalyst. The need to ensure the security and sovereignty of the nation became paramount. Diia could be looked at as a strategic response to strengthen Ukraine's digital resilience and protect its citizens' sensitive information amid an evolving security landscape. With the potential risks of cyber threats and foreign interference, the development of Diia aimed to establish a secure digital infrastructure that would safeguard critical government services and data. The whole system is now being tested during the full-scale war, with Diia demonstrating its instrumental role in providing official information and critical government services to regions where ICT technology infrastructures were deliberately targeted to disrupt the functioning of society. More detailed insights on the app’s contributions to help citizens during the war will be further explored in the subsequent subchapter.

Additionally, Diia successfully addressed the significant security concern of passport forgery. Between 2019 and 2020, the Head of the State Migration Service of Ukraine reported approximately 17,000 criminal cases related to passport forgery in the country. However, since

the introduction of the e-passport in the Diia app, there has been no public record of any criminal cases being opened for e-passport forgery (E-Governance Academy, 2021).

In conclusion, the exploration of the factors behind the Diia creation and quick adaptation offers valuable insights into the complexities that shaped its inception and subsequent growth in Ukraine. Each motivation blended, resulting in this transformative digital ecosystem. Moreover, understanding how Diia is perceived by its users gives the assessment of its impact on the ground and provides a bridge to the Institutional Theory, which further enriches the comprehension of its significance in shaping the e-government landscape in Ukraine. The empirical findings on what users think about reasons behind Diia creation and the comprehensive analysis are present in Chapters 4 and 5.

1.3. Development process of Diia

After exploring the factors that contributed to the rapid success of Diia and before analysing what users are thinking about it, there is a need to delve into the development journey of this app. The origin of Diia is rooted in visionary ambitions and a clear-cut concept that envisioned placing the entire state within a smartphone. Driven by Mykhailo Fedorov, the development process took shape, drawing inspiration from global experiences like Estonia, the UK, and New Zealand. The idea of creating a unified portal with a mobile application at its core emerged and the strategic choice to begin with digitalizing driver's licence and vehicle technical passports was made. The initial presentations took place in Zaporizhzhya on 27th of September 2019, where Diia's potential was showcased to captivated audiences with prototypes, a design system, and a communication strategy focused on offering straightforward, accessible online services to the people (Banik, 2023). This captivating narrative sets the stage for a comprehensive exploration of Diia's developmental journey, illuminating the ingenuity and dedication that marked its inception (Banik, 2023). From the interview taken for this thesis with an IT team of Diia (questions are in Appendix 2) the explanation was taken that the first version of Diia that saw the light was developed by EPAM, an American IT custom software manufacturer company. It was a request from the Ministry of Digital Transformation of Ukraine to create a quick solution, and EPAM took on the task. They swiftly developed a cross-platform solution, which was presented in February 2020. The initial Diia, featuring documents such as driver's licences, technical passports, and others, was developed by the EPAM team. However, at the same time, the

Ministry of Digital Transformation decided to establish its in-house team, which began to assemble individuals with prior experience in native applications. Three separate subdivision were formed - iOS, Android, and back-end - each working on its specific area. This new team then created the new Diia version, which was presented in October 2020 with additional services to differentiate it from EPAM's version. Consequently, the product lifecycle of the Diia version developed by EPAM came to an end at this stage and it became fully in-house work under Ukrainian government. This is an origin story of the first digital passport in the world. At its core, Diia generates temporary barcodes, enabling seamless verification of identities and presentation of important documents. This multifaceted app has integrated the national electronic passport, allowing its use in various essential domains such as post offices, banks, and interactions with patrol police. Its versatility and convenience have proven invaluable, particularly in situations where one might inadvertently leave their wallet behind. With Diia's swift adoption, it has become an indispensable aspect of everyday life for a substantial portion of the Ukrainian population, where every second Ukrainian uses its services. Diia app grew to 10 million users in less than two years. As of November 2021, there have been 7,418,959 unique international e-passports generated using Diia App (E-Governance Academy, 2021). And by Spring 2023 there are up to 19 million users. However, among these users there are still a lot who still doubt the security of it all and the answer to them from the Diia team is something along these lines: "*Diia is an application that serves as an intermediary between individuals and the government, the state, and the registries where some data is stored. So, regardless of whether a citizen has installed Diia or not, their data is in the registry without exception"*. Diia doesn't hold any personal data on their servers. All the data is stored in secured registries and Diia just simply sends a request, like "give me, please" and then all this data is essentially stored on phones of users. It is also evident from explanation of how facial recognition procedure works – this feature allows users to compare their self-generated photo, created within the Diia Portal, with the digitized facial image from the Unified State Demographic Register, received through the integrated information system of the Ministry of Internal Affairs. This process enables the app to generate electronic representations of information contained in official documents, providing users with secure and convenient access to government services and resources.

Diia is an effective tool for confronting challenges and there were plenty in just three years since Diia launch: 1) pandemic, 2) cyber attacks, 3) full scale invasion, just to name a few.

1. However the pandemic became a huge boost for Diia as the app gained popularity during the Covid-19 pandemic due to its ability to provide citizens with digital Covid certificates. This feature allowed users to conveniently access their vaccination and Covid test records, making travel and other activities safer and more accessible. As a result, Diia has become a leading example of the potential of digital identity solutions in managing public health crises.

2. And then just before the full scale war, there has been a lot of information noise, info-attacks on the Ministry regarding claims that "Diia leaked some personal data" and so on. As Diia's team members told the author during the interview, these attacks were specifically targeting the image of the Ministry of Digital Transformation because there were/are certain entities or individuals who dislike what they are doing. They worked on investigating and examining these attacks and opened up many of these schemes. The data leaks were full of outdated collections from various sources, such as PrivatBank or other systems with no relation to Diia or the registries whatsoever.

3. War brings its own changes and with new features of Diia, which were presented since 24/02/22, like Chatbot eVorog, Registration of damaged property, U24 donations, Donations to Army of Drones, War bonds, eDocument, Unemployment benefits, all helped in their own way. Also Diia.TV and Diia.Radio played a huge role in providing information to people, who were cut off from other national info-sources due to occupiers cutting the lines. This government app played a crucial role in maintaining communication and support with Ukrainian residents, including those in war zones and refugees abroad (Ilves, 2023). The question of whether Diia is recognized abroad is a complex issue that requires careful consideration of legal and practical factors. The large number of Ukrainians who left the country in the wake of the full-scale invasion created challenges related to the recognition of digital documents. Despite these challenges, many Ukrainians were persistent in insisting on the acceptance of their digital documents, particularly when they had no alternative options. The team of Diia worked diligently to ensure the right to passage of the borders to Ukrainians and to address concerns raised by border officials about the validity of digital documents. For example, the second day after the war began, Moldovan border guards initially doubted the validity of digital documents presented by Ukrainians seeking refuge in Moldova. However, the Diia team quickly provided an official response confirming the authenticity of these documents, which helped to ease tensions at the border. Poland and Slovakia also were quick to accept digital passports in Diia. This is an exceptional case due to an emergency. Overall, the Diia system played a crucial role in

ensuring that Ukrainians could navigate the challenges of displacement and refugee status, and helped to promote greater recognition and legalisation of digital documents more broadly. Poland has created an application to help Ukrainians who have the Diia and are residing in Poland. The Polish administration has a separate department for digitalization, and they have utilised their expertise to develop this application. The app is designed to pull up documents for Ukrainian citizens who already have a PESUK number, which is a tax number in Poland. The procedure for pulling up these documents is relatively simple, requiring only a few clicks. The app currently focuses on documents such as FOP taxes, fines, and rent payments, but the goal is to eventually include all government-related services such as school and kindergarten enrollments. The aim is to streamline the process for citizens and create a self-sustaining system where users can pay for services within the app, which would require minimal interaction with the state.

Ukrainians are leading the way in promoting mobile eID adoption around the world by showcasing the benefits of Diia to different countries. Diia not only enables Ukrainian citizens to access government services from their mobile devices within the country, but it also connects them to their homeland when they're abroad. With Diia, Ukrainians living abroad can easily access and utilise government services without needing to physically be in Ukraine, which helps them stay connected to their country and its people.

2. THEORETICAL OVERVIEW

In light of the afore-presented overview of the Diia launch and factors behind its creation, the following theoretical frameworks will direct the analysis process for answering RQ2 about discourses around the Diia app in Ukraine through the questionnaire for users of the app.

2.1. Establishing dimensions for analysis of the user perception of Diia

One of the closest academic work to the subject of this topic, the dissertation work “eID Public Acceptance” (Tsap, 2022), was based on the research made throughout three years with different kinds of collecting data. In 2019 the method was a semi-structured qualitative online survey as the main data collection method. The latter were analysed by means of thematic analysis that was conducted manually and facilitated by excel sheets. The author predefined constructs to serve as a theoretical framework to conceptualise and interpret the results of the survey. The survey was designed for the owners of the Estonian eID, which includes citizens, residents, individuals holding a digital citizenship (e-residency), holders of electronic identity cards. The survey consisted of 12 questions. Another research in that dissertation was made to gain a series of valuable insights from in-depth expert interviews that provided the stakeholders’ perspective on eID public acceptance. This gives a working plan on how to conduct analysis for this Thesis, though Diia is a project broader than just an eID system and there is time to interpret previous ideas in a new way.

After going through a lot of research done on different technologies in the time of pandemic, another academic work was inspiring – “Insights into Internet Voting” (Licht, 2021). In the process the author developed the theoretical background for the assessment of technological diffusion and did the analysis of adoption processes of the author's chosen technology in different countries by identifying five adoption stages: 1) awareness, 2) persuasion, 3) decision, 4) implementation and 5) confirmation. In the summary the author depicted the derived categories and dimensions for the framework of i-voting adoption. These five dimensions were 1) perception, 2) evolution, 3) context, 4) adopter category and 5) discourse. So the idea to divide the research into 5 factors gave the idea of making a five stages survey for users on their satisfaction level with Diia, where each section is based on the most related theoretical frameworks. Integrating these five dimensions into the research questions creates a

comprehensive and in-depth analysis of the app's impact, evolution, and adoption in the Ukrainian digital landscape, while also exploring the role of collaborations in shaping e-government initiatives in the country.

Perception. *For RQ1.*	to answer questions on how users perceive Diia's impact on accessing public services and its overall effectiveness. By understanding users' perceptions and experiences with the app, we can gain insights into the factors that have contributed to its development and success. For example, positive perceptions may indicate effective updates and improvements, while negative perceptions may highlight areas for further development and refinement. This can provide interesting points for RQ1;
Evolution. *For RQ1.*	to track the app's growth and development over time, capturing user experiences with its frequent updates and improvements, which is crucial for addressing RQ1. Examining user experiences with frequent updates and improvements will provide valuable information on how the app has evolved since its launch. Understanding the evolution of Diia gives the opportunity to identify patterns and trends that contribute to its success and adoption;
Context. *For RQ1 and RQ3.*	to understand the broader background and factors that influenced the creation and implementation of Diia, shedding light on its significance within Ukraine's digital landscape. Understanding the context in which Diia was developed will help in identifying the driving forces behind its existence and relevance. For example, the political, social, and technological context may have shaped the app's purpose and goals, which is what is needed for answering RQ1. Moreover this dimension is valuable for RQ3 as it can provide insights into how collaborations with other countries have influenced the creation of digital solutions and e-government initiatives in Ukraine. Understanding the broader context around these collaborations will help identify the benefits and challenges they bring to the country's digital transformation efforts;

Adoption. *For RQ1.*	to assess the level of acceptance and utilisation of Diia among users, which is beneficial for addressing RQ1. By examining the factors influencing users' decision to use the app, the research can gain insights into the drivers behind Diia adoption. Understanding why users choose to use Diia will help identify its strengths and areas for improvement;
Discourse. *For RQ2 and RQ3.*	to explore the social conversations and discourses surrounding Diia, identifying key stakeholders. For RQ2: by identifying key stakeholders and understanding their roles in shaping the app's adoption and success, we can gain insights into the various perspectives and discourses that influence its use. Analysing discourses will help us understand how different groups perceive and position Diia in the context of e-gov initiatives in Ukraine. For RQ3 it's about the same as in context dimension, trying to see how international collaboration influences people's discourse and what users know about other countries' partners.

Table 1. Dimensions for the questionnaire

After deciding on subtopics of the survey, there was a need to create proper insightful questions. Behind each of them stands a separate theoretical framework. They help to provide a strong theoretical foundation for the analysis and deepen the understanding of the factors that have influenced the development and adoption of Diia in Ukraine.

2.1.1. The Technology Acceptance Model (TAM)

TAM was developed to predict individual adoption and use of new ITs back in the mid 1980s, which was an extension of the Theory of Reasoned Action that aims to explain the relationship between attitudes and behaviours within human action (Davis, 1985). Although now there is another new continuation of TAM – UTAUT, this research will still focus on the more classical approach. By the end of 2000s it was one of the most widely applied models to research users' acceptance and usage of technology with substantial empirical support (Venkatesh, 2008). TAM states that individuals' behavioural intention to use an IT is determined by two beliefs: 1) perceived usefulness, defined as the extent to which a person believes that using an IT will enhance his or her job performance; 2) perceived ease of use, defined as the degree to which a person believes that using an IT will be free of effort. It also describes how the effect of external variables on behavioural intention will be mediated by perceived usefulness and perceived ease of use (Venkatesh, 2008). The original conceptual framework of TAM is starting in its Stimulus

stage with looking into systems features and capabilities; then it goes into Organism, which is about users' motivation to use the system; after the framework moves into the Response stage, which is an actual system use. That framework from the mid 1980s saying that there is an intervening motivational response on the part of the user. The characteristics of the system affect how motivated users are to use the system, which in turn affects their own actual system use or non-use. Also the aim of the TAM creation was to develop a model of the motivational variables linking system features with actual use, and to develop measures for these variables. Such measures make it possible to empirically test the proposed model, and may provide the instrumentation needed in user acceptance testing (Davis, 1985).

Another explanation of TAM is how this theoretical framework is designed to determine user acceptance of technology through two factors: perceived usefulness (PU) and perceived ease of use (PEOU). PU is defined as the degree to which an individual believes that using a particular system, such as Diia, will enhance task performance. PEOU is defined as the degree to which an individual believes that using a particular system is free of physical and mental effort. The TAM suggests that an individual's intention to accept technology is directly determined by their attitude towards the technology, as well as their perceptions of its usefulness and ease of use. According to the TAM, an individual's intention to use technology determines their actual use of the application, and their attitudes towards technology affect their intention (Venkatesh, 2008). Therefore, in order to analyse user acceptance and adoption of Diia, it would be useful to consider the PU and PEOU factors, as well as attitudes towards the technology and intention to use it. By applying TAM, this research can gain insights into the factors that influence user acceptance and adoption of the citizen app, which can inform strategies for promoting its use and improving user satisfaction.

Here are some of the survey questions, which incorporates TAM (more in Appendix 1):

- To what extent does the use of Diia help you perform your tasks more easily?
- How much do you trust the security features to protect your personal info?
- How easy is it to learn to use Diia?

2.1.2. Actor-Network Theory (ANT)

Actor-Network Theory from a French philosopher Bruno Latour, challenges the traditional social scientific focus solely on human actors and their interactions, urging us to recognize the essential role of nonhuman elements in shaping social life. It emphasises that social relations are not confined to human-to-human interactions but extend to intricate networks involving various nonhumans, such as objects, technologies, animals, and eco-systems. Rather than viewing

society and nature as distinct entities, ANT proposes the concept of "societies-natures," where humans and nonhumans are intricately intertwined. This "more than social" or "more than human" approach broadens the scope of social scientific inquiry, acknowledging the profound significance of nonhuman actors in shaping social dynamics and outcomes (Nimmo R., 2011). Applying ANT to the Diia research allows us to explore the intricate web of relationships between human and nonhuman entities, shedding light on the complex interplay that has contributed to the development and adoption of Diia in Ukraine's digital landscape. The goal is to emphasise the significance of non-human elements, such as technological artefacts and digital infrastructure, in shaping the social processes surrounding Diia.

In ANT there is a special term "actants", which refers to entities or agents that participate in shaping a social or technological network. An actant can be either human or non-human, and the theory treats them as having equal agency in the network. In ANT, actants are seen as active agents that interact with one another, forming associations and alliances to achieve specific goals or outcomes. They are not passive elements, they play an active role in shaping the network and influencing the relationships between different actors. For example, in the context of the citizen app or a web-portal, actants could include the developers and designers, the users who interact with the app, the technological infrastructure supporting the app, the government policies that govern its usage, and even the broader social and cultural context in which the app operates. All of these actants come together to form a complex actor-network that shapes the development, adoption, and discourse around Diia. By focusing on the relationships and interactions within these networks, ANT provides a unique perspective on social phenomena, technological development, and the co-construction of meaning and reality (Nimmo R., 2011).

Furthermore, in the context of Ukraine's collaboration with Estonia and Poland on developing similar citizen apps, another key component of Actor-Network Theory gains significance. A network in ANT is a concentration of resources scattered across a few places, forming a net of heterogeneous actors that interact to develop, produce, distribute, and diffuse methods for generating goods and services (Donzello, 2013). This network of actors includes both human (workers, managers, scientists) and non-human "actors" (machines, nature, printers), their connections are established through symbolic scripts that make them virtually present in the places where they are computed (Donzello, 2013). Within this dynamic network, the translation process plays a crucial role, influencing the development and diffusion of innovative technological solutions. Important to note here is that the word “network” in ANT stands for something which could transport with delay or deformation, it’s not about unmediated access to every piece of information as we now associate this word with the Internet (Latou, 1999).

- The survey includes questions crafted within this framework, exemplified below:
  - How frequently do you notice improvements to the Diia app's features?
  - How satisfied are you with the current capabilities and features of the app?
  - Are you aware of similar apps to Diia that have been adopted in other countries?
- Continue to interpret this framework are the question in the interviews posed to different governmental teams (more in the Appendix 2 of this Thesis):
  - Can you provide some insight into the meeting you just came from?
  - How did the cooperation between Ukraine and Estonia for the implementation of the mRiik come about?
  - How do you arrange connections between countries? Are conferences the main platform for starting cooperation?

Sometimes it's about reshaping the question into a shortened version, but prompt people to answer in a more ANT fashion by giving them the selection of answers. For example, an ANT question “How can the government collaborate with various stakeholders, including technology developers, media outlets, and public influencers, to shape a more positive public perception around Diia?” transformed into: “What other steps should the government take to improve public perception around Diia?”, but with prewritten answers, which include “Increase the number of information campaigns so that more people learn about the possibilities of Diia” and “Improve the quality of services so that users can really experience the positive impact of the Diia”. So the survey still can interpret ANT ideas later in analysis. This specific question considers the network of actors involved in shaping public perception and how they can work together to influence the adoption and usage of Diia. This approach aligns more closely with the principles of ANT and its focus on actor interactions within networks.

2.1.3. The Social Construction of Technology (SCOT)

The Social Construction of Technology emerged as a pioneering framework in the study of technological development four decades ago. Unlike the linear models prevalent in many innovation studies and the history of technology, SCOT introduced a multidirectional perspective, highlighting the complex interplay between variation and selection in the developmental process of technological artefacts (Bijker et al., 1989). This multidirectional view was a fundamental aspect of social constructivist accounts of technology, challenging deterministic views on innovation. SCOT's unique approach emphasised the role of relevant social groups in shaping the meanings and interpretations of technological artefacts. Artefacts within the SCOT framework are at the core of the analysis and define the relevant social groups.

Technology construction differs to a large extent depending on the technical composition of the artefact in combination with relevant social groups (Baalen et al., 2016). By focusing on the diverse meanings attributed to technology, SCOT provided insights into the intricate relationship between sociocultural context, norms, values, and the evolution of technology (Bijker et al., 1989).

This framework is used here for studying the social construction of past and present, offering an alternative to deterministic views on technology development and its specific attributes as the core of the analysis, defining the relevant social groups involved in its construction. The wider social context, including power dynamics, access to resources, cognitive abilities, and technology frames, plays a crucial role in shaping diverging interpretations of the technology by different social groups. The SCOT framework has shed light on the less successful social groups in technology construction and the mechanisms by which different groups attempt to close and stabilise technologies, impacting others. The construction of digital ecosystems must prepare for interactions between diverse stakeholders across sectoral boundaries. This involves confluence of business, social and technological dimensions taking centre stage as researchers grasp inherent complexities of digital ecosystems. SCOT could underpin research along these lines, yet studying the social construction of technologies in the digital world requires a framework extending the well-established SCOT framework (Baalen et al., 2016).

- Here are examples of SCOT questions from interviews:
  - What features of mRiik were adapted from Diia, and what changes were made to the Estonian app to better fit the needs of Estonian citizens?
  - Most users noted that they feel changes are being made to the app every couple of months. Are changes really made frequently?
  - What about new features that users want? What is the latest new feature? What was more difficult to launch from the latest features?

With Diia app as an artefact SCOT highlights the social construction, the influence of different social groups, and the role of human agency in shaping the technology's evolution and impact. The questions explore the social factors that shape users' decisions to adopt and use Diia, which aligns with the framework's emphasis on understanding the social groups involved in technology adoption. SCOT acknowledges that technologies evolve and undergo changes over time, and there is a question seeking to know how frequently updates are made to Diia. SCOT's focus on social groups and their interactions is relevant here, as user feedback and preferences play a role in shaping technology updates and features.

2.1.4. Institutional Theory

Institutional theory is a research tradition that traces its origins back to foundational articles that discussed how organisational founding and change were driven less by functional considerations and more by symbolic actions and external influences than the theory at the time assumed (Meyer et al., 1977). As institutional theory has grown, some branches have moved closer to behavioural theory and it's being influenced by the institutional context (Greve et al., 2015). At the organisation level, institutional logics can be seen as sources of managerial decision-making rules. Institutional theory has also moved into looking more into the founding conditions for new firms (David et al., 2011). Key sources of organisation founding activities are institutional features of the social group to which entrepreneurs belong or the symbolic environment they face (Greve et al., 2015).

- Below are examples of survey questions utilising this framework:
  - What are the main factors that led to the implementation of Diia in Ukraine?
  - How familiar are you with the legal and regulatory frameworks that govern the use of digital government services in Ukraine, including Diia?
  - What other steps should the government take to improve public perception around Diia?
- Here are also examples of Institutional Theory questions from the interviews:
  - Can you tell us more about the process of discovering Diia and how it has influenced the development of the mRiik?
  - What inspired you to develop the initial concept of the mRiik app, and how did it differ from the project your team is developing right now?
  - What is it like to work together with representatives of other countries on a governmental product?

This work is interpreting Institutional Theory due to its emphasis on understanding the role of the state in driving institutional change, which aligns perfectly with the focus of studying Diia as a government-led digital initiative in Ukraine. This framework considers the broader social and institutional contexts that may impact the adoption and use of technology in a given context. It looks at factors such as power dynamics, norms, and values. Particularly it is interesting when exploring how the Ukrainian government, entrepreneurs, and other stakeholders have interacted with institutional features and the symbolic environment during the development and implementation of the citizen app.

2.1.5. Diffusion of Innovations (DOI)

The Diffusion of Innovation theory emphasises the role of communication in driving social change within a community (Rogers, 2003). It describes the process by which an innovation is communicated through certain channels over time among the members of a social system. An innovation, according to Rogers, can be an idea, practice, or project perceived as new by individuals or other units of adoption. Even if an innovation was invented long ago, it can still be considered new if individuals perceive it as such. The DOI process involves several stages, including knowledge, persuasion, and decision-making, which allow individuals to evaluate and adopt or reject new ideas. Communication is a vital element in DOI, as it involves participants creating and sharing information to achieve mutual understanding. The social system, on the other hand, comprises interrelated units engaged in joint problem-solving to achieve common goals.

There is a study, which applies DOI theory to analyse Twitter posts related to the topic of women driving in Saudi Arabia. It contributes to the understanding of DOI by utilising Twitter as a means to exchange information and investigate the sentiment of individuals in the social system regarding this innovative action (Al-Razgan et al., 2021). The study has provided valuable insights into the dynamics of social change and innovation adoption within a specific context and it has inspired to consider the applicability of the DOI framework in the context of my own Diia research. By adopting DOI as a theoretical lens, the aim is to explore how the Diia app's adoption and acceptance among Ukrainian citizens can be understood in terms of innovation diffusion. This framework allows investigating how the app's features, benefits, and communication channels influence the decision-making process of potential adopters. Furthermore, it gives the chance to analyse how the social system of Ukraine, including users, stakeholders, and societal norms, contributes to the diffusion and acceptance of Diia. By integrating DOI into this research, the analysis process will gain a deeper understanding of the factors that influence the spread and impact of the Diia app within the Ukrainian digital landscape.

- Couple of example DOI questions from interviews:
  - What metrics is the team using to measure the success of the project, and how is progress being tracked?
  - Why do you think the implementation of a mobile app with documents, such as mRiik, did not happen in Estonia sooner?
  - Who are the primary adopters of mRiik, and how do you target them?

3. METHODOLOGY

3.1. Data collection and analysis

3.1.1. Collecting the information on the background and historical development of Diia

As part of the data collection and analysis methodology for this thesis, a variety of sources were consulted, including a number of podcasts featuring interviews with professionals in the field of digital governance. A carefully curated selection of podcasts was consulted, featuring notable series such as "e-Estonia" and "Tsyfra", along with relevant technology-related interview YouTube channels and the social media accounts of prominent government officials and Diia team members. Each of these sources was thoughtfully chosen for its significant relevance and valuable insights into the topic of digital governance in Ukraine and other European countries. The advantage of utilising podcasts lies in the fact that they provide access to a wide range of expert perspectives, and offer professionally crafted questions that draw out detailed and nuanced insights. Furthermore, podcasts often feature discussions between experts who are actively engaged in shaping digital governance strategies, and therefore offer a valuable glimpse into the latest trends and developments in the field.

3.1.2. Conducting a questionnaire on the usage of and satisfaction with Diia

The questionnaire conducted on the usage of and satisfaction with the Diia using the Google Forms platform. To maximise the reach of this survey, the author utilised various social media channels including Instagram, Facebook, LinkedIn, and Telegram by sharing the survey link in group chats related to different activities and festivals. Additionally, recognizing that direct outreach may yield more responses, the author personally contacted individuals from their contacts who are Ukrainian citizens and shared the survey with them.

The questions in the survey were influenced by various theoretical frameworks and there is no one book that describes all of them together, as each framework focuses on different aspects of technology adoption and use. However, there are a lot of academic papers, articles, and books that discuss these frameworks for their own researchers, which gives the opportunity to see them

used in different contexts. These frameworks can be combined to provide a more comprehensive understanding of technology adoption, taking into account social, political, economic, and individual factors. The author started by conducting a thorough search of academic databases, such as Google Scholar, JSTOR, or Web of Science, for articles and research papers that discuss e-government, digital services, and related topics, then paid attention to the theoretical frameworks and models that are cited in these works, and noted which ones seem most relevant to the research questions of this thesis.

3.1.3. Conducting interviews on inner workings of web-portals and citizen apps

The author conducted interviews with representatives of Diia and mRiik development offices. Fortunately, both teams were available for live discussions in Tallinn. The Ukrainian team travelled to Estonia's capital for an e-Governance conference, which gave an opportunity to engage with IT and Communication team members. Additionally, the Estonian mRiik team graciously hosted the author at their Ministry office. The author managed to secure the interviews just by outlining the thesis's purpose centred around Diia, and people readily engaged in discussions. This inspiring openness among governmental workers is a testament to their willingness to share insights. The interviews were recorded on camera with permission and later transcribed, capturing essential insights and perspectives. The duration of all together gathered material is just under 4 hours as the mRiik team also provided a walk-through the whole app with all its functions – this is where the author saw the many differences of features between two different citizen apps, which will be later discussed in subchapter 5.1.2.

3.2. Research Limitations

Given the extensive adoption of the Diia app among the Ukrainian population, the survey was designed to include a diverse range of respondents from various organisations, professional fields, cities in Ukraine, and individuals with diverse experiences related to the war. This diversity is evident from the answers collected in the final section of the questionnaire, which focused on the portrait of the respondents. Figure 1 presents half of the statistics, revealing that 63.3% of the users questioned were residing in Ukraine, while 36.7% were located abroad, which gives a big pool of people sharing their unique experience with engaging with their own home country from a distance through the citizen app. The author took deliberate efforts to ensure a comprehensive and diverse representation of Diia app users in the questionnaire, aiming

to gather valuable insights into their usage and satisfaction levels. While the age distribution of the respondents leaned towards those in their twenties, the results still managed to include participants from different age groups, achieving a somewhat diverse representation overall. For instance, around 15% of the respondents fell between the ages of 33 and 65, where 65 was the maximum age observed among all participants. Although improvements could be made in future to further diversify the age distribution, these results provide valuable perspectives from a broad range of users, offering a comprehensive understanding of their experiences with the Diia app.

By the end of Spring 2023, the Diia app had achieved an impressive user base of approximately 19 million users. Despite this vast user population, a sample size of 215 responses for the questionnaire provides sufficient data for meaningful academic analysis of the app and web portal. Understanding the concepts of confidence probability and confidence interval is crucial for appreciating the validity of the sample size. For instance, a sample of 384 individuals taken from a general population of over 500,000 can yield a 95% confidence probability and a confidence interval of ± 5%. This means that if we were to conduct 100 studies with the same sample size (384 individuals), in 95 out of 100 cases, the responses obtained would fall within ± 5% of the initial value. In simpler terms, after interviewing 384 people out of half a million and obtaining a specific value "X," we can confidently state that 95% of the total user population (approximately 475,000 individuals) would respond within the range of X ± 5%. The remaining 25,000 responses might fall outside this interval, but they are accounted for in the statistical analysis (Greenland et al., 2016). So to achieve a reliable understanding of the perspectives of approximately 19 million users with an 85% confidence level, a minimum of 207 responses would have been sufficient. As the data collection reached 215 responses, surpassing the required minimum, the questionnaire was closed, ensuring a robust representation of Diia users for the academic analysis.

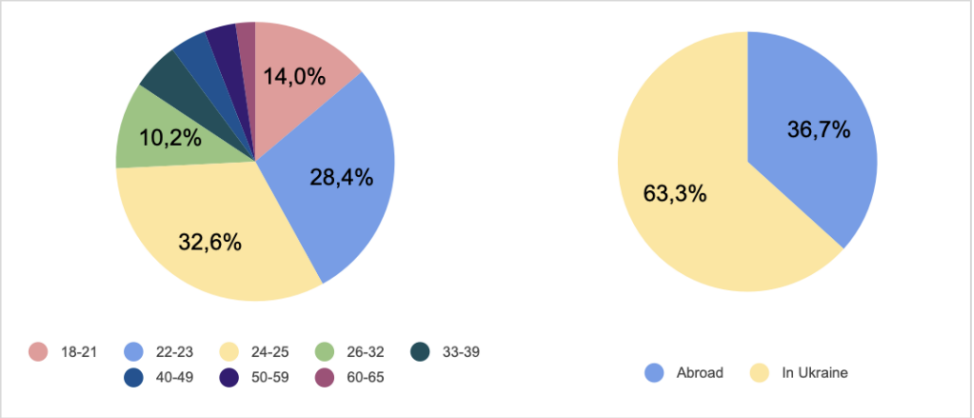

Figure 1. Portrait of users who got through the questionnaire

4. ANALYSIS

By analysing the results of the questionnaire, which was setup by employing previously described theoretical frameworks, the thesis tries to answer RQ2 about the discourse around the app and the reasons for quick adoption of Diia. Moreover there are some additional insights for RQ1 when asking about factors behind the creation of Diia as well as thoughts of participating users on international e-governance leaders, which sets off the discussion for RQ3's international collaborations.

4.1. Survey of Ukrainian citizens on their usage of Diia

4.1.1. Perception of Diia through Technology Acceptance Model

The perception of participants towards the use of Diia was assessed by analysing the extent to which the app contributes to various aspects of their experience. This specific format of using TAM was inspired by one of four different versions mentioned in (Lewis, 2019). Firstly, participants were asked to evaluate the extent to which Diia increases the efficiency of accessing public services, providing insights into the app's impact on streamlining administrative processes. Secondly, participants assessed the extent to which Diia helps them perform tasks more easily, highlighting the app's facilitation of user interactions with government services. The survey also gauged participants' perceptions of Diia's ability to save time and effort when engaging with authorities, shedding light on the app's potential for enhancing administrative efficiency. Additionally, participants evaluated the ease of orientation and use of Diia's functions, indicating the app's intuitiveness and user-friendly design. The ease of learning to use Diia was also measured, capturing participants' experiences with onboarding and familiarising themselves with the app. Lastly, participants were asked to express their confidence in the possibility of using Diia for promotion, revealing their trust in the app's potential for facilitating various government initiatives. These evaluations provide valuable insights into participants' perceptions of Diia's effectiveness in enhancing efficiency, ease of use, time-saving, and confidence in its capabilities.

The purpose of the study based on the Technology Acceptance Model (TAM) was to identify intentions to use the "Diia" application by evaluating the Perceived Usefulness (PU) and Perceived Ease of Use (PEU) parameters. Within the framework of the TAM method, 6 items of the questionnaire were formed, three of which measure perceived usefulness (PU) and three measure perceived ease of use (PEU). These questions actually duplicate each other in different sentences, which will reduce the impact of wording and possible manipulations on the respondent's answer during the survey. Based on the results of a survey of **215** respondents, a table was formed with options arranged from left to right in order of increasing agreement - from *1* to *7* measured using Likert, or rating scale. A Likert scale typically consists of a range of response options such as "strongly disagree", "disagree", "neutral", "agree", and "strongly agree", with assigned numerical values (Joshi et al., 2015).

Parameter	Questions	Answers (1 - completely unsatisfactory 7 - completely satisfactory)							Average TAM
		1	2	3	4	5	6	7	
Perceived usefulness (PU)	TAM1: Increases the efficiency of access to public services	1	1	14	1	27	49	122	6,20
	TAM2: Helps to perform tasks more easily	2	8	13	17	39	52	84	5,67
	TAM3: Saves time and effort when interacting with the authorities	3	4	13	8	22	42	123	6,07
Perceived ease of use (PEU)	TAM4: Ease of orientation and use of functions	1	5	13	4	28	61	103	6,01
	TAM5: Ease of learning to use	1	3	10	4	22	61	114	6,17
	TAM6: Confidence in the possibility of using the Promotion	3	3	11	9	31	58	100	5,96

Table 2. Results through TAM framework

Source: author's calculations/on the basis of data shown in appendix 1 compiled by the author

Perceived utility (PU) and Perceived Ease of Use (PEU) in the context of the Technology Adoption Model (TAM) are subjective perceptions and are usually measured using Likert or rating scales rather than percentages. To represent perceived utility as a percentage, Likert responses are converted to percentages using the formulas:

PU = AVERAGE(TAM1, TAM2, TAM3)*(100/7) = *85,3%*

PEU = AVERAGE(TAM4, TAM5, TAM6)*(100/7) = *86,3%*

The variance for the TAM1-TAM3 parameter sample was *1,94*, the variance for the TAM4-TAM6 parameter sample was *1,66*.

A high percentage of PU and PEU (over *85%*) with a low sample variance (less than *2,0* in both cases) indicates a high perceived usefulness of the Diia app and perceived ease of use by users.

The general results of the survey in the Perception dimension with the addition of a question about trust in security functions to protect users' personal information are shown in Figure 2.

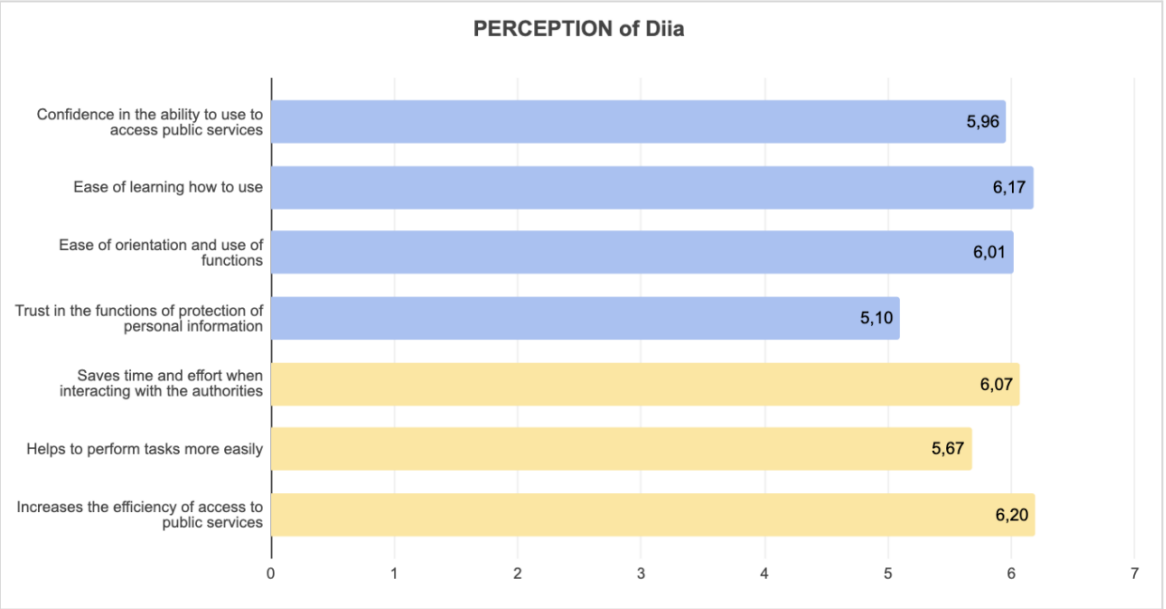

Figure 2. Perception of Diia 1/1 Source: author's calculations

4.1.2. Evolution of Diia through Actor-Network Theory

The evolution of the Diia was comprehensively assessed through an evaluation of five key parameters. Firstly, the frequency of updating and enhancing Diia's capabilities and functions was examined, providing insights into the app's agility and responsiveness to changing user needs. Participants were also asked to assess how well Diia aligns with their needs on a 5-point scale, demonstrating app's effectiveness in meeting user expectations. Afterwards, participants were invited to express their level of satisfaction with the overall development and improvement of Diia, capturing their opinions towards the ongoing enhancements made to the app. Satisfaction with the capabilities and functions of Diia was also measured, enabling participants to rate their contentment with the app's existing features. Furthermore, participants were given the opportunity to suggest new features or functions that they believe should be incorporated into Diia, allowing for user-driven inputs and potential avenues for future development. These evaluations provide valuable insights into the evolution of Diia, its alignment with user needs,

satisfaction levels, and areas for potential improvement. The answers to certain questions from this list gives the research some insights for further ANT analysis in Chapter 4.

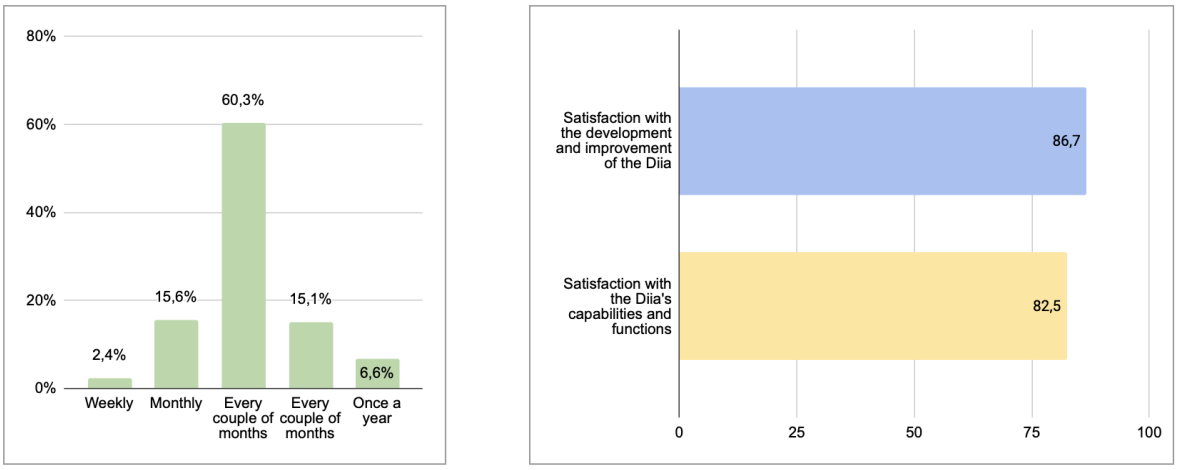

Figure 3. Evolution 1/2 Source: author's calculations/on the basis of data shown in appendix 1

As shown in Figure 3, the results of the survey indicate a high speed of updating and improving the capabilities of Diia. Most of the surveyed users notice updates every couple of months. This demonstrates a proactive approach by the Diia team in keeping the application up-to-date and responsive to user needs. Furthermore, the survey indicates high levels of user satisfaction across various aspects of Diia. Users expressed positive feedback regarding how well Diia meets their needs, with an average score of *3,98* out of *5*. This reflects a strong alignment between the app's functionality and the expectations of its users. Moreover, users displayed a high level of satisfaction with the overall development and improvement of Diia, as well as its capabilities and features, garnering average scores of *4,28* and *4,11* out of *5*, respectively. These findings highlight the success of the Diia team in continuously enhancing the application and ensuring that it provides a valuable and user-friendly experience for its users.

Figure 4 demonstrates the question about new desired functions for Diia, which was prompted by five optional answers, while also having a possibility of providing own ideas.

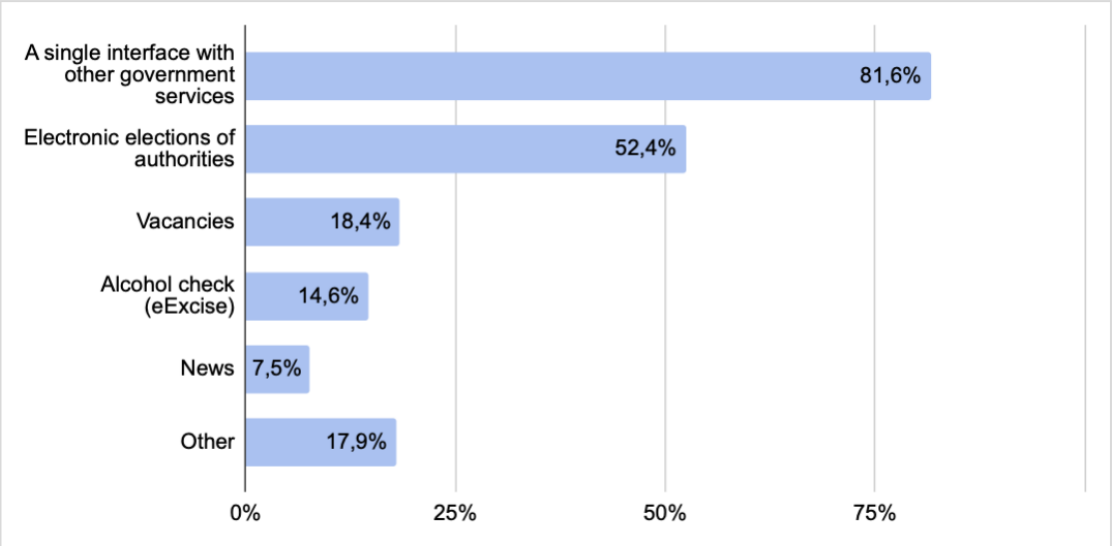

Figure 4. Evolution 2/2 Source: author's calculations/on the basis of data shown in appendix 1

173 people agreed on a unified interface with other government services, while only one user specifically excluded Helsi (an Ukrainian e-Health platform) out of the proposed mix in the additional comment. **112** users want to have the possibility to take part in elections of authorities such as parliament, president, and mayor electronically through Diia. **39** people ticked the option of vacancies for a future feature for Diia, where one person specified that these vacancies should be for jobs inside the government. **31** users voted for the Alcohol checking feature. Interestingly, this is the only one option from the five proposed in the question, which will be indeed soon implemented into Diia. **16** people thought it would be nice to add a News section into Diia.

There were a lot of additional expectations of Diia users that reflect a wide range of innovative features that could enhance the application. These include access to bureaucratic queues, the confirmation of diplomas, issuance of certificates, and the submission of applications for various government services. Users also expressed interest in features such as legalisation outside Ukraine, insurance services, open registers, online registration for changing the place of residence, and the ability to pay utilities. Additionally, there is a desire for interactions with the judicial branch and executive committees, tax payment reminders and tax consultations, ordering certificates and statements in English and not just in Ukrainian. Other desired features include a veterinary passport for animals, expanded functions for managing sole proprietorship (FOP), possibility to legally change a name, and tips for functions related to jurisprudence. Furthermore, users desire a news feed featuring recently passed laws, a unified search engine for state registers and geocadastre, profiles from the "Chesno" movement, a tax office integration, service for passport replacements online, customs clearance and registration services, access to the law base

with a convenient search function, and the ability to view open declarations of civil servants. There were also a couple of additional votes for a digital hospital book with all referrals, prescriptions, and test results, which is basically Helsi. Lastly, users expressed interest in alternative methods of identification beyond photo verification and the ability to manually add documents. There are a lot of ways in which Diia can still improve based on these comments. Some of these recommended improvements came from the issues people are having when using Diia, which latter will be discussed in the Adopter section. Several of these features are already available through other governmental or privately provided services in Ukraine, which raises the question of how secure it would be to consolidate all digital services under one governmental app. Some of these asked features are in web portals for citizens of other countries and they will be discussed in subchapter 5.1.2.

4.1.3. Context in which Diia was created through DOI and Institutional Theory based questions

The questionnaire also delved into the context surrounding the creation and development of Diia, seeking insights from participants through six specific questions. Participants were asked to identify the main factors that contributed to the establishment and implementation of Diia in Ukraine, providing an understanding of the driving forces behind its inception. Furthermore, participants were asked about the timing of their installation of Diia, shedding light on the adoption patterns and the app's growth over time. Factors influencing decisions of individuals to use Diia were explored, offering valuable insights into the motivations and considerations that influence user adoption. Participants were also asked whether they had recommended Diia to others, providing an indication of the app's perceived value and advocacy among its users. The questionnaire also looked for insights in participants' knowledge regarding the legislative and regulatory framework governing electronic identification document systems in Ukraine, allowing for an evaluation of the public's awareness of the legal aspects surrounding Diia. Trust in the Ministry of Digital Transformation of Ukraine was examined, aiming to understand the level of confidence participants had in the government body responsible for the development and management of Diia. Lastly, participants were asked to rate their trust in the government's ability to safeguard their personal data, assessing perceptions of data protection and privacy. Some questions tried to get Institutional Theory insights on how organisations and individuals are influenced by the institutional environment and the norms, rules, and practices within it. Asking about the factors that influenced the individual's decision to use Diia is exploring how institutional features or norms might have played a role in their adoption of the app. While

"What factors influenced your decision to use Diia?" inspired by DOI as this question directly addresses the factors that influenced the individual's decision to adopt and use the Diia app, aligning with the central focus of the Diffusion of Innovations theory, which seeks to understand the adoption process and the factors influencing individuals' decisions to adopt or reject innovations. And so the first question in this dimension was about main factors in the creation and implementation of Diia and it was constructed so later it would be possible to discuss the reasons behind app's creation. There were six different pre-answers, which were designed after researching the question through podcasts and interviews conducted and already discussed in subchapter 1.2. of this thesis. The main idea here was to see, which option will get the biggest amount of upvotes to know that is considered to be the most important influence by users' opinion. There are also some additional comments collected, which provided diverse perspectives on the factors shaping the creation and implementation of Diia, enriching the understanding of the complex dynamics surrounding this digital solution. By considering these findings, policymakers and stakeholders can gain a deeper understanding of the motivations and influences behind the development of this important digital solution in Ukraine.

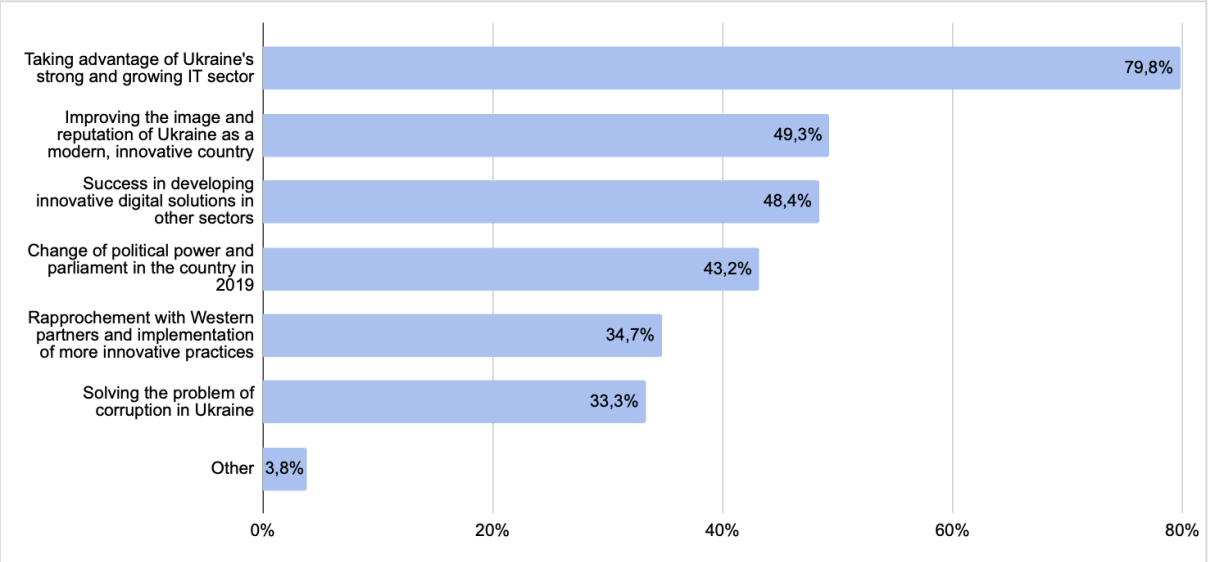

Figure 5. Context 1/4 Source: author's calculations/on the basis of data shown in appendix 1

Surprisingly for the author, *79,8%*, the majority of respondents indicated that taking advantage of Ukraine's strong and growing IT sector was one biggest factor behind the creation and implementation of Diia, making it the most significant of them all. This finding underscores the importance of leveraging the country's technological expertise and resources to drive the development of innovative digital solutions. *49,3%* of respondents recognized the role of improving the image and reputation of Ukraine as a modern and innovative country. This

suggests that enhancing the country's perception as a technologically advanced nation played a part in the creation and implementation of Diia. *48,4%* of respondents acknowledged the success achieved in developing innovative digital solutions in other sectors as a contributing factor to the creation of Diia. This highlights the influence of prior advancements in digital technologies within Ukraine. *43,2%* of users voted for the change of political power and parliament in the country in 2019, as indicated by respondents. *34,7%* of respondents upvoted the rapprochement with Western partners and the implementation of more innovative practices were recognized. *33,3%* of users identified solving the problem of corruption in Ukraine as one of the main reasons behind the creation of Diia. *3,8%* of survey participants also added interesting additional factors, for example, one respondent highlighted the issue of over-bureaucratization in state institutions, suggesting that Diia serves to simplify contacts with the government and streamline bureaucratic processes. There were two comments about the importance of fulfilling election campaign promises and increasing the government's rating among the population through tangible evidence, such as the implementation of Diia, which is another point made from a different angle for the "Change of power" argument from subchapter 1.2. Separately from just ticking that "change of power" option in the questionnaire the impact of Mykhailo Fedorov, a key figure in the development of Diia, was acknowledged by one respondent, making him a clear candidate for Policy Entrepreneur. Another two users expressed their belief that limited financial resources in Ukraine necessitate innovative approaches, and the country's relatively fewer laws make it easier to implement such initiatives. Other comments raised concerns about the practical usefulness of certain features and the need for clarity in differentiating between reasons and goals in the question.

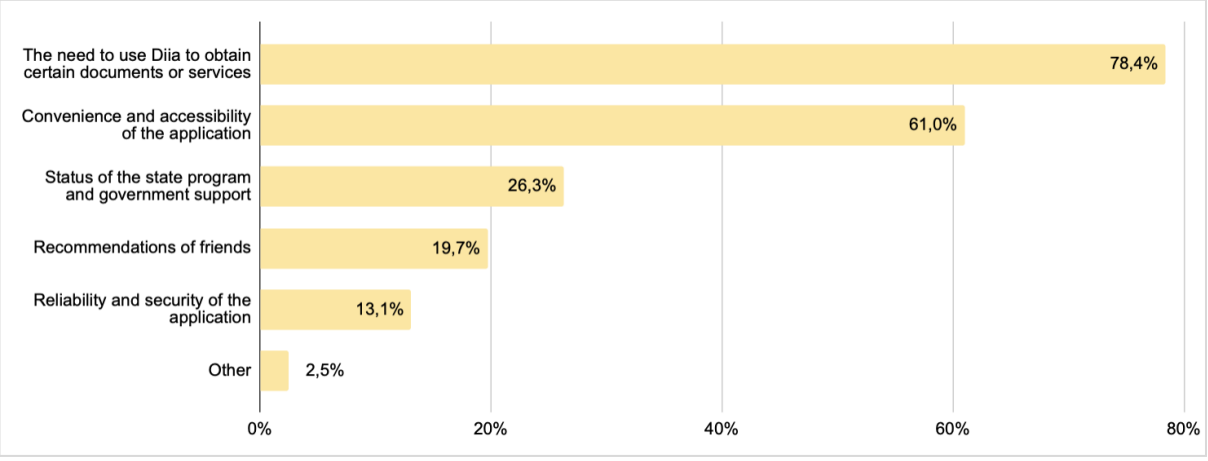

Figure 6. Context 2/4 Source: author's calculations/on the basis of data shown in appendix 1

Continuing analysing the context of Diia by asking participants about the factors influencing their decision to use Diia as seen in Figure 6. *78,4%*, the majority of participants in the questionnaire indicated that the need to obtain certain documents or services was a significant factor in their decision to use Diia. This highlights the practical utility and functionality of the application for users in accessing essential government services. *61,0%* of users mentioned the convenience and accessibility of the application as a motivating factor, so the user-friendly design and ease of use likely contribute to the app's appeal. *26,3%* mentioned the state program and government support, suggesting that the endorsement and backing of the government play a role in influencing decisions of the users. *19,7%* of participants cited recommendations from friends, indicating the importance of personal account referrals in promoting adoption. 13,1% of respondents considered the reliability and security of the application, highlighting the significance of trust in the digital solution. *2,5%*, gave their own thoughts on the matter, where user mentioned being convinced by the absence of significant incidents associated with the application, indicating a perception of reliability and stability. Couple of comments simply mentioned "Seemed interesting" as a motivating factor, suggesting a curiosity or intrigue surrounding Diia. One respondent expressed using Diia as a form of test, alluding to the attention and discussions surrounding the app. This all underscores the multifaceted nature of individual decision-making when it comes to adopting Diia. The next question shown in Figure 7 regarding assessment of participants' level of knowledge about the regulatory framework for electronic identification documents in Ukraine got varied responses.

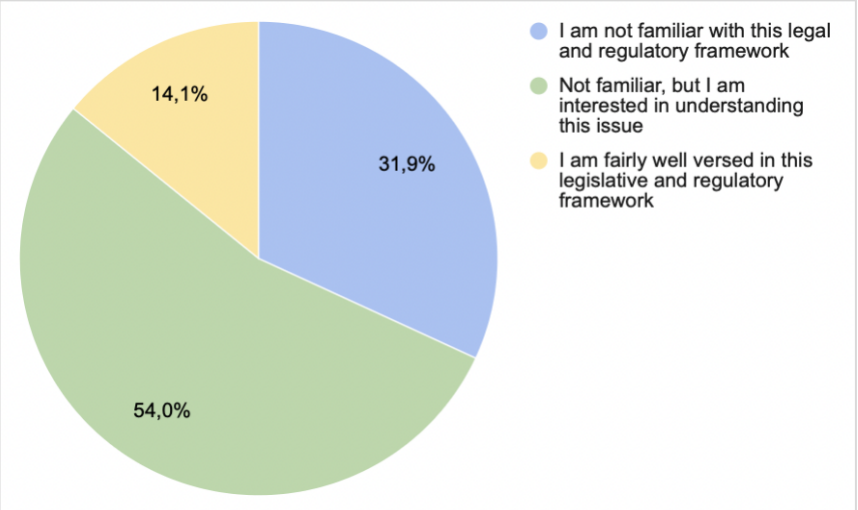

Figure 7. Context 3/4 Source: author's calculations/on the basis of data shown in appendix 1

54.0%, a half of all survey participants admitted to not being familiar with the framework but expressed interest in understanding the issue, highlighting a willingness to learn more. *30.5%* of

users confessed to having no knowledge of the legal and regulatory framework. *14.1%*, a notable proportion of participants claimed to be fairly well versed in the legislative and regulatory framework, implying a higher level of comprehension. *0.1%*, a small percentage considered their knowledge level to be at the minimum, suggesting limited understanding. *1.3%* indicated "Other" suggesting a different level of familiarity or a specific reason for not selecting any of the given options. All of these results indicate a range of awareness and expertise among participants regarding the regulatory aspects of electronic identification documents in Ukraine.

So the last two questions shown in Figure 8 were in the context of Diia, inspired by Institutional Theory as the author wanted to know how users felt about the government, with whom the app was created. The first question regarding the trust in the Ministry of Digital Transformation of Ukraine, received a varied response from participants.

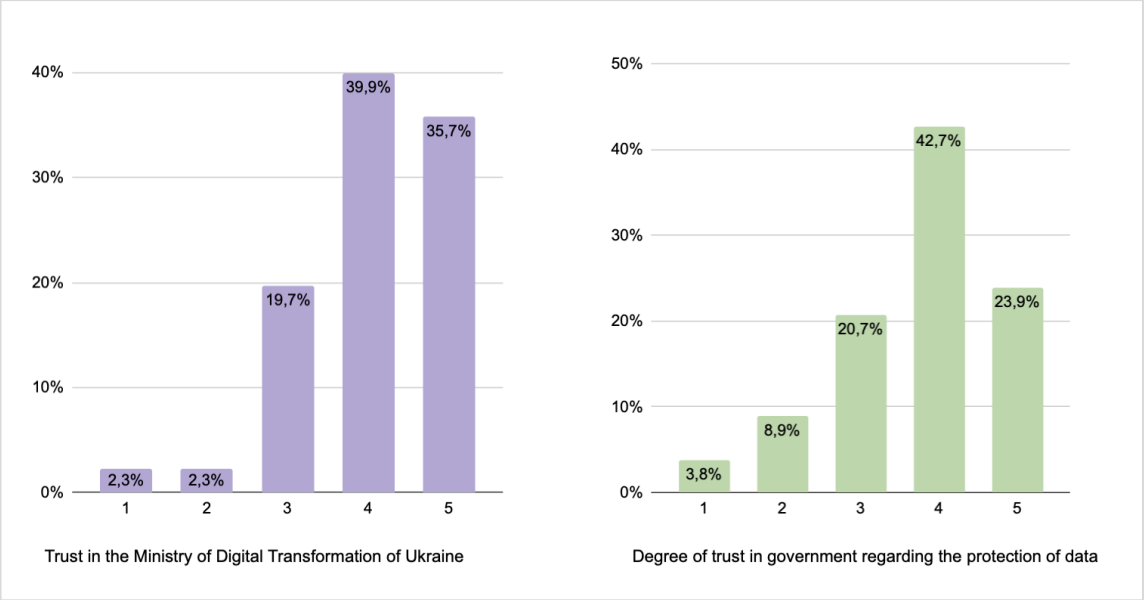

Figure 8. Context 4/4 Source: author's calculations/on the basis of data shown in appendix 1

2,3% of users expressed the lowest level of trust with a score of *1*. *2,3%* indicated a slightly higher level of trust with a score of *2*. *39,9%*, rated their trust at a high level with a score of *4*. *35.7%*, gave the highest score of *5*, indicating a strong level of trust in the ministry. The Institutional Theory examines the influence of institutions and their norms on shaping behaviours and decision-making processes within societies. The question about trust in the Ministry of Digital Transformation is more relevant in understanding the public perception and attitude towards a specific institution responsible for digital transformation efforts in Ukraine. It is not directly connected to the theoretical frameworks of the Institutional Theory here, but trust in the ministry may indirectly impact the adoption and success of digital initiatives like Diia. In

the second question, which assessed the degree of trust in the government regarding the protection of personal data when using Diia, the responses varied and overall showed less trust. *3,8%* users expressed the lowest level of faith with a score of only *1*. *8,9%* of participants had a slightly higher level of trust in protection of their data with a score of *2*. *20,7%* rated with *3*, showing the level of uncertainty in the protection systems in Diia. *42,7%* are somewhat sure in protection power, but have their doubts so gave the score of *4*. *23,9%* of Diia users strongly believe in the Ukrainian government being able to protect their data by giving the max score of *5*. As Institutional Theory emphasises the influence of societal norms, beliefs, and legitimacy on the behaviour and practices of organisations (Meyer et al., 1977), the positive perception of the Ministry and the government reflects the institutional legitimacy they possess within the context of digital governance. The high trust scores are showing that users perceive these institutions as reliable and competent in safeguarding personal data and ensuring the smooth functioning of Diia. However, the presence of lower trust scores should not be overlooked. These responses may indicate areas where institutional legitimacy can be further strengthened. It is essential for the Ministry and the government to continue fostering trust through transparent practices, effective communication, and robust data protection measures. By addressing any concerns or doubts expressed by users, they can reinforce their legitimacy and solidify their role as trusted institutional actors in the digital realm.

4.1.4. Adopter Category of Diia users through Diffusion of Innovations

The 4th dimension included a couple of questions aimed at understanding the experience and engagement with Diia. Participants were asked about any difficulties they encountered while using the app, which provides valuable insights into the usability and user-friendliness of the platform. Additionally, users were asked to rate their comfort level with using a digital identity card to access government services and indicate the importance they placed on having access to government services through an app like Diia, which sheds light on the perceived value and convenience of such digital service delivery. Furthermore, participants were asked about the specific features of Diia they had utilised at least once, as well as the features they used most frequently.

From Figure 9 let's analyse the results for the two questions regarding the functions of Diia. For the question "What functions of Diia have been used at least once?", the responses indicate a high level of engagement and utilisation of various functions within Diia:

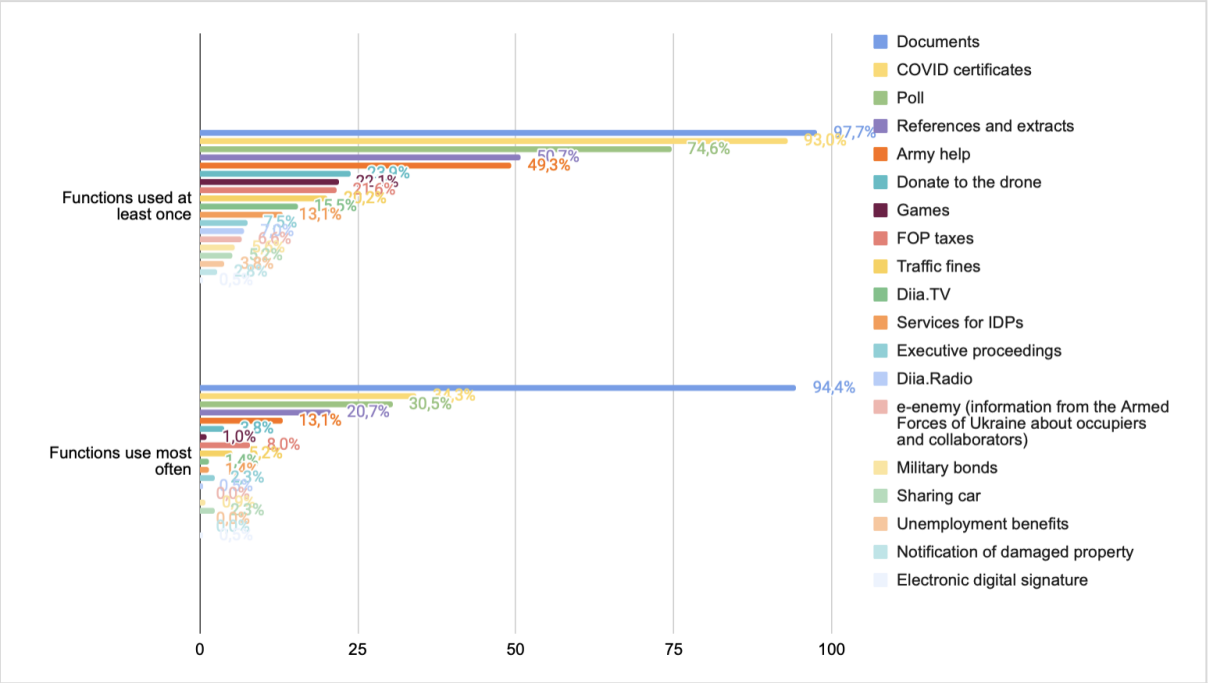

Figure 9. Adopter 1/1 Source: author's calculations/on the basis of data shown in appendix 1

97,7% of users indicated trying the Document service of Diia, interesting how another *2,7%* got passed such an essential function, *93,0%* for COVID certificates, and *74,6%* for Poll. These results highlight the importance and relevance of these functions in interactions with Diia, indicating their practical value and the benefits they offer. Other functions, such as References and extracts got *50,7%*, while *49,3%* for Army help functions, and *23,9%* for Donate to the drone. Moving to the question "Which Diia functions do you use most often?", there a shift in usage patterns is observed. While Documents continue to be the most frequently used function with *94,4%*, the usage of certificates drops significantly to *34,3%*. This could be attributed to the evolving situation of the COVID-19 pandemic, where the demand for certificates decreased over time. Other functions, such as Poll got *30,5%*, References and extracts took *20,7%* of users, and Army help with *13,1%*, also continue to be utilised, although to a lesser extent. It is important to note that certain functions, such as Games with *22,1%*, Diia.TV and Diia.Radio got *1,4% and 0,5%* respectively, while Unemployment benefits are not being utilised at all by the mainstream public. This suggests that these functions may not be as widely known or considered relevant to the needs of users. However, the availability of such functions within Diia showcases the platform's versatility and potential for future development. These findings shed light on the specific functions within Diia that have gained traction among users. The high usage of essential functions, such as Documents and COVID certificates, underscores their significance in facilitating access to important services and information. By understanding the usage patterns

and preferences of users, the developers of Diia can make informed decisions regarding feature updates, improvements, and prioritisation, ensuring that the platform continues to meet the evolving needs of its user base.

Done with good, let us move on to the app's issues. While 129 users, more than a half, reported no trouble using Diia, other users highlighted various difficulties they encountered. These included challenges with signing a photo through PhotoId, uploading the COVID certificate, and experiencing delays in document uploads. Some users mentioned documents getting lost and needing to be reuploaded, while others had issues loading specific documents such as driver's licences or foreign passports. Problems with the Diia.Signature feature were also mentioned, including its lameness and failure to recognize faces. Users faced obstacles with registering, finding specific services, and encountering errors in personal identification numbers. Difficulties in logging in, face recognition, and confirming identity on the camera were mentioned as well. Some users experienced problems with the application not updating or lacking detailed descriptions of services. Issues with device compatibility, missing documents, and occasional service disruptions were also noted. Inconsistent face identification, missing individual tax numbers, disappearing or incomplete documents, and difficulties with user identification were reported. Users also mentioned trouble searching for functionality, disappearing transport documents. In some cases, frequent reauthorization or updates were required, and problems were attributed to state institutions or incomplete document entries. Other users cited challenges with explaining the registration process to older family members, which underscore the importance of providing user support and guidance to enhance engagement.

4.1.5. Discourse around Diia through Actor-Network Theory

The last section of the questionnaire delves into ANT, as it explores the interconnected network of actors involved in shaping the discourse and perception of Diia with its eight questions. Trying to learn about Diia through social networks and publications, rating the general mood of the public discussion around Diia on social media, evaluating media coverage in terms of informativeness and objectivity, assessing the impact of messages in mass media and social media on perception and use of Diia, suggesting additional steps for improving public perception. Moreover, to know people’s level of knowledge in worldwide e-governance development questions were added on awareness of similar apps in other countries, and identifying the country seen as a leader in developing Diia-like systems for accessing public services online, which gives unique info for answering RQ3. In Figure 10 the responses to the question "Where will you learn about Diia?" are shown and they provide insights into the

sources from which users acquire information about the platform, including new features and related updates.

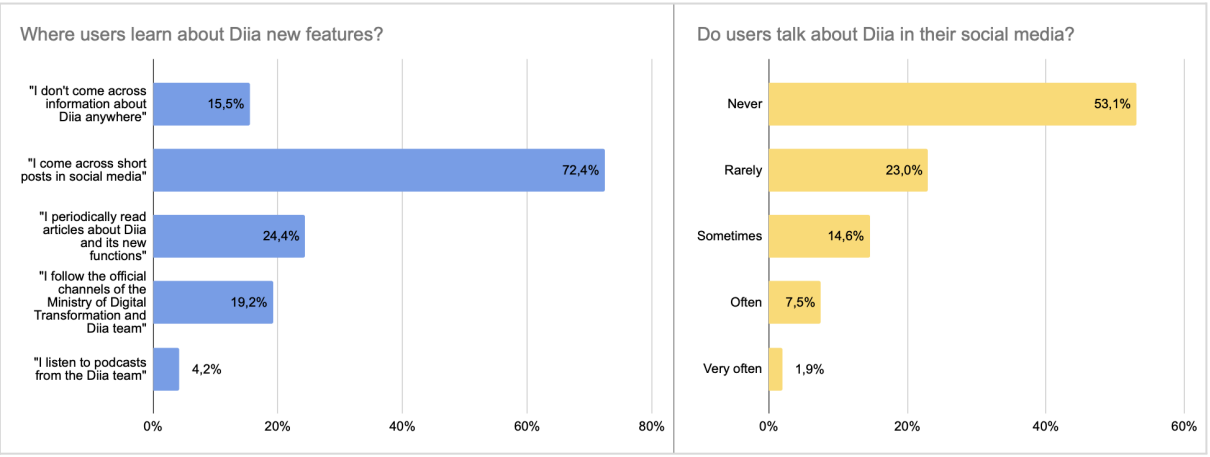

Figure 10. Discourse 1/3 Source: author's calculations/on the basis of data shown in appendix 1

72,4%, a significant majority of participants indicated that they come across information about Diia through short posts on social media, highlighting the influential role of social media platforms in disseminating information and generating awareness about Diia. *24,4%*, a notable percentage of participants, reported that they periodically read articles about Diia and its new functions, which suggests that written content, such as news articles or blog posts, plays a role in providing more detailed and comprehensive information about the platform and users can gain a deeper understanding of Diia's features and stay up-to-date with its advancements. *19,2%*, a smaller portion of participants mentioned following the official channels of the Ministry of Digital Transformation and the Diia team, which demonstrates the value placed on receiving information directly from the authoritative sources associated with Diia. Polar opposites are the *15,5%* of users saying they are not coming across information about Diia anywhere and *4,2%* indicated other sources of information, such as listening to podcasts from the Diia team. While these sources may have a smaller reach compared to social media or written articles, they still contribute to the overall landscape of information dissemination. So by leveraging various channels, including social media, articles, official channels, and podcasts, the developers and stakeholders of Diia can effectively reach and engage with users, ensuring that they receive timely and accurate information about the platform's features and updates. The next question "Have you discussed Diia on social media?" provides insights into engagement and participation in discussions related to Diia on social media platforms. Where *53,1%* of participants indicated that they have never discussed Diia on social media, which could indicate a lack of interest or a preference for other means of communication and engagement, but let's continue with *23,0%* of

people, who reported discussing Diia on social media rarely, indicating occasional participation in discussions. This group of users may engage in discussions when specific topics or issues related to Diia capture their interest or when they have something noteworthy to share. *14,6%*, a smaller proportion of participants mentioned discussing Diia on social media sometimes, suggesting periodic engagement in discussions. *7,5%* reported discussing Diia often, indicating active participation in conversations and an inclination to share their thoughts and experiences on a regular basis. And only *1,9%* mentioned discussing Diia very often. These results show a range of engagement levels among users when it comes to discussing Diia on social media, there are still individuals who engage occasionally, periodically, or with higher frequency, but the majority are out of the subject. Understanding these patterns and preferences can provide valuable insights for the Diia team and stakeholders in terms of optimising communication strategies and fostering meaningful engagement with users on social media platforms. It is important for the Diia team to recognize the diversity of user behaviours and preferences when it comes to social media discussions. In Figure 11 the next two aspects are examined, the evaluation of media coverage with discussions in social networks in terms of informativeness as well as objectivity, and the influence of social media messages on users' perception of Diia.

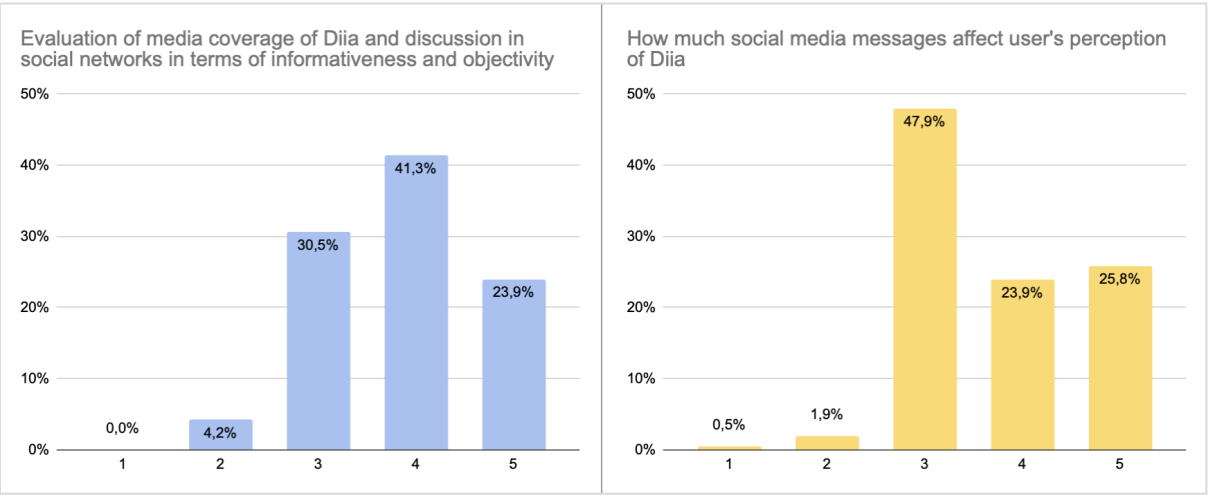

Figure 11. Discourse 2/3 Source: author's calculations/on the basis of data shown in appendix 1

In terms of media coverage, participants rated the level of coverage on a scale from *1* to *5*, with the majority indicating moderate to high levels of informativeness and objectivity. Notably, no participants voted for the lowest score of *1*, indicating at least some level of coverage and discussion. This suggests that negative narratives or criticisms of the application may be relatively limited in the media and social networks, contributing to a more positive overall perception among users.

When looking into the impact of social media messages on perception, a significant proportion of users reported a moderate to strong influence. The results indicate that *47,9%* from the **215** users gave a score of *3*, suggesting a moderate level of influence. These findings provide valuable insights into the role of media and social networks in shaping perception of Diia, contributing to a comprehensive understanding of the discourses surrounding the application. According to ANT, social phenomena are viewed as networks of actors, including both human and non-human entities, and their interactions shape the development and perception of technologies (Nimmo R., 2011), so in this context, the media and social media platforms can be seen as actors that play a crucial role in influencing users' understanding and opinions about Diia. The ratings provided by participants shed light on the dynamics and relationships within the actor-network surrounding Diia. By considering these findings through the framework of ANT, gives a better understanding of the complex interplay between human actors, technological artefacts, and the discourses that shape the perception and adoption of Diia. And looking at Figure 12, gives an analysis of the results for the question about the steps the government should take to improve public perception of Diia:

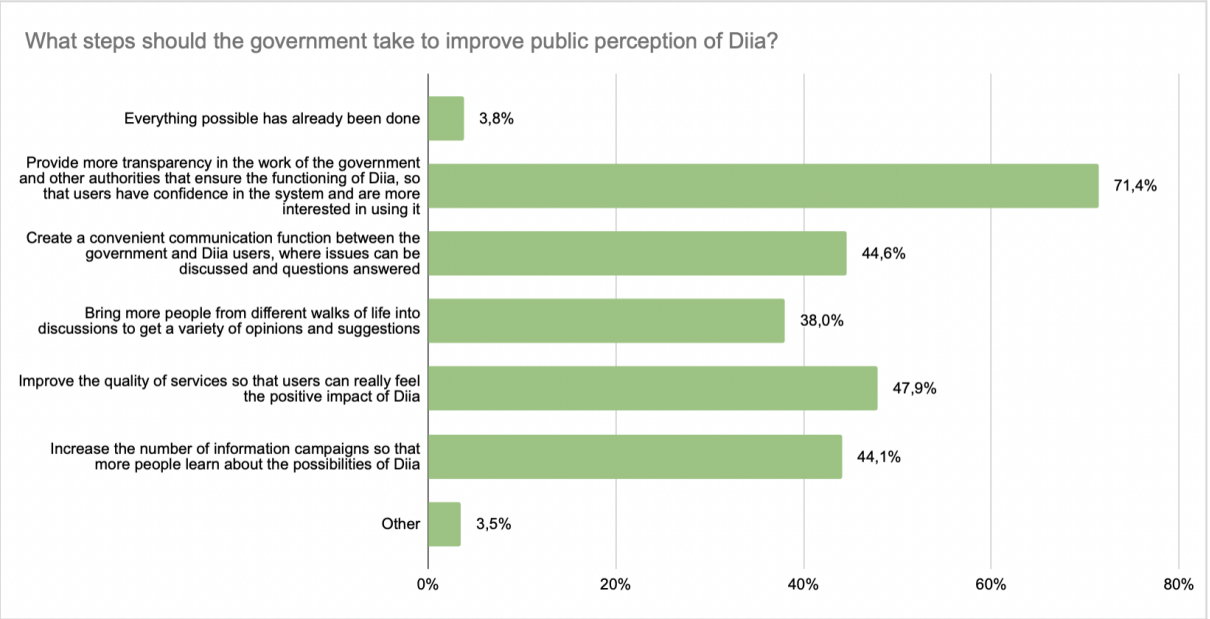

Figure 12. Discourse 3/3 Source: author's calculations/on the basis of data shown in appendix 1

71,4% of votes went to providing transparency in the government's work. This is the call for greater transparency in the functioning of the government and related authorities responsible for Diia as participants expressed a really strong desire for increased transparency, and it engenders confidence in the system and generates user interest in utilising Diia. This result highlights the importance of openness, accountability, and clear governance structures to promote public trust

in the application as the main step for improving. *47,9%* voted for working on the quality of services, expressing the view that the government should prioritise enhancing services provided through Diia and effectiveness of that is seen as a key factor in improving public perception. *44,6%* users were for creation of a convenient communication function, a new feature which would enable users to discuss issues, ask questions, and receive timely responses, fostering a sense of engagement, trust, and accountability. *44,1%* for increasing the number of information campaigns, suggesting that there is a perceived need for increased outreach and awareness initiatives to reach a wider audience and educate them about the benefits and functionalities of the application. Some users added to this point by highlighting the importance of familiarising the older generation with the application by conducting targeted training and providing assistance can be a powerful lever to help older individuals overcome potential barriers and effectively utilise Diia, which is a second time this comes up in the overall questionnaire.

Many indicated that the information campaign needs to be on application security, like addressing concerns related to the security of Diia and give people confidence in the application's security protocols. Transparently communicating the steps taken to ensure data privacy and security is crucial for building trust among users. It is also about communicating real steps taken to improve data security with measures taken by the government to enhance data security. By providing detailed updates and progress reports on data security enhancements, the government can foster trust and reassurance among users. And then, *38,0%* of users included diverse perspectives in discussions, talking about involving individuals from different walks of life in discussions to obtain a variety of opinions and suggestions. This highlights the value of inclusivity and the desire for diverse voices to be represented in decision-making processes related to Diia and by involving a wider range of stakeholders there is assurance that the application reflects the needs of the diverse user base. At last *3,8%* of participants chose the “perceived completeness of efforts” option and so they believe everything possible has already been done to improve public perception of Diia. This suggests that a minority of users feel satisfied with the government's current efforts.

In summary, the results suggest that participants identify several key steps the government should take to improve public perception of Diia. These include increasing information campaigns, improving service quality, incorporating diverse perspectives, establishing convenient communication channels, and prioritising transparency. These findings provide valuable insights into the areas that require attention and can guide policymakers and stakeholders in addressing user concerns and enhancing the overall perception of Diia.

For the most part these last subchapters primarily focused on addressing RQ2, analysing the significance of the percentage-based outcomes within the broader context of Diia. However, here at the middle point of Chapter 4, the spotlight shifts to collaborative partnerships, revealing how the cross-border alliances contribute to the evolution of Ukraine's digital solutions and e-government aspirations, which is the theme of RQ3. This is the last part of the multidimensional portrait of Diia, which overall spans through its historical evolution, user perspectives, international reception, and its prospective support, which lays the groundwork for the forthcoming Chapter 5 Discussions.

4.2. A look through collaborations in digital transformation field between EU countries

The last question out of the questionnaire deserves a separate subchapter as it's a nice opening for RQ3 exploration by analysing collaborations with other countries that have influenced the development of Diia. Moreover, it also gives insights for RQ1 as the comparative analysis of Ukraine with other countries can show the evolution of Diia to similar digital products in other countries. So the question from the survey was asking real citizens of Ukraine about their opinion on who the global leader in digitalization is. While Denmark, which is on top in international ratings, is mentioned only two times out of **215** answers, a significant portion of **89** people indicated that they were uncertain about the digital leadership of other countries. However, Estonia emerged as the most frequently mentioned country with **55** respondents recognizing its digital leadership status in the world, followed by Ukraine itself with **40** respondents, which shows the pride and certain level of satisfaction in e-government development by Ukrainian people. Poland, United States and Great Britain received relatively lower recognition with **8**, **5**, and **3** respondents respectively. Other countries mentioned include Finland, Norway, Japan, Denmark, Canada, United Arab Emirates, Georgia, Korea, China, Israel, Iceland, Lithuania, and Switzerland, each with one or two respondents acknowledging their digital leadership. A small percentage of respondents, only **3** people, admitted that they see no country as a leader in the digital realm. Furthermore, looking at the additional comments provided by respondents, there is satisfaction with Diia, emphasising that it fulfils their needs compared to similar applications in other countries. Poland's "mObywatel" ("mCitizen") application is mentioned, but respondents find it lacking in comparison to Diia. Japan is commended for its positive stance on user information protection. Interestingly, a couple of people specifically mentioned Germany as the least e-developed in Europe. Overall, apart from Ukraine, respondents have limited knowledge of comparable systems in other countries, which

for the author highlights the gap, which could be filled with interesting content in the future, but more about it in Conclusions. These diverse perspectives shed light on different aspects of digital leadership and highlight Diia's strengths in the context of other digital services worldwide. Taking all that into account, the ties between Estonia and Ukraine in digital development are evident in the minds of citizens. These thoughts are based on many real life projects between two countries and a good information campaign about them. However, before describing the biggest partnership, it is essential to compare these results with the e-Government Development Index. The EGDI serves as an important indicator used to assess the development and adoption of e-government services by countries. This comparison provides valuable insights into Ukraine's progress in the digital governance landscape and its standing in relation to other nations. It provides a quantitative measure of a country's e-government development, and allows for comparative analysis between countries (United Nations E-Gov Surveys, 2020 & 2022).

2022 Rank	Country	2012	2014	2016	2018	2020	2022
1	Denmark	0.8889	0.8162	0.8510	0.9150	0.9758	0.9717
2	Finland	0.8505	0.8449	0.8817	0.8815	0.9452	0.9533
3	Republic of Korea	0.9283	0.9462	0.8915	0.9010	0.9560	0.9529
4	New Zealand	0.8381	0.8644	0.8653	0.8806	0.9339	0.9432
5	Sweden	0.8599	0.8225	0.8704	0.8882	0.9365	0.9410
6	Iceland	?	?	?	0.8316	0.9101	0.9410
7	Australia	0.8390	0.9103	0.9143	0.9053	0.9432	0.9405
8	Estonia	0.7299	0.8047	0.8451	0.8486	0.9473	0.9393
9	Netherlands	?	?	?	0.8757	0.9228	0.9384
10	United States	0.8687	0.8748	0.8420	0.8769	0.9297	0.9151
46	Ukraine	0.5653	0.5032	0.6076	0.6165	0.7119	0.8029

Table 3: Global trends in e-Government.
Sources: 2020 and 2022 United Nations E-Gov Surveys.

From this “Global trends in e-Government” table Europe has the highest average EGDI value (0.8305), followed by Asia (0.6493), the Americas (0.6438), Oceania (0.5081), and Africa (0.4054). Georgia, Peru, Serbia, and Ukraine have all made notable progress by moving from the

high to the very high EGDI group, with Serbia advancing two intervals from HV to V2. #82 in 2018 Ukraine to #46 in 2022. UN recognizing the quick success of the country. All European countries except Ukraine are in the high-income or upper-middle-income group (Shkarlet et al., 2020). From Top-10 countries in the world by EGDI 6 of them are from the European Economic Area (EEA), while 5 are EU members. For decades the official aim of Ukraine is to join the EU so aligning with the EU digital initiatives could be proven a great help in achieving this goal. So that's already two of the main reasons why this thesis is so heavily invested in comparing Ukraine to the EU's digital journey – EGDI ratings and EU aspiration of Ukraine.

For the next part of this thesis to work, there is a need to find an ultimate example, best suited for a comparison study with Ukraine. Some of them can be recognized as a future prospect for Diia. The examples provided here could vary from being out of recent years as well as from early 2000s, because this work tries to find parallels in the developing stories, and each country's timeline is different.

In the realm of digitalization of governmental services, European Union (EU) countries have demonstrated a strong collaborative spirit, assisting and supporting each other's eID systems and other digital initiatives. The digital initiatives in the Nordic countries and Estonia have been in place for a longer period of time and have reached a higher level of maturity with a focus on citizen-centric services and digital transformation of the public sector, which can provide useful insights (World Digital Government Ranking, 2021). For instance, EDGI #1:Denmark's advanced digital infrastructure and innovative use of technology paved the way for the NemID, a digital signature and online identification system launched in 2010, which was used for secure online transactions and accessing public services. From 2018 it became possible to install a NemID code app on a mobile device and use it as a code device. In 2022 it was replaced by MitID which offers a more secure solution for the future and was made in collaboration with the Danish Agency for Digitisation and Finance Denmark. From the start MitID is first and foremost an app for smartphones and tablets. This showcases the remarkable speed at which the format and usage of the solution changed, occurring in less than ten years, which in turn reflects the agility and adaptability in digital innovation. Notably, the Swedish company 'Scrive' played a crucial role in supporting both Denmark's NemID and EDGI #5:Sweden's own eID framework. Similarly, in the case of EDGI #8:Estonia, their eID system 'SmartID' was developed in 2002 by Estonian company "SK ID Solutions" (Tsap, 2022), which later cooperated with EDGI #29:Latvia and EDGI #24:Lithuania (World Digital Government Ranking, 2021), so by 2017

every citizen of Baltic countries can verify their documents through one system, showcasing the support and partnership between neighbouring countries in their digital transformation journey. It is observed from these examples that the mutual support between countries with similar historical contexts, where one country assists the other in the early stages of their digital transformation journey, ultimately leading them to become leaders in the field as evident from Denmark and Sweden's fluctuations in their EDGI rankings. These instances highlight the importance of collaboration and knowledge exchange among EU member states in their pursuit of efficient and secure e-government services. The sharing of expertise, technology, and experiences enables each country to benefit from the successes and lessons learned of their counterparts, fostering a more interconnected and resilient digital ecosystem within the EU. The text is highly relevant to RQ3 as it emphasises mutual support in digital transformation. This information provides a valuable insight into the impact of collaboration for Ukraine's efforts in creating digital solutions and e-government initiatives. Especially since one of endeavours is now to get Diia recognised officially everywhere and it also has eID.

EDGI #2: Finland has much more academic works in English written about its e-development, more than Denmark. This gives the opportunity to find another three interesting aspects about their digitalization of governmental services, which all be later brought up in Chapter 5.

1) Let's start by citing an interesting paralel made in "e-Development and Consensus Formation in Finland" (Knight & Routti, 2010) between creation of eLearning Program by EU and establishment of Finnish Virtual University in 2001. This could count as a picture of how EU initiatives set out a common vision of high-quality, inclusive and accessible digital education among its members. Within the EU, most of the efforts surrounding e-government are captured through Action Plans and Initiatives rather than through laws, which is evident from the academic work, which discussed the e-development of Sweden (Nilsson, 2013).

2) The country has Suomi.fi – an online portal that provides access to a wide range of government services and information. By verifying users' identity through that portal, Finnish citizens can access a national electronic health record system – KanTa – that allows patients and healthcare professionals to access and share health information securely. This project to build a national, centralised health information archive was initiated by the Ministry of Social Affairs and Health and on the basis of a public tender in 2007, Social Insurance Institution of Finland chose Services Oy in Finland, which is part of a Japanese multinational information and communications technology equipment and services corporation, to be the prime contractor for delivering the KanTa system. All other key operators in information management in healthcare and social welfare are state-owned companies or institutions (Suna, 2011). Moreover, back in

2017 the Ministry of Social Affairs and Health of Finland announced a design competition for application developers, aimed at finding new kinds of applications to utilise Kanta PHR, so citizens could share their own wellbeing information via mobile phone. So there could be a parallel drawn to Diia in the developing process of KanTa. Remember this awe inspiring governmental eHealth platform, as later it will be compared to Ukraine's e-Health initiatives and its integration within Diia web-portal and mobile app.

3) Back to analysing collaborations between Top EDGI countries and there is a successful project between Finland and Estonia in transportation. There is a public transport operator that offers a mobile app for buying and managing tickets – HSL (Helsinki Regional Transport Authority). This convenience extends beyond Finland's borders, as Estonia and Finland share a close connection and economic involvement, with over six million passengers travelling annually between Tallinn and Helsinki. Recognizing the need for enhanced public transport services for these travellers, the two countries, along with the city of Tartu, collaborated on the implementation of a cross-border ticketing system. The project was carried out as part of the e-ticketing project, co-financed by the European Union through the Interreg Central Baltic Programme.

4.2.1. Perspective in EU cooperation for Ukraine and Diia

Cooperation and collaboration in e-government are essential factors that significantly impact the success of the system. The scale and scope of relations in this field play a crucial role in the effectiveness of e-government initiatives. There is a term 'communication revolution' for this, so to ensure a robust e-government ecosystem, governments must prioritise the assembly of related actors together (Kutlu et al., 2010). One of the motivating factors for including this section on cooperation between EU and Ukraine in the thesis comes from a fellow aspiring EU member state, where the phrase "Turkish public administration has to adopt contemporary processes not to fall behind the levels required to catch its European partners and criteria" and "One of the motivating factors to promote e-government in Turkey is the 'E-Europe Action Plan' by the EU" (Kutlu et al., 2010) caught the author's attention. The last quote is also proven by the Finish example from the previous subchapter. Interestingly, in 2010, these phrases were relevant for Turkey, and now in 2023, they can be rewritten to reflect EU regulations from mid to late 2010s such as eIDAS and GDPR, which are crucial aspects for Diia's development. While Ukraine has made significant progress with its citizen app, it still faces challenges, such as the legal recognition of electronic documents in other countries.

Diia may encounter some challenges with GDPR compliance, as it may not fully align with certain protocols. Harmonising electronic identification schemes could be problematic since different countries have varying levels of e-governance development, and Ukraine, being a visionary innovator, might not want to compromise its progress to comply with regulations. The Diia team acknowledges the complexities related to legal aspects, particularly when dealing with countries that do not recognize electronic documents of their own, let alone Ukrainian electronic documents. Their interview highlights the importance of a unified legal framework within the EU for accepting digital transactions and the need to establish a basis for legalising digital documents, understanding their essence, types, mandatory requirements, and other relevant aspects before engaging in legal discussions. Those countries, which don't recognize digital documents at all, posing challenges for document sharing and collaboration in digital formats. However, this challenge could be looked down as an opportunity for Ukraine, a digital state, which is leading at the moment in government services and digitalization of documents. Successful collaborations with countries like Estonia, renowned for their expertise in digitizing documents, offer significant benefits and opportunities (Banik et al., 2023).

It appears that Ukraine faces an opposite problem compared to Turkey in 2010, as it sometimes innovates too much, perhaps because of the country's ease of legal compliance compared to the EU system. Despite this, there have been some successes, such as Diia.Signature receiving eIDAS approval for digital signatures and seals. It is essential for Ukraine to find the right balance in promoting and pushing Diia's brand and technology, ensuring it remains unrestricted and aligned when the accession to the EU eventually happens.

And there is faith from the EU, which is proven by The Digital transformation for Ukraine (DT4UA) project, set to run from November 2022 to April 2025, with a total budget of € 17,400,000. Its primary objective is to enhance the efficiency and security of public service delivery, making them more accessible to citizens and businesses in Ukraine while adhering to EU requirements. Additionally, the project aims to provide swift responses to the needs arising from the ongoing war. Spearheading the implementation is the E-Governance Academy from Estonia (EGA). Building on the successes of the EGOV4UKRAINE (previously mentioned in Chapter 1.1. of this thesis) and EU4DigitalUA projects, DT4UA leverages previous achievements in Ukraine's digital transformation. Notably, the EU has been actively supporting Ukraine's digital advancement since 2016, investing over € 51 million in various initiatives. So there is this grant for digitalization of Ukraine from the EU proving the faith in Ukraine as the country proves itself in this field of e-transformation. But to make it everlasting and not just a sudden craze the dialog needs to be broadened to the people and knowledge given.

4.2.2. Special case of collaboration between Estonia and Ukraine on mRiik

The start of collaboration between Ukraine and Estonia was already discussed in Chapter 1 of this Thesis with a story of Trembita. In Chapter 4 there was already a mention about Estonian support with Ukraine obtaining EU Grant for its further digitalization. What else can be said? The author of this thesis had an unique opportunity to talk to the Project Manager of the Digitalization department of the Estonian Ministry of Economy and Telecommunications.
Nikolai Kornõshev about collaboration between two countries from Estonian perspective (the list of questions is in Appendix 2), which provided a couple gems to all three RQs. So the EE-UA work continues, there is a big project in the works between two countries, which is a creation of a mobile version of Estonian citizen webportal, an analog to Diia, called mRiik. This specific cooperation between Estonia and Ukraine started with the discussions between the Ministry of Digital Transformation of Ukraine and the Estonian mRiik team, which included notable figures like Valeriya Ionan, Mykhaylo Fedoriv, Mstyslav Banik, and others. These deliberations revealed the potential to extend the Diia platform to Estonia, leading to the realisation that Diia could be repurposed and utilised in new contexts. The Ministry of Digital Transformation of Ukraine took a proactive stance and proposed the development of mRiik for Estonia. As the collaboration gained momentum, the Eastern Europe Foundation played a crucial role in financing the project, further solidifying the partnership. The Ukrainian team from EPAM company was engaged as the developer. So while the development process was predominantly driven by Ukrainian developers, the Estonian team focused on providing business management expertise and working on legal matters with a technical team overseeing platform management, including a Product Owner and a few developers, analysts, and devops, who are diligently ensuring the application's success in the market. In this special case of collaboration, it is evident that Ukraine played a pivotal role in initiating and facilitating the development of mRiik for Estonia. Their proactive approach and dedication to the project underscore their profound impact on this ambitious endeavour, which holds immense promise for both nations in the realm of e-government innovation.

In contrast to mRiik, Diia was a unique story in the digitalization for Ukraine, as it was the starting point of the country's digital ecosystem. Serving as the first digital service, Diia's initial application was a groundbreaking innovation that revolutionised the way citizens accessed government services. The introduction of Diia provided a convenient channel for accessing services through both the Diia portal and the mobile application, creating a significant impact in

Ukraine. The case of mRiik in Estonia deferred due to its well-established digital state, which has been in existence for over two decades, with platforms like eesti.ee serving as the foundation. Estonia's long history of digital state development and its strong societal understanding of web services make it more challenging to promote and sell mRiik. While eesti.ee's most popular services were already accessible through mobile devices, the question arose as to the necessity of a separate mRiik application. Unlike Ukraine, where both options were introduced simultaneously for citizens' convenience, Estonia faced the task of explaining the added value of mRiik given the existing well-functioning state portal.

mRiik team is currently working on aligning all the platforms, including eesti.ee, mRiik, Bürokratt and others, by conducting reviews of their respective businesses. This helps them ensure that they are on the same page, especially concerning Health care services. The day to day work of two countries' governmental teams consists of meeting with their development team, specifically the Diia-mRiik meeting, which is a standard weekly tech meeting. During this gathering, they address technical questions, problems, progress, and plans, aiming to understand the current state of the development process and whether they have successfully accomplished the tasks they set out to achieve.

An intriguing aspect for this thesis analysis process is that the mRiik team revealed their use of a questionnaire, which was organised with the assistance of EPAM and them being the developer for Diia and involved in other Ukrainian governmental projects, brought a wealth of expertise to the process. The questionnaire was designed with various questions, aiming to gather information about the devices used by users to ensure mRiik's compatibility across different Android and iOS devices. Additionally, specific questions were dedicated to each of the up to 8 mRiik services, including detailed inquiries for more complex services. The questionnaire also covered three external platforms integrated into mRiik. Though comprehensive, the value derived from the questionnaire was immense. Project Manager of mRiik acknowledged that processing the answers would require significant time, but the insights gained from it were truly invaluable and well worth the effort as they want to hear the public voice – what is society's request for the Estonian Ministry of Economy and Telecommunications.

Several insights shared during this interview were echoed later in a podcast by e-Estonia, where the Ukrainian Diia team and the mRiik team sat down together at the same table and, interestingly, they collectively referred to themselves as "the digital pathfinders", which highlights the robust technological partnership between Estonia and Ukraine (Ilves et al., 2023).

5. DISCUSSION

5.1. Discussing the results of the survey with the Diia team

After conducting an analysis of the questionnaire responses, the author of this thesis had the opportunity to talk with the Diia team during the e-Governance Conference. This annual conference held in Tallinn serves as a platform for embracing the latest e-governance trends and fostering connections among countries worldwide, particularly linking them with Estonian digital solution companies. In 2023, the spotlight was on countries from the African continent, Brazil, and Indonesia. The collaboration between Ukraine and Estonia served as a successful example inspiring others to follow suit, which also shed light on Ukraine's endeavours to engage African countries as digital consultants and creators, trying to present themselves in a leadership role in this domain. Which is a nice example for answering RQ3 as this highlights how collaborations and international interactions can play a significant role in facilitating the creation and implementation of digital solutions and e-government initiatives in Ukraine, allowing for the exchange of best practices and innovative approaches from different countries.

Appendix 2 presents the set of questions posed to the communication and IT departments leads, and among the intriguing findings, one response stood out. It became apparent that the Diia team doesn’t rely heavily on formal research involving sociological models, metrics or any theoretical frameworks discussed in the thesis. Instead, they use beta-users comments and reports following the introduction of new functions to measure user reactions and gather feedback for improving these features. Nonetheless, it was interesting to compare findings to similar questions asked and analysed through different methods, one being professional and one academic. The reactions to some answers from the survey do not directly address the research questions. Instead, this subchapter focuses on how the Diia team handles user feedback and suggestions. Still it provides valuable insights into the app's development and user feedback giving broader understanding of the Diia for answering RQ1 and RQ2.

From Evolution dimension: The survey revealed that most users perceive changes in the Diia app approximately every couple of months, aligning with the team's practice of announcing new features and updates at a similar frequency. However, it should be noted that some releases may primarily focus on optimizations and bug fixes rather than introducing entirely new services, leading to philosophical questions about what constitutes a "new feature" and what counts as a

“separate service or feature”. This points to a continuous development process and the adoption of an agile approach to improving the app, while explaining why the quantity of features Diia has in one report may differ to another from approximately the same time, as it is possible to count all the documents available as separate services, for example.

From Adoption dimension: Notably, the latest addition to the app, Diia Signature, posed challenges during its launch due to the development of a new facial recognition system for it to work. It was one of the highlights in the questionnaire section regarding issues with Diia, where users indicated this is one of the biggest problems in their additional comments to the question and some of them even wrote how they would like a different system altogether. The team is actively working on finding suitable solutions. These challenges faced during the launch of Diia Signature and the team's active efforts to find suitable solutions illustrate the complexities involved in the adoption of new technologies.

From Discourse dimension: the question which got a surprising reaction from the Diia team was about the steps to be taken to improve public perception around Diia with the top response emphasising the need for an information safety campaign, it was neither the IT team nor the Communication team were certain about how to address this concern, as they believed that their current efforts, such as organising "bug bounty" programs and actively participating in conferences and interviews, were sufficient. This observation raises an intriguing point that extensive interviews and communication initiatives alone may not effectively reach users who still harbour doubts and concerns, which in turn indicates potential discourses and communication gaps that still influence Diia adoption.

5.2. Discussing Diia’s possible future features

.In assessing the practicality of incorporating desired features highlighted through questionnaire responses, the author engaged with an IT department representative who said that anything is possible to program given a specific request. Two features – i-voting and a unified interface with other citizen services – emerged as the most requested among user inputs. These exact two features, already functional in other nations, give this thesis an opportunity to explore their possible integration into Diia and the subsequent dialogues they evoke. Their potential inclusion presents both opportunities and challenges, casting a spotlight on the app/webportal's ongoing evolution, user embrace, and cross-border collaborative potential. Investigating how the Ukrainian Ministry of Digital Transformation navigates the prospect of introducing online voting and a unified interface can provide valuable insights into Diia's future trajectory. Moreover,

showcased international digital narratives will demonstrate that successful precedents persist, continuing to shape Ukraine's ongoing e-government endeavours. Which is a nice combination for answering both RQ2 and RQ3 at the same time, by seamlessly interweaving discourse and international collaboration. Furthermore, an intriguing observation from one of the 215 responses introduces the notion of an AI chatbot, inspires a second subchapter here to discuss potential enhancements with illustrative dialogues from other countries governmental stakeholders.

5.2.1. Challenging requests

1. Online Voting. As discussed in the "Evolution" subchapter (4.1.2) of this thesis, 112 users from the survey expressed interest in the possibility of participating in elections, such as parliamentary, presidential, and mayoral, electronically through Diia. Remarkably, Estonia has already implemented this concept since 2005 and became the pioneer of i-voting by introducing the world's first nationwide electronic voting system for parliamentary and European Parliament elections. This groundbreaking system allows voters to cast their ballots from anywhere with an Internet connection, providing the flexibility to vote without being bound by time or location. Additionally, voters have the unique ability to change their votes, making it a versatile and accessible voting method. During the 2019 European Parliament elections 46.7% of all voters voted online and 51% i-voted in the 2023 parliament elections (e-Estonia, 2023).

The success of i-voting in Estonia can be attributed to the country's unique circumstances. As a small nation of approximately 1.3 million people, with a substantial number of Estonians travelling abroad, the traditional voting process at physical embassies was not practical. To address this challenge and encourage participation, the development of an i-voting system was a logical and forward-thinking choice. A core strength of Estonia's i-voting lies in the country's national ID card infrastructure and its cryptographic capabilities. While not invulnerable to all attacks, the ID cards significantly enhance security and make certain types of attacks considerably more challenging. Moreover, the transparency exhibited by the Internet Voting Committee, through the release of source code, demonstrates their confidence in the software's developers and their commitment to collaborate with the wider security research community (Springall et al., 2014). However, it is essential to acknowledge that i-voting systems face certain challenges and potential risks. Research in 2014 has identified architectural limitations and procedural gaps that could compromise the integrity of elections. Studies have demonstrated how attackers could potentially target election servers or voters' clients to manipulate election results or undermine the system's legitimacy, the architecture of the system leaves it open to

cyberattacks from foreign powers, such as Russia (Springall et al., 2014). These findings shed light on the practical obstacles faced by Internet voting and offer valuable insights for Estonia and other countries considering similar systems.

And now coming to discussion about the possibility of such a thing in Ukraine. The Diia team said in podcasts that i-voting is absolutely irreversible, not only for Ukraine but for the whole world, but they admit that the implementation of electronic voting for the President and the Verkhovna Rada is not solely in the hands of the Ministry of Digital Transformation. To bring electronic voting to Ukraine, changes in legislation are necessary, and the Central Election Commission plays a significant role in initiating such amendments. The most critical aspect of this endeavour lies in the public's perception and trust in the process. Regardless of the transparency and security measures implemented, people's belief in the efficacy of electronic voting is paramount. As of now, sociological data indicates a growing but still relatively low level of trust in electronic voting (Banik, 2023). The Internet Association of Ukraine also sees significant risks to the integrity of the election process with i-voting. In their report they mention how electronic voting systems are vulnerable to hacking, data leaks, and information attacks. Ukraine is under constant threat of cyberattacks and a successful one on the Ukrainian infrastructure could influence the election process without detection. The counting process for electronic systems is less transparent, and citizens would need to trust developers and administrators. As it is not possible to ensure both verifiability and secrecy in an electronic voting system, and the introduction of such a system in Ukraine could distort the will of citizens and the process of vote counting, for now it’s premature to introduce electronic voting (INAU, 2018). Meanwhile, Ukrainian Diia users can exercise their voting power in selecting judges for the Eurovision Song Contest through the “Diia” app, the implementation of full-scale electronic voting faces challenges. The current survey capabilities have been used to gather opinions on various topics, such as whether March 8th should be a public holiday.

2. Unified interface with other citizen services. 173 people agreed on a unified interface with other government services, while only one user specifically excluded Helsi, an Ukrainian e-Health platform, out of the proposed mix. Interoperability is a crucial aspect of effective e-government services, allowing seamless interaction between different platforms. Moreover, it helps avoid redundancies in the systems. Estonia and Great Britain showcase this with their citizen portals that integrate with online healthcare programs, a feature that Diia users expressed interest in, as revealed in the survey conducted for this Thesis. However, Ukraine faces challenges in achieving interoperability due to technical constraints and fragmentation of many

services available in the country. For instance, services like Helsi, which has a government-like feel for many citizens, operate independently as a separate startup since its creation in 2016, and now, as of August 2022, it belongs to Kyivstar company, which is Ukraine's largest telecom operator. Although all data - directions, sick leave notes, prescriptions, and certificates - are automatically retrieved to the user's account from the central database of the Unified Electronic Health System controlled by the government, it is still a 100% private company (Krasnomovets, 2022). This is mirror opposite to Finnish KanTa system, which was discussed in subchapter 3.2., with it being part of governmental services. Additionally, transport apps in different cities remain separate and are not integrated into the citizen app, contributing to the lack of a unified experience. This explanation emerged during an interview with the IT team of Diia. The presence of numerous standalone databases further complicates the situation.

5.2.2. Innovative Possibilities

1. Artificial Intelligence (AI). There are two examples of ambitious AI projects from the EU countries already discussed in this thesis, which can be exemplary for Ukraine. One such project can serve as a potential feature for Diia - an AI chatbot for governmental services, reminiscent of Estonia's Bürokratt, which “is not just an IT project but a concept of how digital services and the state could operate in the age of artificial intelligence”, as the Chief Data Officer of Estonia’s Digital Government saying (Mäe, 2023). There are even plans to implement a chat function and a robot for the Estonian Police and Border Guard Board and the National Library, making Bürokratt’s network broader. Additionally, Denmark's National Artificial Intelligence Strategy, with its ambitious goals and comprehensive approach to AI development, presents another noteworthy example as it promotes responsible AI use in public and commercial sectors, and expands AI applications in critical areas like health, energy, agriculture, and transportation (World Digital Government Ranking, 2021). As Ukraine integrates AI into governmental projects, a robust AI strategy with regular evaluations and adjustments becomes essential for successful implementation.

2. Augmented reality (AR) & metaverse. As mentioned in the e-Estonia podcast, the search for the next step in digital government is likely pointing towards the metaverse (Ilves, 2023). This opens up questions. While specific projects may not yet be widely implemented, some pioneers might already be working on augmented reality interfaces for electronic passports. Additionally, the use of virtual reality (VR) in military efforts, such as in use of the drone army sponsored by

the Ministry of Digital Transformation and in virtual military training, showcases the potential for emerging extended reality (XR) technologies to be embraced by the Ukrainian government. Notably, Mstyslav Banik's evident excitement towards new XR tech on social media could be interpreted as a sign of the Ministry of Digital Transformation of Ukraine's preparation for further technological advancements in this domain. In conclusion, embracing AR and exploring the metaverse could propel Ukraine's e-government journey towards innovative and inclusive solutions for its citizens. From the perspective of a serious digital government, the input method should not be limited to typing into a mobile device or speaking to a phone; it should also encompass interactions with avatars in the metaverse, necessitating a comprehensive technology framework (Ilves, 2023).

CONCLUSION

Throughout this thesis, a comprehensive exploration of Diia evolution and its impact on Ukraine's and the world's digital governance landscapes has been made. The study delved into the factors that influenced the creation and development of Diia, shedding light on its growth trajectory and the role of Ukraine's strong IT sector, innovative image, and prior success in digital solutions across sectors. The analysis also uncovered the practical utility and convenience that motivated users to adopt Diia, highlighting its role in enhancing citizen interactions with government services. While one-third of the thesis was discussing the role of collaboration with other governments with policy diffusion and its perspective on further Diia's development.

RQ1: The evolution of Diia since its launch has been a continuous journey marked by frequent updates and enhancements. Users perceive changes in the app approximately every couple of months, indicating its agile and responsive approach to meeting evolving user needs. Notably, user feedback has played a significant role in shaping the development of the app and Diia's alignment with user needs has been a driving force behind its success, as responders to the survey expressed high levels of satisfaction with the functionality, capabilities, and ongoing improvements of the app.

Considering the factors behind Diia's creation collected and analysed in the thesis, policymakers and stakeholders can gain a deeper understanding of the motivations and influences driving the development of this significant digital solution in Ukraine. The preference for the IT sector and the prior success of digital solutions in the private sector underscore the value of incorporating business expertise into governmental initiatives. This approach is exemplified by the leadership composition of the Diia team, many of whom indeed came from the private business sector.

RQ2: Discourses surrounding Diia in Ukraine have been shaped by user perceptions and expectations. The survey revealed that the majority of users trust the Ministry of Digital Transformation and express somewhat confidence in data protection, contributing positively to the app's adoption. Practical utility, convenience, and accessibility were key factors motivating users to adopt Diia. However, challenges such as the need for improved information campaigns and addressing concerns about data security and privacy were also identified, indicating the

complex interplay between discourses, perceptions, and adoption. This was a part of an interesting finding that emerged regarding the pace of Diia's developments. It appears that some users struggle to keep up with the rapid updates and information campaigns conducted by the Diia team. This sentiment is reflected in the results presented in Chapter 4.1.5, where users expressed a desire for more extensive information campaigns and increased transparency. While the Diia team acknowledges their efforts to address this through interviews and conferences, there is a gap between their efforts and the reach of their message, potentially attributed to the diverse communication preferences of the audience. This is further evidenced by preference of users for social media over podcasts, despite the Diia team's podcast initiatives. As a potential solution, integrating short podcast clips into platforms like Instagram and TikTok or engaging more independent bloggers to discuss Diia technology and brand, who can bring their own audiences to the subject, could also help bridge the communication gap presented in the discussion of the results of the survey with the team. Further details can be found in Chapter 4.

RQ3: Collaboration between countries has played a pivotal role in Ukraine's digital solutions and e-government initiatives, as exemplified by the comparison with Estonia's mRiik app. The unique collaboration between Diia and mRiik teams, termed "the digital pathfinders", showcasing the potential of international partnerships in advancing digital governance. Insights from the collaboration highlight the importance of analysing cooperation efforts and inspire future exploration of international collaborations. Notably, the alignment with Western partners, as evidenced by many EU collaborations already in action or planned, showcases Ukraine's commitment to technological advancements and international best practices.

So one of the major pros of Diia and the Ministry of Digital Transformation teams lies in fostering international engagement. This is evident through their active participation in conferences, strategic invitations to meetings, cross-border embassy interactions, and collaborative engagements on podcasts and YouTube channels in other languages. These efforts collectively contribute to the establishment of an international brand and the progressive normalisation of innovative technology, such as Diia as its a first in the world legalised digital passport. This, in turn, facilitates Ukraine's seamless transition to new political alignments, which align with aspirations of the country. As discussed earlier, this approach mirrors successful international collaboration strategies observed in leading European countries, showcasing the influence of such alliances on digital governance evolution.

The interwoven nature of these research questions becomes evident through the chapters. Insights for all three questions are sprinkled throughout the whole work. However, the foundational exploration for answering RQ1 is primarily unfolded in the initial chapter, where a comprehensive academic analysis of policy diffusion illuminates Ukraine's e-governmental history and the evolutionary path of Diia. In Chapter 4's first segment, the focus shifted to user perspectives, shedding light on the adoption and discourse surrounding Diia and its web portal – addressing RQ2. The subsequent segment, along with the discussions in Chapter 5, extend the exploration to answer RQ3, where the thesis delved into comparative analysis with other countries, predominantly within the European Union, mirroring Ukraine's political trajectory.

While this thesis has provided valuable insights into already mentioned dynamics, there are certain limitations that should be noted for the next research. The sample size, though comprehensive in its diversity, may be subject to expansion in the future to ensure a broader representation of users as 215 respondents are just barely satisfying the formula, which was mentioned in Chapter 3. Still it provided a picture of what could be done with technology like Diia in the academic realm for a comparative analysis. In a few years something like this could be repeated to track the app's trajectory and changes over time. Further investigations might delve deeper into the experiences of specific user groups or explore the app's evolving functionalities in response to new emerging challenges, whatever would happen after pandemic and war. It's worth noting that this study has not only contributed to scholarly understanding but also initiated direct engagement between academic researchers and the development teams of this type of citizen apps in three countries. Live interviews were conducted with the Ukrainian Diia team, Estonian mRiik team and Polish mCitizen team. The last talk was secured at the last minute, hence it is only briefly mentioned and doesn't have a separate subchapter as the collaboration between Diia and mRiik does in this thesis. This could potentially inspire further interviews with international governments, as an increasing number of collaborations are being forged with the Ukrainian Ministry of Digital Transformation. In essence, the engagement that the author had with these teams showcases the enthusiasm of the new generation in shaping digital solutions for governance and proves the openness of government in engaging with students.

As this technological landscape continues to evolve, there remains a promising realm for future studies to continue uncovering the intricate interplay between citizen-centric applications, policy-making, and the broader societal landscape.

The last question this thesis will expand upon in Conclusions is the one mentioned in the beginning of the Introduction. After going through so many aspects of the app we can now expand the initial answer, by stating that to gather 19 million users in three years while ensuring their safety and satisfaction – it takes the fusion of visionary leadership, resilient collaboration, meticulous design, and an unwavering commitment to citizen-centric service that propels Diia's success. This achievement resonates far beyond Ukraine's borders, underscoring the power of technology, international cooperation, and the collective determination to forge a path of progress even in the face of adversity. The path to sustaining and building upon this success lies in vigilantly following user trends and embracing the courage to step beyond comfort zones of long-time established legacy systems, ensuring that no opportunity presented by the next technological revolution is missed.

Looking forward, the author of this thesis is inspired by the research done to continue their work on promoting Technology Governance and Digital Transformation to bridge that gap in dialogue between governments and citizens as well as bringing international experience home as that what brings enhancement and pushes the technology forward.

LIST OF REFERENCES

Al-Razgan, M., Alrowily, A., Al-Matham, R., Alghamdi, K., Shaabi, M. & Alssum, L. (2021). Using diffusion of innovation theory and sentiment analysis to analyze attitudes toward driving adoption by Saudi women. *Article for Technology in Society Volume 65*. Retrieved from https://www.sciencedirect.com/science/article/pii/S0160791X21000336

Baalen, P., Fenema, P. & Loebbecke, C. (2016). Extending the Social Construction of Technology (SCOT) Framework to the Digital World. *Thirty Seventh International Conference on Information Systems, Dublin 2016*. Retrieved from https://core.ac.uk/download/pdf/301370166.pdf

Banik, M. (2023). Mstyslav Banik: Diia is not a summons distribution service. *Interview for YouTube Channel "PO3MOBA"*. Retrieved from https://youtu.be/UkE5Ez5JKEY

Banik, M., Ivanov D. & Synelnykov Y. (2023). Digital podcast Zhenya Synelnykov and Diia abroad: is the application recognized in other countries? *Podcast for YouTube Channel "Дія"*. Retrieved from https://youtu.be/APLZB5HAhxc

Bijker, W., Hughes T. & Pinch T. (1989). The Social Construction of Technological Systems. *First MIT Press paperback edition. Fourth printing, 1993.* Retrieved from: https://monoskop.org/images/1/1f/Bijker_Hughes_Pinch_eds_The_Social_Construction_of_Technological_Systems._New_Directions_in_the_Sociology_and_History_of_Technology_no_OCR.pdf

David, R.J. & Tolbert, P.S. (2011). Studying Choice and Change: The Intersection of Institutional Theory and Entrepreneurship Research. *Organization Science* 22, 1332-1344. DOI:10.2307/41303125 . Retrieved from https://www.researchgate.net/publication/234021965_Studying_Choice_and_Change_The_Intersection_of_Institutional_Theory_and_Entrepreneurship_Research

Davis, F. (1985). A Technology Acceptance Model for Empirically Testing New End-User Information Systems. *Massachusetts Institute of Technology.* Retrieved from https://www.researchgate.net/publication/35465050_A_Technology_Acceptance_Model_for_Empirically_Testing_New_End-User_Information_Systems

Donzello, C. (2013). Employing Actor Network Theory to Explore the Role of Management Control Systems in New Product Development Projects. *PhD thesis for University of Catania*. Retrieved from http://archivia.unict.it/bitstream/10761/1606/1/DNZCST86L16H163L-tesi%20phd%20donzello%20(versione%20submission).pdf

e-Estonia. (2023). Enter e-Estonia. *The e-Estonia presentation*. Retrieved from https://e-estonia.com/wp-content/uploads/e-estonia-050623_eng.pdf

E-Governance Academy. (2021). Diia mobile application. *Evaluation report.* Retrieved from https://eu4digitalua.eu/wp-content/uploads/2021/12/diia-evaluation-report.pdf

Emelyanov, V., Bersan, E. (2016). Problems and prospects of development of e-government in Ukraine. *Article for Scientific and methodical journal Public Administration*, 269(281), 11-17. Retrieved from http://www.irbis-nbuv.gov.ua/cgi-bin/irbis_nbuv/cgiirbis_64.exe?I21DBN=LINK&P21DBN=UJRN&Z21ID=&S21REF=10&S21CNR=20&S21STN=1&S21FMT=ASP_meta&C21COM=S&2_S21P03=FILA=&2_S21STR=Npchdu_2016_281_269_4

Fenton, N. & Lohsen, A. (2022, November 8). Corruption and Private Sector Investment in Ukraine's Reconstruction. *CSIS Briefs. Center for Strategic and International Studies*. Retrieved from www.csis.org/analysis/corruption-and-private-sector-investment-ukraines-reconstruction

Graham, E., Shipan, C. & Volden, C. (2012). The Diffusion of Policy Diffusion Research in Political Science. *Article for British Journal of Political Science, Volume 43, Issue 3*, 673 - 701. Retrieved from DOI: https://doi.org/10.1017/S0007123412000415

Greenland, S., Senn, S., Rothman, K., Carlin, J., Poole, C., Goodman, S. & Altman, G. (2016). Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations. *Article for European Journal of Epidemiol*, 31: 337–350. Retrieved from DOI: 10.1007/s10654-016-0149-3

Greve, H. & Argote, L. (2015). Behavioral Theories of Organization. International Encyclopedia of the Social & Behavioral Sciences. *International Encyclopedia of the Social & Behavioral Sciences (Second Edition)*, 481-486. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/B9780080970868731217?via%3Dihub

Ilves, L. (2023). Navigating a digital country as a CIO with Luukas Kristjan Ilves, CIO of Estonian Government. *e-Estonia Podcast*. Retrieved from https://e-estonia.com/navigating-a-digital-country-as-a-cio-luukas-kristjan-ilves-cio-of-estonian-government/

Ilves, L., Kornõšev, N. and Banik, M. (2023). The digital pathfinders: Estonia and Ukraine's strong tech partnership. *e-Estonia Podcast*. Retrieved from https://e-estonia.com/e-estonia-podcast-s3e6-the-digital-pathfinders-estonia-and-ukraines-strong-tech-partnership/

INAU. (2018). The position of the Internet Association of Ukraine regarding electronic voting. *Press release of INAU*. Retrieved from https://inau.ua/komitety/z-pytan-zakhystu-prav-lyudyny-ta-svobody-slova/pozytsiya-inau-shchodo-elektronnoho

Joshi, A., Kale, S., Chandel, S. & D. K. Pal. (2015). Likert Scale: Explored and Explained. British Journal of Applied Science & Technology. *Article for British Journal of Applied Science & Technology* 7(4): 396-403. Retrieved from

https://eclass.aspete.gr/modules/document/file.php/EPPAIK269/5a7cc366dd963113c6923ac4a73c3286ab22.pdf

Knight, P.T. & Routti, J. (2010). e-Development and Consensus Formation in Finland. *Article for Journal of the Knowledge Economy*, volume 2, 117–144. Retrieved from https://link.springer.com/article/10.1007/s13132-010-0023-6

Krasnomovets, P. (2022, December 20). "Kyivstar" bought the Helsi medical service at the height of the war. Who is behind one of the most mysterious Ukrainian startups. *Article for Forbes*. Retrieved from https://forbes.ua/company/ugoda-iz-bagatma-nevidomimi-14122022-10093

Kutlu, O. & Sevinc, I. (2010). An Overview Of The E-Government Initiatives In Turkey In Respect To The Eu Accession Process. *Article for International Journal of eBusiness and eGovernment Studies,* Volume: 2 Issue: 2, 1-12. Retrieved from https://dergipark.org.tr/en/pub/ijebeg/issue/26203/275887

Latou, B. (1999). On recalling ANT. *The Editorial Board of The Sociological Review Published by Blackwell Publisher.* 1-25. Retrieved from http://www.bruno-latour.fr/sites/default/files/P-77-RECALLING-ANT-GBpdf.pdf

Lenzu, M.D. (2022, September 5). Joint press release following the 8th Association Council meeting between the EU and Ukraine. *Press release Council of the EU*. Retrieved from https://www.consilium.europa.eu/en/press/press-releases/2022/09/05/joint-press-release-following-the-8th-association-council-meeting-between-the-eu-and-ukraine/

Lewis, J. (2019). Comparison of Four TAM Item Formats: Effect of Response Option Labels and Order. *Journal of User Experience, Volume 14, Issue 4.* Retrieved from https://uxpajournal.org/tam-formats-effect-response-labels-order/

Licht, N. F. (2021). Insights into Internet Voting: Adoption Stages, Drivers & Barriers, and the Possible Impact of COVID-19. *Thesis for Tallinn University of Technology.* Retrieved from https://digikogu.taltech.ee/et/Item/bd12d1d6-a1e6-405c-b855-1a7ce4c8a80a

Mäe, I. (2023, May). Estonia's Bürokratt, a concept of how state could operate in the age of artificial intelligence, again in UNESCO's global list of top AI projects. *Article for Invest in Estonia.* Retrieved from https://investinestonia.com/estonias-burokratt-is-a-concept-of-how-state-could-operate-in-the-age-of-artificial-intelligence/

Meyer, J. & Rowan, B. (1977). Institutionalized Organizations: Formal Structure as Myth and Ceremony. *Article for American Journal of Sociology Vol. 83, No. 2*, 340-363. Retrieved from https://www.jstor.org/stable/2778293

Nilsson, A. (2013). Legal Culture and E-government in Sweden and Japan. *Master thesis for Lund University.* Retrieved from https://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=3920406&fileOId=3920407

Nimmo, R. (2011). Actor-Network Theory and Methodology: Social Research in a More-Than-Human World. Article for *Methodological Innovations* 6(3). 108-119. https://www.researchgate.net/publication/290486656_Actor-Network_Theory_and_Methodology_Social_Research_in_a_More-Than-Human_World

Rogers, E. (2003). Diffusion of Innovations, *5th Edition*. Retrieved from https://books.google.ee/books?id=9U1K5LjUOwEC&printsec=frontcover&redir_esc=y#v=onepage&q&f=false

Shamota, G. (2011). Diffusion of innovations in Ukraine at the current stage. *Article for Problems and prospects of the development of the banking system of Ukraine: a collection of scientific works*, issue 3, 288-296. Retrieved from https://essuir.sumdu.edu.ua/bitstream-download/123456789/56821/7/Shamota_innovation.pdf;jsessionid=A4B6222E0F042F677FE83D39D5E09AF5

Shkarlet, S., Oliychenko, I., Dubyna, M., Ditkovska, M., Zhovtok,V. (2020). Comparative analysis of best practices in e-Government implementation and use of this experience by developing countries. *Administratie si Management Public*, 34, 118-136. Retrieved from https://www.ceeol.com/search/viewpdf?id=1010933

Springall, D., Finkenauer, T., Durumeric, Z., Kitcat, J., Hursti, H., MacAlpine, M. & Halderman, A. (2014). Security Analysis of the Estonian Internet Voting System. *21st ACM Conference on CCS*. Retrieved from https://jhalderm.com/pub/papers/ivoting-ccs14.pdf

Suna, T. (2011). Finnish National Archive of Health Information (KanTa): General Concepts and Information Model. *Article for FUJITSU Sci. Tech. J.*, Vol. 47, No. 1. Retrieved from https://www.fujitsu.com/sg/imagesgig5/paper15.pdf

Tsap, V. (2022). eID Public Acceptance: Success Factors, Citizen Perception, and Impact of Electronic Identity. *PhD thesis for Tallinn University of Technology.* Retrieved from https://digikogu.taltech.ee/et/Item/13217274-6ec5-4c3b-8324-dcf5bef99081

UN (2022). E-Government Survey *2022. 12th edition of the United Nations' assessment of the digital government landscape across all 193 Member States.* Retrieved from https://desapublications.un.org/sites/default/files/publications/2022-09/Web%20version%20E-Government%202022.pdf

UN (2018). E-Government Survey 2018. *Edition of the United Nations' assessment of the digital government landscape across all 193 Member States.* Retrieved from https://publicadministration.un.org/egovkb/portals/egovkb/documents/un/2018-survey/e-government%20survey%202018_final%20for%20web.pdf

Velmet, A. (2016). Networking the Nation: The Politics of Digital Infrastructure in Estonia. *Kārlis Bērziņš et al. eds. The Baltic Atlas. Berlin: Sternberg Press,* 180-190. Retrieved from http://p6drad-teel.net/~p6der/Velmet_Networking.pdf

Venkatesh, V. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Article for Decision Sciences* 39(2), 273-315. Retrieved from https://www.researchgate.net/publication/247644487_Technology_Acceptance_Model_3_and_a_Research_Agenda_on_Interventions

Verkhovna Rada of Ukraine. (2019). Issues of the Unified State Web Portal of Electronic Services and the Register of Administrative Services. *Cabinet of Ministers of Ukraine Decree.* Retrieved from https://zakon.rada.gov.ua/laws/show/1137-2019-п#Text

Vihma, P. (2023). Twenty Years of Building Digital Societies: Thinking about the Past and Future of Digital Transformation. *Paper book for e-Governance Academy*. Retrieved from: https://ega.ee/publication/building-digital-societies/

World Digital Government Ranking. (2021). *Part II Country Assessment Report. 16th Waseda University-IAC.* Retrieved from https://idg-waseda.jp/pdf/2021_Digital_Government_Ranking_Report_part_II.pdf

APPENDICES

Appendix 1. Questionnaire for users of Diia.

The questions are selected to describe Diia using five different theoretical frameworks: such as the TAM, ANT and others. This questionnaire consists of five short sections:

PERCEPTION *And the first is about Perception of the application by users: usefulness, ease of use and security features of the application.*

This part is based fully on the Technology Acceptance Model. First four questions are designed to understand Perceived Usefulness (PU) of the app. While the last three are for looking into Perceived Ease-of-Use (PEU).

On a scale of 1 to 7 (1 – extremely unsatisfactory, 7 – extremely satisfactory), please indicate to what extent the use of Diia…							
… increases efficiency of access to public services?	1	2	3	4	5	6	7
… helps you perform your tasks more easily?							
… saves time and effort interaction with the authorities?							
How much do you trust the security features to protect your personal information?							
How easy is it for you to navigate in Diia and use the app's features?							
How easy is it to learn to use Diia?							
How confident are you in your ability to use Diia for access to public services?							

EVOLUTION *This section examines the user's perception of the relative advantage and compatibility of the technology, as well as the user's experience with the technology.*
Some questions in this section are based on Actor-Network Theory

How frequently do you notice updates and improvements to the Diia app's features and functions?				
Weekly	Monthly	Each couple of months	Once every six months	Once a year

Do you feel that the Diia app has kept up with changes in technology and user needs?				
1	2	3	4	5

How satisfied are you with…					
… current development speed and improvement of Diia?	1	2	3	4	5
… current capabilities and features of the application?					

What new features or functions would you like to see added to the Diia app in the future?
☐ Unified interface with other government services (e-helsi, etc.)
☐ Vacancies
☐ Alcohol check
☐ Electronic elections of authorities (parliament, president, mayor)
☐ News
☐ *Your idea?*

CONTEXT & ADOPTER CATEGORY *The third part of the survey is about the external factors that influence user perception and adoption of the technology, including social, cultural and economic factors. In the context of the Diia, this is about the social, cultural and economic environment in which the application is used, including the legal and regulatory framework governing such systems. The fourth parameter about the adoption of the application concerns different groups of citizens who use the application: from first users to government officials.*

Some questions in this section are based on SCOT, Institutional Theory and Diffusion of Innovation

What, in your opinion, are the main factors that led to the creation and implementation of Diia in Ukraine?
☐ Leveraging Ukraine's strong and growing IT sector
☐ Improving the image and reputation of Ukraine as a modern, innovative country
☐ Success in developing innovative digital solutions in other sectors
☐ Change of political power and parliament in the country in 2019
☐ Rapprochement with Western partners and implementation of more innovative practices
☐ Solving the problem of corruption in Ukraine
☐ *Your idea?*

When did you install Diia?				
2019	2020	2021	2022	2023

What factors influenced your decision to use Diia?
☐ Convenience and accessibility of the application
☐ State program and government support status
☐ Recommendations of friends
☐ Application reliability and security
☐ The need to use the Diia to obtain certain documents or services
☐ *Your idea?*

Have you ever recommended Diia to anyone?	
Yes	No

Do you trust the Ministry of Digital Transformation of Ukraine?				
1	2	3	4	5

Have you had any problems using Diia?
Short paragraph answer

How comfortable are you with using a digital identity card to access government services?				
1	2	3	4	5

How do you rate your level of knowledge regarding the legislative and regulatory frameworks that regulate electronic identification document systems in Ukraine?
☐ Yes, I am fairly well versed in this legislative and regulatory frameworks
☐ No, but I am interested in understanding this question
☐ No, I am not familiar with this legal and regulatory frameworks
☐ *Your idea?*

How important is it for you to have access to governmental services through an app like Diia?				
1	2	3	4	5

How much do you trust the government to protect your personal data when using the Diia?				
1	2	3	4	5

What features of Diia have you used at least once?			
☐ Documents	☐ Army help	☐ Donate to the drone	☐ Military bonds
☐ COVID certificates	☐ “eEnemy”	☐ Polls	☐ Diia.TV
☐ Services for inner refugees	☐ Notification of damage property	☐ Services for IDPs	☐ Diia.Radio
☐ References and extracts	☐ Unemployment benefits	☐ Traffic fines	☐ Games

☐ Executive proceedings	☐ FOP taxes	☐ Sharing car	☐ Traffic fines
☐ *Another feature*			

Which Diia features do you use most often?			
☐ Documents	☐ Army help	☐ Donate to the drone	☐ Military bonds
☐ COVID certificates	☐ “eEnemy”	☐ Polls	☐ Diia.TV
☐ Services for inner refugees	☐ Notification of damage property	☐ Services for IDPs	☐ Diia.Radio
☐ References and extracts	☐ Unemployment benefits	☐ Traffic fines	☐ Games
☐ Executive proceedings	☐ FOP taxes	☐ Sharing car	☐ Traffic fines
☐ *Another feature*			

DISCOURSE *The 5th dimension is related to the public debate surrounding the technology, including media coverage, user feedback, and social media discussions. Public discussion of the Diia, including the level of trust and satisfaction among users, as well as the level of public awareness and promotion of the app.*

Some questions in this section are based on Actor-Network Theory

Do you learn about Diia in social networks and publications?
☐ Listening to podcasts from the Diia team
☐ I follow the the social media of the Ministry of Digital Transformation and Diia’s project managers
☐ I periodically read articles about Diia and its new functions
☐ I come across short info drives in social media networks

Do you learn about Diia in social networks and publications?
☐ I don’t consume any information about Diia anywhere

How would you rate the overall tone and sentiment of public discourse around Diia?				
1	2	3	4	5

Have you discussed the Diia app on social media?				
1	2	3	4	5

What do you think of the media coverage and social media discussions around Diia?				
1	2	3	4	5

How do these conversations impact your perception and use of Diia?				
1	2	3	4	5

What other steps should the government take to improve public perception around Diia?
☐ Provide greater transparency in the work of the government and other authorities that ensure the functioning of the Diia, so that users have confidence in the system and are more interested in using it
☐ Improve the quality of services so that users can really experience the positive impact of the Diia
☐ Create a convenient communication function between the government and Diia users, where it is possible to discuss issues and get answers to questions
☐ Increase the number of information campaigns so that more people learn about the possibilities of Diia
☐ Bring more people from different walks of life into discussions to get a variety of opinions and suggestions
☐ I believe that everything possible has already been done
☐ *Your idea…*

Are you aware of any similar apps to Diia that have been adopted in other countries?
☐ Yes. Many countries have it similar applications
☐ Yes, but I know that only some countries have it similar applications
☐ No, I don't know about such applications in other countries

Which country do you see as a leader in the development of Diia-like systems that provide access to public services online?
Short paragraph answer

PORTRET *The survey is anonymous, but for statistics we still need to draw your portrait.*

What is your age?
Short paragraph answer

Your occupation?		
☐ I work full time	☐ I work part-time	☐ Student
☐ I do not work, but I am actively looking work	☐ At the moment without employment	☐ Retired

Your current place of residence?	
Abroad	In Ukraine

Appendix 2. Interview Questions for Diia and mRiik teams

For Estonian mRiik team:

Starting questions:
Do you think it is important to share info about our countries' collaboration as much as possible?
Can you provide some insight into the meeting you just came from?
mRiik related questions:
Why do you think the implementation of a mobile app with documents, such as mRiik, did not happen in Estonia sooner?
How does mRiik differ from other digital government services offered in Estonia?
How did the context of Estonia's existing eID system and digital government services inform the development of mRiik?
What inspired you to develop the initial concept of the mRiik app, and how did it differ from the project your team is developing right now?
How did you think the Estonian public would perceive the introduction of a mobile app for government services?
Who are the primary adopters of mRiik, and how do you identify and target them?
What metrics is the team using to measure the success of the project, and how is progress being tracked?
How does your team ensure the security and privacy of user data in mRiik? Are there any specific measures or protocols you follow?
Diia comparison questions:
How exactly in Estonia are you going to deal with the problem of data security and GDPR compliance?
Does the cooperation between our countries in this project imply that mRik has resolved the issue of GDPR compliance? Will this solution to the problem be communicated to the Diia team?
Can you share with us what features or components of mRiik were adapted from Diia, and what changes were made to Estonian app to better fit the needs of Estonian citizens?

Collaboration with Ukraine questions:
Can you tell us more about the process of discovering Diia and how it has influenced the development of the mRiik?
How did the cooperation between Ukraine and Estonia for the implementation of the mRiik come about?
What is it like to work together with representatives of other countries on a gov. product?
Is there any other collaboration planned in this field between UA and EE?

For Ukrainian Diia team:

Starting questions:
How do you arrange connections between countries? Are conferences the main platform for starting cooperation?
Is there a prospect that the Diia model will be dominant and possibly minimum requirements for the harmonization of e-governance tools in the EU?
Which EU members approached your team with requests or questions?
Who developed Diia? Were there any problems with one of the platforms?
Is there a tech podcast planned to be published on the official company channel?
Questionnaire related questions:
Most users noted that they feel changes are being made to the app every couple of months. Are changes really made this frequently?
I conducted an amateur study, but I wonder how a study of the user experience of Diia is actually conducted?
Many participants of the questionnaire don't trust the security of the app, what do you say about it?
Surveyed users pointed out some steps they think the Diia team still needs to do to improve discourse around the app. The most voted option was “information campaign on safety” – what do you think about it?
What about new features that users want? What is the latest new feature? What was more difficult to launch from the latest features?
What does the team mean by "new feature"?

Appendix 3. Non-exclusive licence

A non-exclusive licence for reproduction and publication of a graduation thesis[1]

I, Yelyzaveta Kukovska

1. Grant Tallinn University of Technology free licence (non-exclusive licence) for my thesis Transforming Governance: The Evolution of Diia App in Ukraine and the Role of International Collaboration, supervised by Egert Juuse,

1.1 to be reproduced for the purposes of preservation and electronic publication of the graduation thesis, incl. to be entered in the digital collection of the library of Tallinn University of Technology until expiry of the term of copyright;

1.2 to be published via the web of Tallinn University of Technology, incl. to be entered in the digital collection of the library of Tallinn University of Technology until expiry of the term of copyright.

2. I am aware that the author also retains the rights specified in clause 1 of the non-exclusive licence.

3. I confirm that granting the non-exclusive licence does not infringe other persons' intellectual property rights, the rights arising from the Personal Data Protection Act or rights arising from other legislation.

07.08.2023
_____ (date)

[1] *The non-exclusive licence is not valid during the validity of access restriction indicated in the student's application for restriction on access to the graduation thesis that has been signed by the school's dean, except in case of the university's right to reproduce the thesis for preservation purposes only. If a graduation thesis is based on the joint creative activity of two or more persons and the co-author(s) has/have not granted, by the set deadline, the student defending his/her graduation thesis consent to reproduce and publish the graduation thesis in compliance with clauses 1.1 and 1.2 of the non-exclusive licence, the non-exclusive license shall not be valid for the period*