

**EXPLORING THE DRIVERS AND BARRIERS OF
DIGITAL GOVERNMENT TRANSFORMATION IN LITHUANIA**

A Thesis

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Abstract

The topic of digital government transformation (DGT) is becoming more and more crucial because it has the potential to transform institutions to become more effective, transparent, and capable of providing better services. The existing literature offers a multitude of models for identifying key factors that are driving or impeding the implementation of digital government transformation. In addition, prior research has found a large variety of variables significant to DGT implementation across different countries. Such diversity contributes to the reasoning that there is no universal answer and additional research needs to be completed in the context of Lithuania's public sector. Therefore, the purpose of this thesis is to determine key factors that have a positive or negative influence over the implementation of digital transformation in Lithuanian governmental institutions.

To accomplish the research aim, we collected raw data from Lithuania's public sector employees by using an online survey and performed regression analysis to verify hypotheses and evaluate other significant factors. Our study found that the strongest positive influence over the implementation of DGT in Lithuania's public sector is created by planning the implementation of DGT flexibly, open to experimentation and also using data for planning, analyzing, and decision-making while implementing the transformation. On the other hand, the study revealed the strongest negative influence over the implementation of DGT are induced by complex organizational structures and public sector organizations inability to attract qualified human capital with necessary skills for DGT implementation. This study has expanded the current DGT literature by using regression analysis to test which drivers or barriers have the strongest influence over digital government transformation in Lithuania. Finally, the study provides theoretical and practical managerial implications for leaders who aim to implement DGT in their organization. By creating a shared transformation vision and defining goals and key performance indicators, managers can help ensure the success and longevity of the digital government transformation initiatives.

Keywords: digital government transformation, implementation of DGT, public sector, Lithuania, factors, regression analysis

Santrauka

Skaitmeninė transformacija viešajame sektoriuje tampa vis aktualesnė, nes ji gali prisidėti prie efektyvesnių, skaidresnių ir kokybiškesnės paslaugas teikiančių institucijų sukūrimo. Šios srities tyrėjai siūlo daugybę skirtingų modelių, leidžiančių nustatyti pagrindinius veiksnius, kurie skatina arba trukdo įgyvendinti skaitmeninę transformaciją. Taip pat mokslinėje literatūroje pristatoma plati kintamųjų, darančių įtaką skaitmeninei transformacijai, įvairovė. Ši įvairovė prisideda prie diskusijos, kad universalus atsakymas, leidžiančio apibendrinti lemiamą tam tikrų faktorių įtaką skaitmeninės transformacijos įgyvendinimui, nėra, ir Lietuvos viešojo sektoriaus atveju reikia atlikti papildomus tyrimus. Todėl šio baigiamojo darbo tikslas – nustatyti pagrindinius veiksnius, turinčius teigiamą ar neigiamą įtaką skaitmeninės transformacijos įgyvendinimui Lietuvos viešojo sektoriaus institucijose.

Pasitelkę internetinę apklausą surinkome duomenis iš Lietuvos viešojo sektoriaus darbuotojų. Šių duomenų pagrindu atlikome regresinę analizę tikrindami hipotezes ir vertindami kitų reikšmingų veiksnių įtaką. Atliktas tyrimas parodė, kad didžiausią teigiamą įtaką skaitmeninės transformacijos įgyvendinimui Lietuvos viešajame sektoriuje turi lankstus transformacijos planavimas, kuris yra atviras eksperimentavimui ar perplanavimui. Taip pat tyrimas atskleidė, jog transformacijos procese svarbu naudoti kaupiamus duomenis planuojant, analizuojant ir priimant sprendimus. Kita vertus, buvo pastebėta, kad didžiausią neigiamą įtaką transformacijos įgyvendinimui daro sudėtingos organizacinės struktūros ir viešojo sektoriaus organizacijų nesugebėjimas pritraukti kvalifikuoto žmogiškojo kapitalo, kuris turėtų reikiamų įgūdžių transformacijos įgyvendinimui. Šis tyrimas prisidėjo prie skaitmeninės viešojo sektoriaus transformacijos literatūros naudojant regresinę analizę, siekiant patikrinti, kurie veiksniai turi didžiausią įtaką transformacijos įgyvendinimui. Galiausiai, tyrime pateikiamos teorinės ir praktinės vadybos gairės vadovams, kurie siekia įgyvendinti skaitmeninę transformaciją savo organizacijoje. Sukurdami bendrą transformacijos viziją ir apibrėždami tikslus bei veiklos rezultatų rodiklius, darbuotojai gali padėti užtikrinti transformacijos iniciatyvų sėkmę ir ilgaamžiškumą.

Raktažodžiai: skaitmeninė viešojo sektoriaus transformacija, viešasis sektorius, Lietuva, veiksniai, regresinė analizė

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List of Main Concepts

Concept	Definition
Digital transformation	Digital transformation is the use of digital technologies to fundamentally change how an organization operates and delivers value to its customers. It requires changes to organizational culture and business models to fully leverage the opportunities presented by digital technology.
Digital government transformation	Digital government transformation is a specific type of digital transformation that focuses on the use of digital technologies to fundamentally change how government operates and delivers services to citizens. It involves the integration of digital technology into all areas of government, such as service delivery, policy making, and decision-making.
Drivers and barriers	In the context of digital government transformation, drivers are factors that motivate or encourage an organization to pursue digital transformation whereas barriers are factors that inhibit or prevent an organization from pursuing digital transformation.
Public sector	The public sector is the part of a country's economy that is controlled by the government and includes all government agencies and state-owned enterprises. It is responsible for providing a wide range of services to the public, such as education, healthcare, public transportation, and social welfare. The public sector is funded by tax revenues and is accountable to the government and the taxpayers.

Introduction

Digital government transformation (DGT) is an increasingly important topic in modern societies. The explosive growth of digital technologies over the last decades has enabled organizations to radically reshape the way they operate. Digital transformation can result in organizations that are more efficient, more transparent and deliver better services (Alcaide–Muñoz et al., 2017). In government context, citizens are gradually expecting more from their governments to provide high-value and instantly accessible digital services (Mergel et al., 2019). To address the increasing expectations, governments are attempting to become more effective and to achieve higher citizen satisfaction through innovations in stakeholder management and frameworks of service delivery (Mergel et al., 2019).

According to Larsson & Teigland (2019), digitalization of government institutions is even more important in the context of recent global events. Digitally transformed governments are able to better react to new situations—migrant crises, natural disasters or pandemics—by creating innovative, data-driven solutions (Statistics Lithuania, 2021). While many governments have successfully digitalized their services, transformation of the back-office operations to improve efficiency is often struggling (Pedersen, 2018). In mid-2010s, a €160M investment into digitalization of Danish tax authority has not produced a net positive result, and a similar attempt to improve the Danish health-care system using digital technologies actually generated almost €100M of losses and worsened the patient waiting times (Pedersen, 2018). These examples demonstrate that the implementation of DGT must be managed carefully in order to result in net benefits for organizations and citizens.

In this research project, we are focusing on positive and negative factors that influence the implementation of digital transformation in governmental institutions, where *implementation of DGT* is defined as the degree to which an organization has been digitally transformed in terms of people, culture, process, structure and information systems (Tangi et al., 2020). The ability to understand the specific factors of DGT and their importance directly impacts the opportunity to optimize and boost the digital transformation process in a practical way, for example, by adopting new legislative or managerial frameworks, or technical solutions.

While there are numerous qualitative research studies regarding DGT factors in various countries, there have only been several quantitative studies (Tangi et al., 2020, 2021), which consider not only the factors themselves but also statistically evaluate each factor's level of influence. There have not been quantitative research studies conducted in Lithuania on factors influencing DGT, and this is the research gap we are aiming to fill in. A quantitative study of

Lithuanian public institutions will contribute to the scientific landscape of DGT and will enable comparing the results to other countries of a similar profile.

Research Question

The research question is: “What factors influence the implementation of digital government transformation in Lithuania?”

Research Aim

The aim of this research is to determine key factors that have a positive or negative influence over the implementation of digital transformation in Lithuanian governmental institutions.

Research Objectives

This research consists of three objectives:

1. Present a critical evaluation of academic literature on the main concepts used in this research and develop a conceptual model of factors that potentially influence digital government transformation.
2. Collect empirical data and perform a quantitative analysis to identify the factors that have the greatest influence over the implementation of digital transformation in Lithuanian governmental institutions.
3. Develop theoretical discussion and formulate actionable recommendations based on the research findings.

Research Design

In this research project, the causal-comparative quantitative research method is used. The research population is comprised of approximately four thousand Lithuanian public institutions that collectively employ tens of thousands of managerial personnel (The Ministry of the Interior of the Republic of Lithuania, 2020). The raw data was collected using an online survey, the structure of which is based on questionnaires and scales from past quantitative studies, including Tangi et al. (2021). The survey was distributed to a sample of more than 1000 managers and specialists of Lithuanian public institutions, and over 250 responses from 100+ organizations have been collected. The questionnaire consists of three primary questions and several secondary demographic fields. Since the survey structure is organization-focused, we aimed to achieve a higher organizational diversity over individual diversity since extraneous responses from a single organization would converge with previous responses and provide marginal benefits. Research design will be explained in greater depth in the Research Methodology section.

Sequence of the Thesis

The research thesis is further structured as follows:

1. Literature review chapter presents an in-depth view of the current state of Digital Government Transformation research and provides a theoretical model for further analysis.
2. Research methodology chapter explains our chosen research strategy as well as reasons behind those choices.
3. Empirical research results chapter presents the findings of the research in a statistical form.
4. Discussion and conclusions chapters explain the impact of the research results in the real world and propose directions for further research.

Literature Review

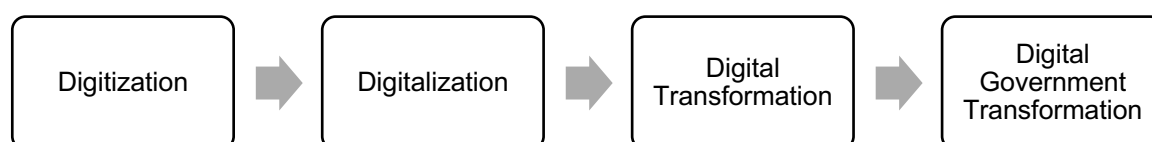
This section of the thesis is a review of academic literature related to the phenomena of Digital Government Transformation and its application in the public sector. The purpose of the literature review is to familiarize the reader with the continuous development and evolution of the phenomena under consideration, as well as providing several case reviews of the phenomenon application in the context of Lithuania and other countries. Furthermore, the examination of predictors of variability and DGT influence on the economy, society, and government will provide a solid foundation for developing a methodological approach suited for further empirical research.

Definition of Dependent Variable

Today, digitization, digitalization and digital transformation are among the most popular terms used in the literature to characterize the use of information and communication technology (ICT) to modernize administrative tasks (Fischer et al., 2021). At first glance, the terms seem to have the same or a similar meaning, and often they are used interchangeably. Nevertheless, understanding the differences is critical to comprehending the phenomenon at hand.

Figure 1.

Flow Model for Discussion on the Research Dependent Variable



Digitization

Most languages, including German (*digitalisierung*) or Spanish (*digitalización*), do not distinguish between the two concepts of digitization and digitalization, even though the two activities are very distinct (Vrana & Singh, 2021). Apart from the resemblance in notation, the only similarity between the two concepts is that digitization necessitates digitalization.

Digitization is defined as the direct conversion of analog data to digital storage, i.e., the electronic reproduction of existing analog structures and processes with no further modifications to the administrative, organizational, or process structures (Mergel et al., 2019). The use of digital forms in ordering processes, digital surveys, and digital apps for internal financial calculations are all examples of digitization. While internal and external documentation processes are frequently digitalized, value creation activities are frequently unaffected. In fact, these measures have already significantly improved public organizations, for example by reducing the amount of time it takes to exchange information. However, at this level, it is sometimes forgotten that improvements brought

about by digitalization are still limited. Based on the foregoing, we define digitization as the process of converting analog data into digital data.

Digitalization

In the next phase, digitalization refers to the revision of analog processes and the introduction of new organizational models in order to convert them to digital processes (Heuermann, 2018). For instance, the development of new online or mobile communication channels or digital services that enable all consumers to readily engage with institutions and transform traditional government-customer relationships (Verhoef et al., 2021). Such a shift frequently requires the creation of new social and technical structures using digital artifacts that would not have been possible without the use of digital technology.

Information technology (IT) is a significant facilitator in digitalization because it allows organizations to capture new opportunities by changing existing business processes, such as communication, distribution or relationship management (Ramaswamy & Ozcan, 2016). Organizations employ digital technology to optimize current processes by allowing for more efficient coordination across different activities and/or by increasing user experiences to bring more customer value (Pagani & Pardo, 2017). As a result, we can define digitization as an activity which uses digital technology to encompass not just cost reductions, but also process optimizations that may improve user experiences.

Digital Transformation

When processes are not only digitalized, but a more comprehensive organizational change takes place, we speak of digital transformation. This concept encompasses not just organizational and procedural changes, but also fundamental cultural changes in the organization, personnel and qualification systems, user interactions, and long-term changes in service delivery performance (Fischer et al., 2021). By experimenting and iterating with technologies that are not typically included in the organization's tools, the usage of these digital technologies frequently necessitates a radical transformation, asking for a disruption of the status quo and the usual operating procedures (Nograšek & Vintar, 2014). As a result, digital transformation is accompanied by significant changes in the creation of services or products and the associated interactions with a target to gain a competitive advantage, reduce costs, increase agility, process efficiency and similar objectives. Rather than focusing solely on technical issues, digital transformation considers the social and transformative nature of these changes.

The transformative part of the concept refers to a significant change in an entity's appearance, essential structure, and function (Misuraca et al., 2020). The concept refers to a

transition from one state to another. This process may occur spontaneously, but in the context of purposeful change, the present state is one that needs to be improved, whereas the new one is anticipated to do so.

Digital Government Transformation

The current state of public sector has been described as a bureaucratic, inefficient, uncollaborative both internally and internationally, and unresponsive to citizens' demands. Citizens and business expect that the transformation of the state will produce improvements such as better service quality, greater inclusion, reduced administrative burdens and increased transparency. Certain metrics for success for digital transformation in the public sector are the same as for the private companies, for example higher efficiency, higher customer satisfaction or cost reduction. Nevertheless, for the government, the transformation should also result in higher citizen trust, inclusion, accessibility, security and enhanced accountability. As long as new technologies are introduced without matching adjustments to current structures, processes or culture, there cannot be a transformation that changes fundamental functioning of the organization.

In line with this reasoning, we argue that previously presented digital transformation concept is more applicable for private sector organizations, because priorities are set for different targets and it does not entail all the necessary aspects under the purposeful change of the government sector. In addition, considering that transformation in the public sector has a different risk adversity due to the nature of governance, trust in institutions, legal tradition and publicity, concept of Digital Government Transformation (DGT) will be used as the main research phenomenon and dependent variable in order to determine key factors that have positive or negative influence over the implementation of digital transformation in Lithuanian governmental institutions. Misuraca et al. (2019) defines DGT as follows:

DGT is the introduction of radical changes, as well as more incremental ones, in government operations, internal and external processes, and structures, in order to achieve greater openness and collaboration within and beyond governmental boundaries, enabled by the introduction of a combination of existing ICTs and/or new data-driven technologies and applications, as well as a radical reframing of both organizational and cognitive practices. It may include various types of public sector innovation at various stages of the service provision and policy cycle in order to achieve key context-specific public values and related objectives, such as increasing efficiency, effectiveness, accountability, and transparency, delivering citizen-centric services, and designing policies that increase inclusion and trust in government (Misuraca et al., 2019).

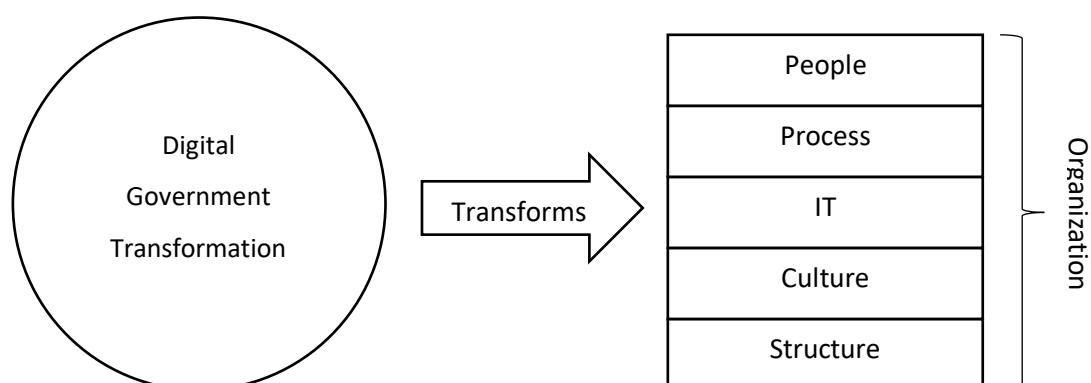
The DGT definition that will be used further on in this study is the one proposed by Misuraca (see above) because it describes the activities together with the main elements of the organization that must be transformed. Since these elements are constituent parts of the DGT definition, a further analysis of these elements will be presented in the next section of this paper.

Digital Government Transformation Elements

Organizations are complicated systems made up of the following five components. (Bostrom & Heinen, 1977). These elements are the nature of people's work (people), processes of the organization (process), information technologies, culture of the organization (culture) and structure of the organization (structure). To fully realize the benefits of using digital technology, investments must be matched with changes in all organizational components (Nograšek & Vintar, 2014).

Figure 2.

Flow Model for Discussion on Digital Government Transformation of Organization



The Nature of People's Work

Through formal methods, new behaviors and ways of functioning are reinforced. This strategy has long been proven to facilitate organizational change (Abhari et al., 2021). A key component of successful transformation is the development of new processes for performing tasks. Based on analysis on best practices of digital transformation (Bughin et al., 2019), employees are more likely to report successful digital transformations if they claim that their organizations introduced at least one new method of working as part of their change initiatives, such as continuous learning or open work environments.

Another crucial step is giving employees a role in how and where digitalization should be introduced. Employees are 1.4 times more likely to report success when they come up with their

own ideas about how technology may help the organization. Additionally, a related factor is the encouragement of employees to challenge established work practices. Employees who claim their senior leaders and those engaged in transformation specific jobs question the old ways of working, those are the ones more likely to report about a successful digital transformation.

Processes of the Organization

Although the most obvious and probably most exciting components of transformation is challenging and reimagining the traditional way of work, organizations are also reaping significant benefits from internal process transformation through process digitization, maintenance, and control. Organizations can refocus their personnel on more strategic duties rather than mundane jobs by automating processes (Westerman et al., 2014). Additionally, it produces data streams that could be advantageous in future data mining and performance tracking projects. Executives can make decisions based on actual data rather than assumptions thanks to process reviews that give them deeper understanding of services and customers. Additionally, the level of detail is also increasing, enabling managers to compare departments performance or reallocate resources in ways they previously could not.

Information Technology

Agility in organizational structures and information systems becomes a vital ability as organizations engage in innovative activities in a highly dynamic environment (Drews, 2017). Given the historical evolution of public sector information technology, it is not unexpected that IT operations are frequently not well-prepared for the demands of the digital age. The public sector's IT systems have undergone a number of stages of development, and in many cases the desired results have been realized. However, because of the rapid development and leapfrogging of technological advancements, the IT function now operates far away from the regular business line in many public sector organizations, and an effective business-IT alignment has proven to be an ongoing challenge (Drews, 2017). The IT function needs to evolve in order to handle the difficulties of digitalization. This transformation includes using data for planning, analysis, or decision-making. It also includes new internal organizational models and new collaboration and departmental alignment strategies. Cross-functional digital teams, IT innovation management, and IT architecture management are a few examples of concepts that can be seen as the forerunners of the new IT function, which transforms IT from a service provider to a consultant, facilitator, and innovator.

Culture of the Organization

Digital transformation is also referred to as a technological revolution and is considered as a paradigm shift. Citizens' expectations of governments' abilities to provide high-value digital services

are evolving as a result of these innovative technological advancements occurring outside the public sector. Even if there are great expectations, digital transformation is mostly considered as a cultural shift that must take place within the organization, and the literature to date hasn't offered many specifics on how to manage this transformative change (Mergel et al., 2019). Nevertheless, some authors such as Kane (2019) have discussed about a path to digital transformation, and they did so with a defined set of cultural traits that are pertinent to changing the culture of the organization: actively increasing agility, encouraging experiments and ongoing learning, recognizing and rewarding collaboration, accepting an appropriate level of risk of failure, and increasingly organizing around cross-functional teams. For other digital transformation initiatives, cultural change serves as a facilitator.

Structure of the Organization

Lastly, significant influence for failure or poor progress of digital transformation is unprepared organization (Mirkovic et al., 2019). There is no doubt that the entire organization would be slowed down if there were rigidity, silo structure, poor communication, and a lot of formalization and rules. An organizational structure that has been demonstrated to be successful in practice was characterized with a more flattening structure, decentralized and autonomous teams with decision-making powers, horizontal communication, flexibility, and agility (Mirkovic et al., 2019). In the context of digital transformation, old bureaucratic models are rigid and have strong internal and external borders, and as a result, are unable to quickly adapt to changes in the fast-paced, hyperconnected environment.

The adoption of organized procedures and activities that carefully takes into account these factors is crucial to the success of digital transformation programs in the public sector. In this study, previously mentioned elements of organization are going to be evaluated in terms of digital transformation by collecting empirical data and performing a quantitative analysis on the factors that influence the implementation of digital transformation in Lithuanian government. Similar studies have already been performed in other countries, therefore in the following section we will crystalize and present the main takeaways that will help us building a theoretical approach for our own research.

Prior Research on Factors Influencing Digital Government Transformation

To this end, the existing literature offers a multitude of models and frameworks for identifying critical success factors and assessing the effectiveness of digital transformation (Hess et al., 2016). On the other hand, other researchers suggest that there is a lack of understanding of the many organizational difficulties that make the digital transformation journey challenging in the

context of governmental agencies (Jonathan, 2020). It is crucial to examine cases of digital government transformation in other countries, in order to create a specific direction for what factors have to be taken into consideration in our own research. In addition, the readers and future researchers may benefit from such review, because the risks and time associated with implementation of transformation can be reduced by studying the best practices of e-government (Al-Shuaili et al., 2019). Table 1 offers an organized overview of the literature on DGT efforts by analyzing impeding or enabling factors that were influencing project success. The following list of research about DGT is not finite, but the listed studies were chosen due to their relevance (similarity of research topic and aim) to our research.

Table 1.

Case Studies of DGT Implementation in Different Countries

Nº	Country	Reference	Main findings
1	Italy	(Marino & Pariso, 2019)	It emphasizes how bureaucracy and Italian culture are significant barriers to the implementation of digital government transformation and related economic growth. Study suggests a new management strategy of transformation that is connected to the degree, nature, and effectiveness of institutional bureaucracy.
2	Estonia	(Pappel et al., 2021)	It is discussed that fully digital service administration without any interaction with paper documents can improve service delivery and enables fully digitalized contact between citizens and government. It employs a methodical approach to DGT implementation (interoperability, ongoing process improvement, and ongoing feedback).
3	Denmark	(Nielsen, 2019)	It lists three facilitators (clear governance of the transformation, intergovernmental collaboration, and benefits management) and explains distinct features that promote shared ownership and objective alignment at all governmental levels.
4	Canada	(Roy, 2019)	It shows that there remain structural and cultural barriers to innovation and the creation of public value, despite significant attempts to concentrate on a more citizen-centric design and encouragement of open and digitalized government.
5	India	(Nerurkar & Das, 2017)	Through a detailed examination of a significant digital transformation projects in India, it highlights the necessity of agile project management .

6	Sweden	(Lindgren & van Veenstra, 2018)	It emphasizes how digital transformation may be a multifaceted process occurring over several organizational levels. It also highlights the need for process changes , organizational layer redesign , and structural layer redesign during the establishment of public digital services.
7	Sweden	(Sundberg, 2018)	The research identified enablers that are open-source software , targeted resource allocation for concrete project implementation and an agency dedicated to government digital infrastructure . These enablers boost government's efficiency and effectiveness with regard to privacy, and security.
8	Finland	(Osifo, 2018)	It emphasizes how the development and usage of technical tools have had a significant impact on how public policies and services are developed and implemented. It also shows how the DGT framework for digital government benefits the implementation by offering great strategic analysis and action plans.
9	Mexico	(Avila-Maravilla & Luna-Reyes, 2018)	It demonstrates how institutional setup and its structure have an influence on whether digital government programs are successful or unsuccessful.
10	UAE	(Marzooqi et al., 2017)	Study makes the case that governments digital transformation may increase citizen approval by taking a citizen-centric orientation .
11	Portugal	(Carrasqueiro & Monteiro, 2018)	It demonstrates how government services might facilitate the integration of regulations and encourage government agencies to work together to streamline and standardize workflows in order to better serve the needs of the public .
12	Ghana	(Tchao et al., 2018)	According to research, political , infrastructure , and financial obstacles prevent a national deployment of the government's digital transformation. Nevertheless, it also acknowledges that, in addition to reducing operating costs, the current rate of digitization in government has promoted openness of the government and citizen involvement.
13	Switzerland	(Cahlikova, 2017)	Author outlines the key influences on DGT, such as the necessity of economic justification for the introduction of reform , the significance of managers' attitudes toward the necessity of government change, and the challenge of digitalizing public administrations in a coordinated manner due to high levels of autonomy across different public organizations.

Note: Relevant factors are highlighted

Prior analysis of experiences implementing DGT in different countries showcases the wide spectrum of factors that should be taken into consideration. These case studies point to an understanding that in different countries, different factors play a role in DGT implementation. For example, in Sweden DGT is enabled by redesigning IT, processes and organizational layers (Lindgren & van Veenstra, 2018), while in Switzerland the main factors impacting DGT include the need for economic justification for reform and the significance of managers behaviors and attitudes towards DGT (Cahlikova, 2017). Such outcome contributes to the reasoning that there is no universal answer, which would explain what factors influence DGT implementation and additional research should be completed in the case of Lithuania's public sector.

Due to a high count of different variables, they are going to be grouped into few main categories according to the factor's characteristics. According to existing research, most factors belong to managerial and organizational, IT- related and environmental aspects that must be configured properly in order to take full advantage of DGT. To simplify the following research and provide a background for such factor classification, following literature review will aim to explore these groups and the independent variables that belongs to them.

Predictors of Variability in Digital Government Transformation

Looking at the findings of previous studies, the various factors that have been discovered to influence the digital transformation process in the public sector can be classified and linked to one of three groups: organizational and managerial factors, information technology factors, and environmental factors (Tangi et al., 2021).

Organizational and Managerial Factors

In most cases literature presents organizational factors as barriers for DGT implementation. Management and organizational complexity are both influenced by organizational factors. For instance, digital innovation may be hampered by the public sector's organizational structure. (Heeks & Stanforth, 2007). Bureaucracy and hierarchical systems, which are traits of the traditional public sector, cause inefficiencies and delays. (Davison et al., 2005). Initially, the public sector's bureaucratic structure was designed to promote democratic values, equal opportunity and efficiency of the government. (Cordella & Iannacci, 2010). However, it has now taken center stage as the fundamental reason why institutions are working slowly, unwilling or unable to adapt, and lagging behind other industries in new technology adoption. (Davison et al., 2005). Another study that interviewed employees responsible for the digital transformation, found that the current organizational culture and structure of local government administration is not equipped to embrace digitalization as a required endeavor for creating value and improving service delivery. Employees'

resistance to change and the organization's bureaucratic culture acted as barriers for DGT (Tangi et al., 2021).

Together with bureaucracy and hierarchical structures, Vogelsang et al. argues that change management methods, employee and leadership involvement and knowledge management are important factors influencing DGT (Vogelsang et al., n.d.). Henriette et al., on the other hand, sees these organizational elements as management issues that fall into the strategic and cultural categories (Henriette et al., 2016). Unlike the organizational barriers, literature emphasize the role of public managers' and managerial activities as the driving forces during the transformation process (Sambamurthy & Zmud, 2000). The management function is to carry out a sequence of steps to adjust the underlying logic of transformation, beginning with confirming the necessity of the change and outlining the desired outcome. Literature demonstrates how managers should create a high level of flexibility while organizing the transformation process in order to overcome unforeseen obstacles (Cordella & Tempini, 2015). Finally, managers need to plan information and training activities and make sure that all actors who will be impacted by the change are included.

Based on the literature review, organizational barriers such as bureaucracy, hierarchical organizational structure, employee resistance and disinterest to change are factors impeding digital government transformation. Unlike the organizational barriers, managerial activities such as leadership involvement while building the framework and desired outcome of transformation together with flexibility in the transformational process enabled the implementation of DGT.

Information Technology Factors

Researchers and practitioners appear to agree that digital transformation acts as enabler for DGT and factors in this group are closely related to technology which enhance operations and helps to achieve overall organizational success. As a result, literature offers a clear scope of IT-related factors influencing digital transformation (Legner et al., 2017):

1. Data-driven agility - organizations that are digitally excellent use data to improve analytics capability. It is done by adaptation of 1) building, 2) measurement and 3) learning approach. This requires data analytics and IT competencies.
2. Digital platform management - digital platforms are quickly transforming the connections between organizations and individuals interacting with each other in a variety of sectors. Companies and institutions must decide whether to become platform providers themselves or use existing tools that are relevant to their field of work.
3. IT architecture transformation - It continues to be a major challenge for many organizations to modify their present IT infrastructure to satisfy the ever-changing needs of users.

4. Security and compliance – organizations in the public and private sectors must take the necessary security precautions since they are becoming more sensitive to cyber-attacks as the level of digital interaction in their ecosystem grows.

The public sector transition to a digitalized entity requires a significant shift, which has implications for the whole organizational structure and strategy. Based on the research, made by Legner et al., IT related factors such as data usage for analytics, digital platform management, IT architecture and security compliance are key areas that determine the success of digitalization endeavors, therefore their assistance in interpretation of digital government transformation will be an asset while analyzing Lithuania's case.

Environmental Factors

Literature suggests that in addition to the internal organizational and IT factors that impact digital transformation mentioned above, consideration also has to be given to the external factors. Scholars argue that the effectiveness of public organizations' attempts to digitalize their services is affected by the restrictiveness of legal and regulatory frameworks, as well as industry-related elements like relationships and dependencies between different institutions within the country (Gil-García & Pardo, 2005). Collaboration between organizations embarking on digital transformation should include other stakeholders, including service providers and suppliers who may have experience in innovation that enables digital transformation (Jonathan & Rusu, 2018). To get the most out of IT investments, citizens must participate in digital transformation by adopting the usage of digital government services.

Together with cooperation with other stakeholders, organizations in the public sector are required to operate under stricter laws and regulations than those in the private sector. For example, in the public sector, digitization or digitalization initiatives must be discussed and authorized by people with political and administrative authority (Gil-García & Pardo, 2005). Furthermore, the political climate may change unexpectedly, resulting in a shift in priority and the redirection of funding away from IT investments. Researchers cite that one of the biggest reasons for the failure of digital transformation initiatives in many countries is a lack of funding (Altameem et al., 2006). Other variables such as the cost and quality of IT infrastructure, the availability of skilled human capital, and the openness of economies are all shown to influence how government organizations manage the digital transformation.

Based on the literature review, environmental factors such limitations of the legal framework, complex relationships and dependence on other institution, unfavorable political

climate, and inability to attract qualified human capital are factors impeding digital government transformation.

In Table 2 below we categorized all off the previously mentioned factors into specific groups. These factors will be further used in developing the research instrument – survey.

Table 2.

Categorization of Factors

Factor Group	Factor (B – Barrier; D – Driver)
Organizational & Managerial	Bureaucracy (B)
	Complex organizational structure (B)
	Staff disinterest (B)
	Managerial disinterest (B)
	Operational and IT incompatibility (B)
	Reluctance to change (B)
	Slow and centralized decision-making (B)
	Lack of competencies (B)
	Develops a DGT plan, open to failure, redesign and experimentation (D)
	Allocates sufficient resources such as budget, people and time (D)
	Defines objectives and measures of result (D)
	Explores relevant new technologies (D)
	Analyses and optimizes old processes (D)
	Upgrades the competencies or qualifications of existing staff (D)
IT	Uses data for planning, analysis or decision making (D)
	Adapts the existing IT architecture to meet customer needs (D)
	Ensures compliance with security requirements (D)
	Involves citizens and other stakeholders in the process (D)
Environmental	Limitations of the legal framework (B)
	Complex relationships and dependence on other institutions (B)
	Unfavorable political climate (B)
	Inability to attract qualified human capital (B)

For the analysis of the most influential factors on the implementation of the current digital government transformation in Lithuania we plan to conduct our own quantitative study which will test the relevance of all the previously mentioned factor groups. It will allow us to determine key factors that have positive or negative influence over the implementation of digital transformation in Lithuanian governmental institutions. Nevertheless, instead of jumping into research, it is important to discuss why the phenomenon of DGT is of relevance for research, because it remains unclear what specific impact the transformation produces. Therefore, in the next section, we will analyze the

digital government transformation effects on public sector organizations together with the broader implications to economics and society.

External Effects and Outcomes of Digital Government Transformation

Liva et al. (2020) categorizes external effects and outcomes of digital government transformation into three general groups: cost, efficiency & productivity improvements; enhanced quality and effectiveness of services and processes; and increased trust, transparency and legitimacy of governmental institutions. Effects and outcomes of digital government transformation are difficult to measure. For instance, 40% of studies over the last three decades did not report exact outcomes and rather treated the transformation as a positive value in itself (Liva et al., 2020). As a result, this research area is still lacking empirical evidence and is mostly based on theory rather than practice (Liva et al., 2020). The following subsections will consider each category of external effects in more detail.

Cost, Efficiency and Productivity Improvements

Effects that belong to this category are the most obvious and easiest to measure in the short-term: reduction of labor and operational expenses, allocating human resources to more important activities, speeding up and reducing cost of service delivery. Many digitalization initiatives are mainly driven by economic incentives – reduced costs or increased efficiency in the long-term. This is easy to sell politically, as the society is generally interested in using public funds more efficiently.

Digital government transformation is frequently associated with job losses, which is generally perceived as a negative outcome. However, Acemoglu et al. (2016) argues that in many cases automation of processes can rather lead to a different, more meaningful employment configuration. Layoffs may happen when government employees cannot be or are unwilling to be retrained for more advanced tasks that result from an innovation, such as bulk data analysis and decision making rather than one-on-one service delivery (Arntz et al., 2016). This risk can be managed by proactively implementing broad upskilling programs for government employees (Liva et al., 2020).

Enhancements of Quality and Effectiveness

One of the key benefits of digital government transformation is the increase of quality and effectiveness of government services, functions and operations (Liva et al., 2020). The underlying driver of this outcome is the technological capability to collect vast amounts of data and to perform large-scale analytics, which enables smarter decision making, improved predictions and resource allocation, and user-centric public services. For instance, by analyzing data governments can move

focus from reaction to prevention of societal problems (Barbero et al., 2016). Data-driven policy making enables governments to develop better-functioning and more inclusive policies. Policies can be tested using Artificial Intelligence before the rollout and assessed in real-time after the rollout (Margetts & Dorobantu, 2019).

Increase in Trust, Transparency and Legitimacy

A key expectation from digital government transformation is that increased administrative effectiveness and improved services should result in greater transparency, accountability, legitimacy, trustworthiness of the government, and in stronger democratic processes (Liva et al., 2020). Transparency of the government is a particularly important factor that defines government's trustworthiness. In the context of digital transformation, opening of data, and subsequently, decisions made based on open data contribute to government's transparency since individuals can verify fairness independently (Liva et al., 2020). Even though digital innovations in government are often considered as enablers of more direct democracy (World Bank, 2016), there is little empirical evidence on the significance of this effect.

Security Challenges

Digitalization of governmental activities also opens new challenges and vulnerabilities of the public sector, especially in the field of cyber security. Fundamental security challenges of digital transformation include aspects like confidentiality, personal data protection, integrity, and non-repudiation (Stewart, 2022). The certainty that a communication or transaction has not been altered with is referred to as integrity. Non-repudiation ensures that a communication or transaction actually happened and that its contents cannot be disputed after it has been sent. These problems highlight the necessity for organizations to view and treat digital security as a strategic issue, not merely an IT one.

Many researchers have recommended government institutions to include security strategy into their general DGT strategy not only for previously mentioned factors, but also because cyber security issues could have an impact to political attitudes or public opinion. We share the findings of a survey carried out immediately following a ransomware assault in Germany to provide a confirmation of how digital security problems affect public opinion (Shandler & Gomez, 2022). On September 9, 2020, a ransomware assault disrupted hospital operations by encrypting patient data and crippling computer systems. Researchers conducted a poll of 707 residents of North Rhine-Westphalia in the week after the incident received widespread media coverage. Researchers show how the cyberattack caused significant emotional reactions, which, in turn, weakened public trust in the government's capacity to protect against further assaults. They done this by evaluating people's

exposure to the incident. Such result shows that digital security issues can have significant societal repercussions for trust and legitimacy even if it doesn't cause major physical harm.

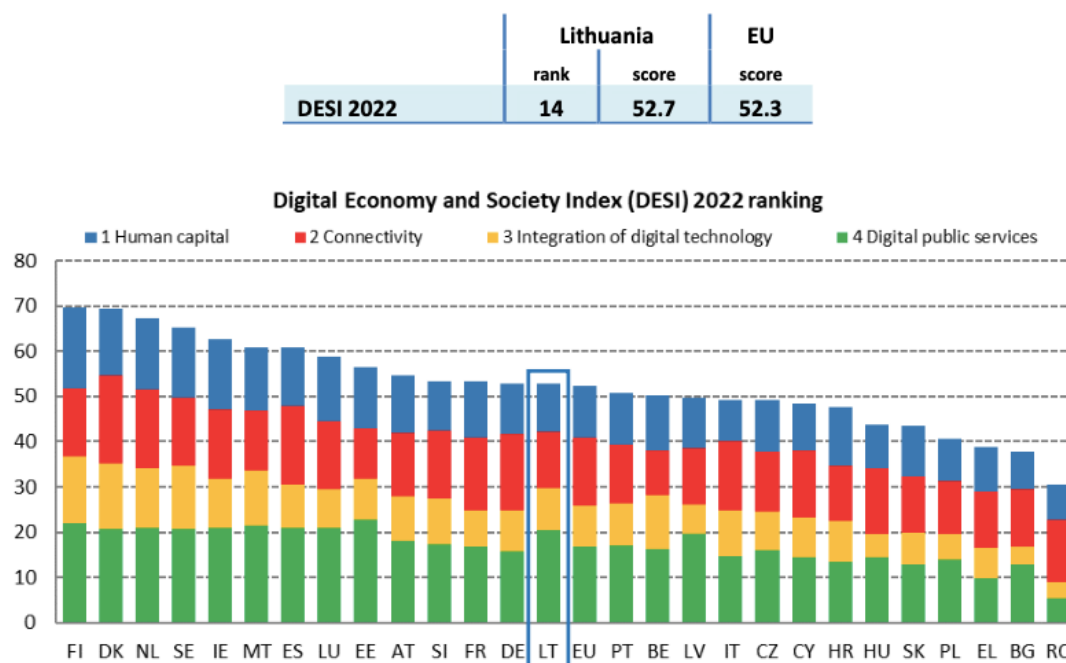
The Relevance of the Research for Lithuania's Public Sector

In the new chapter of 2021-2027 EU Structural Funds, Lithuania's government is allocating 448 million euros of national Recovery and Resilience Fund (RRF) grants to the digital transformation (European Commission, 2022). Funds for digital transformation will be aimed at the transformation of state IT resources (centralization of IT management, infrastructure consolidation), data management (open data and their exchange), development of electronic services, digital connectivity (development of mobile communication in remote areas and creation of conditions for the introduction of 5G communication) and digital innovations (digitization of the Lithuanian language, promotion of digital innovations in business). Following the aim of research, which is to determine key factors that have positive or negative influence over the implementation of digital transformation in Lithuanian governmental institutions, we will provide an overview of current digital state of Lithuania's economy and society based on European Commission evaluation, together with case studies of past experiences implementing digitalization projects. By combining the literature review of DGT implementation in other countries, together with the following chapter, we will formulate hypotheses of our own empirical research.

Lithuania's Digital Performance

Since 2014, the European Commission has been continuously focusing on Member States' digital development and has been issuing yearly Digital Economy and Society Index (DESI) assessments. The reports comprise thematic chapters that offer an EU-level analysis in the major digital policy areas, as well as national profiles that assist Member States in identifying areas for priority action. The DESI Index rates Member States according to their level of digitalization and examines their comparative progress over the previous five years while considering their starting point. The index is in line with the tenets outlined by the European Commission in order to deliver a thorough and lasting digital transformation across not only government, but all economic sectors.

Although there are indications of convergence, digitalization levels in the EU are still highly uneven. The leaders have not changed, however there is a significant number of Member States that are centered around the EU average.

Figure 3.*Digital Economy and Society (DESI) 2022 Ranking*

Note. Figure retrieved from European Commission DESI Index 2022

Lithuania is ranked 14th out of 27 EU members in the Digital Economy and Society Index for 2022 (DESI, 2022). Although the country outperforms the EU average in terms of digital technology integration and digital public services, it still lags behind in connectivity and human capital. Despite having numerous indicators that are near to average, the country's development over the previous five years has slowed down, and it has taken longer than it should to catch up to the most digitally advanced EU nations.

Human Capital

Human capital indicator measures basic and above-basic digital skills, number of ICT male and female specialists and number of ICT higher degree graduates. Out of the 27 Member States, Lithuania is ranked 20th and is treated below average in terms of human capital across EU. In Lithuania 49% of people possess basic digital skills, with the EU average exceeding this mark (49% vs. 54%). The results on the above-basic digital abilities also reveal a similar gap (23% vs. 26%). ICT graduates currently make up 4% of all graduates in Lithuania, and the gender balance in this field is far better than the EU average.

Lithuania has been accumulating experience in digital transformation initiatives for several decades. The 2014-2020 EU Structural Funds (SF) period had a focus on the development of digital

skills of the general public, necessary for everyday life. Despite this, 17% of Lithuanian society does not use the opportunities provided by digital technologies (Department of Statistics of Lithuania, 2020). During the implementation of the SF Information Society Development program, the indicators to be achieved in the program were not reached (Manžuch et al., 2018). For example, residents not using the Internet in 2015 – 28.6%, in 2016 – 25.6% (aimed at 15%). Population with greater and average skills in using the Internet in 2016. – 51% (aimed at 67%). Society's lack of digital skills remains an ongoing challenge to this day as it is noted in the DESI index of 2022, where Lithuania scored 20th place out of 27 Member States. In addition, research shows that the digital divide in everyday life in Lithuania is not caused by the availability of ICT, but by low digital skills (Visionary Analytics, 2020). Therefore, we hypothesize that lack of digital skills will prove to be a significant barrier in Lithuania's public sector digital transformation implementation.

Connectivity

Connectivity indicator measures country's efforts of developing 5G coverage and broadband take-up to the premises. With overall connectivity score of 49.4, Lithuania ranks 23rd and is among least developed EU countries in this section. Nevertheless, since the indicator is purely focused on hardware technology coverage across the whole country, all Lithuania's public sector institutions have access to at least broadband internet connection, therefore connectivity issues will not be investigated further as a potential barrier to DGT implementation.

Integration of Digital Technology

The following indicator measures the integration of digital technologies, such as cloud technologies, big data, social media or artificial intelligence into enterprise operations. It also measures the volumes of online commerce, e-invoicing or digital information sharing. Of the 27 EU members, Lithuania comes in at number 13th in terms of the integration of digital technologies. In the majority of the measures concerning the use of digital technologies, Lithuania has maintained performance levels that are somewhat better than the EU average. It has improved in the areas of online sales by SMEs and total e-commerce revenue, where it outperforms the EU average. However, other indicators, such as big data or electronic information sharing, have slightly decreased compared to the previous few years results. Only 22% of Lithuanian businesses are using social media actively, 28% use cloud technology, and 4% are incorporating AI technology into their business processes.

Regarding the public sector, majority of investments for integration of digital technology during 2007-2020 EU Structural Funds periods were concentrated in two areas: cyber security and consolidation of state information resource infrastructure (Ministry of Transport and

Communications, 2019). More than 64.6 million EUR were allocated for implementation of the project, which contribute to the consolidation reform that solves the problem of fragmentation of the state information resources. The following challenges were encountered when implementing projects:

1. Important concepts, such as *data*, *data management system*, *register*, are not uniformly interpreted or understood. This situation complicated the implementation of changes, agreements and communication between different institutions, public and private sector.
2. Public sector employees are not aware of the steps that should be taken while getting ready to migrate to the cloud – roadmap for project implementation is relevant.
3. It is difficult to attract employees with the necessary competencies. Possible reasons for this are the market value of required IT competencies and relatively uncompetitive working conditions in the public sector.

These encountered challenges points toward concrete barriers that were discussed in DGT literature. Therefore, we hypothesize that inability to attract qualified human capital will act as a barrier for DGT implementation. Also, using data for planning and decision making, together with development of a plan of DGT activities will act as drivers of DGT implementation.

Digital Public Services

Arguably the most relevant indicator for this research in the DESI index is digital public services, which measures e-government users count, number of online pre-filled forms, available digital public services to citizens and businesses and volumes of open data. Out of all Member States Lithuania is ranked 10th and it's the best result out of all four indicator groups. Regarding the provision of digital public services for both citizens and enterprises, Lithuania continues to perform far better than the EU average. The percentage of internet users that use e-government has consistently climbed to 70%, up from 67% in 2019. Lithuania does much better than the EU average on pre-filled forms (92% compared to 64%). Additionally, it performs highly in terms of open data (89% compared to 81% for the EU). Lithuanian government is making gradual but steady progress toward the goal of having all public services available online.

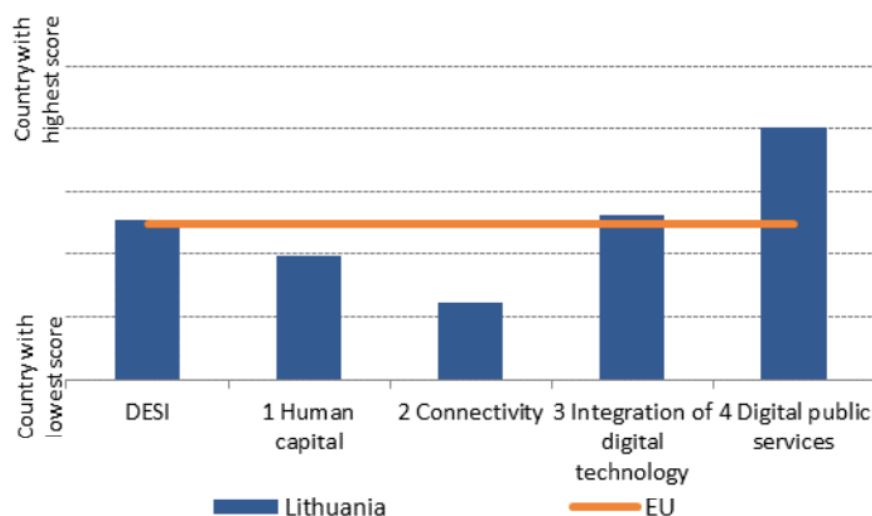
During 2007-2013 and 2014-2020 SF periods, Lithuanian government implemented measures aimed at exploiting the potential of ICT by improving the accessibility and convenience of public sector services. In 2016 about 77% of services were fully accessible online, 18% of services had only information about the service online and about 5% of services were completely missing from the digital platforms. In 2017 there were no services left that do not have any information on the Internet. According to SF post implementation valuations, common challenges recurred in both

periods of intervention, such as insufficient analysis of user needs and digitization of infrequently used services (National Audit Office of Lithuania, 2019). According to the project executors, the institutions constantly collect the needs of users, but they are unable to systematically collect and record them in writing. The quality of such needs analysis depends greatly on the competencies of the employees - there is a risk of losing this knowledge when employees change frequently. Institutions that provide services to businesses best meet the needs of consumers, because the pressure to meet the needs is greatest. Customer feedback and citizen engagement is crucial for creating user-centric services. Past experiences of digitization initiatives lacking customer engagement provides reasonable argument for expecting similar limitations in ongoing DGT initiatives. Following this logic, we hypothesize that involving citizens and other stakeholders in the process of DGT acts as a driver for DGT implementation.

According to Figure 4, analysis of DESI shows that when comparing with other EU Member States, Lithuania has advanced the furthest in providing digital public sector services and integration of digital technology. Nevertheless, Lithuania falls behind in the perspective of society's basic and above-basic digital skills. Findings of previous research have shown that there is a great variety of factors influencing the implementation of DGT. By providing additional research about the implementation of projects in Lithuania's government that are related to improvement of digital skills, integration of digital technology or delivering digital public services, we formulate five distinct hypotheses that will be tested in the following empirical research.

Figure 4.

Lithuania's Relative Performance by Dimension (DESI, 2022)



Note. Figure retrieved from European Commission DESI Index 2022

Research Methodology

Research Aim and Objectives

This research aims to determine key factors that have a positive or negative influence on the implementation of digital transformation in Lithuanian governmental institutions and consists of three objectives:

1. Present a critical evaluation of academic literature on the main concepts used in this research and develop a conceptual model of factors that potentially influence digital government transformation.
2. Collect empirical data and perform a quantitative analysis to identify the factors that have the greatest influence over the implementation of digital transformation in Lithuanian governmental institutions.
3. Develop theoretical discussion and formulate actionable recommendations based on the research findings.

Research Design

In this research project, due to the limited ability to impact real-world processes and the long feedback loop of the digital transformation phenomena, the causal-comparative (quasi-experimental) quantitative research method has been used. Although there have been conducted both quantitative (Tangi et al., 2021) and qualitative studies (Jonathan, 2020) in the area of DGT, the quantitative method was picked because of the large research population, which is comprised of approximately 3880 Lithuanian public institutions and 55 thousand civil servants, of which around ten thousand are managers who we will prioritize in this study (The Ministry of the Interior of the Republic of Lithuania, 2020). The major drawback of qualitative research method, and the reason why we dismissed it, is that it severely limits the sample size, which, in turn, decreases the generalizability of the results (Almeida et al., 2017). The structure of our research survey is based on questionnaires from past quantitative DGT studies, including Tangi et al. (2021), and scales from other relevant research articles. We collected raw data using an online survey by means of the Qualtrics platform, which allows convenient distribution of survey links via email and enables survey delivery optimization according to live response statistics.

As our research population is very specific, we decided to manually compile the list of potential subjects, a employed several approaches to achieve the desired response rate. We aimed to select one or more, depending on the size of the institution, high-level managers and IT leaders from as many institutions as possible. Some institutions have been skipped if a) they are too small, or b) if our definition of DGT cannot be meaningfully applied to them. Our limit of subjects per

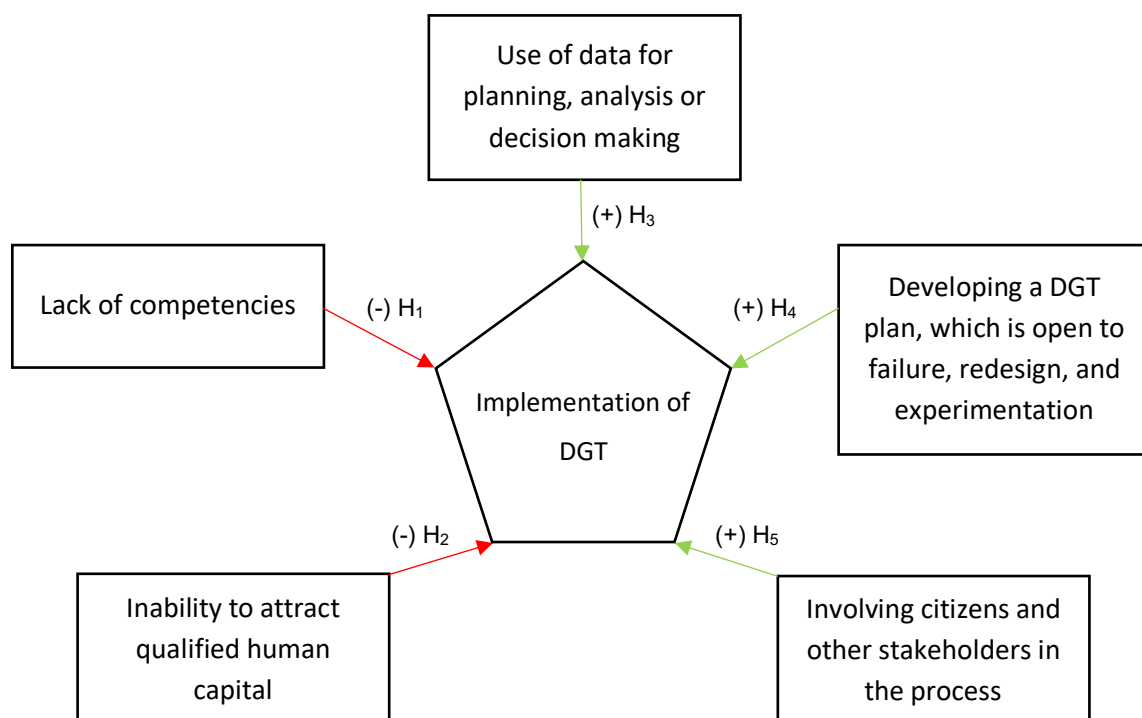
organization draws from our literature review and past similar studies, where organizational diversity is prioritized over individual diversity and the survey questions are organization focused. This process is detailed further in Research Sample section.

Conceptual Model

The conceptual research model that will be employed to verify hypotheses is presented in Figure 5. The model consists of five independent variables, one dependent variable, and five hypotheses (H_1 – H_5) regarding the relationships between variables. The dependent variable “Implementation of DGT” is based on a scale that is comprised of five separate items in the questionnaire. In the questionnaire, there are in total 23 independent variables and five demographic questions, however they are not part of hypotheses and thus are not displayed in the figure. The additional variables are collected in order to identify the factors that have the greatest influence over the implementation of DGT and are used in regression analysis further on.

Figure 5.

Design of Conceptual Model



Hypotheses

In the Literature Review chapter, we identified five hypotheses that we aim to verify:

H₁: Lack of competencies is negatively related to the implementation of DGT.

H₂: Inability to attract qualified human capital is negatively related to the implementation of DGT.

H₃: Use of data for planning, analysis or decision making is positively related to the implementation of DGT.

H₄: Developing a DGT plan, which is open to failure, redesign and experimentation, is positively related to the implementation of DGT.

H₅: Involving citizens and other stakeholders in the process is positively related to the implementation of DGT.

Research Instrument

The research instrument is an online questionnaire, consisting of questions listed in Table 3. The primary independent and dependent variables were based on the 5-point Likert scale questions, and demographic variables were based on multiple-choice questions with optional custom text input. The original questionnaire (as presented to the respondents) is in Lithuanian language and is provided in Appendix A.

Table 3.

Questionnaire

Variable	Question	Scale
	Assess the current level of digital transformation of your organization from the perspective of the organization you work at this moment. Do you agree with the statement that digital transformation has already affected or is currently affecting the following in your organization:	
IDGT1	The nature of people's work (work using information technology (IT), automation of tasks, IT competencies are required for task delivery)	Likert (1-5) 1 – strongly disagree
IDGT2	Organizational culture (openness to innovation and technology, new ways of working, high level of trust in staff)	2 – disagree 3 – neither agree, nor disagree
IDGT3	Structure (decentralization, autonomous teams, cooperation with others is encouraged, flexibility)	4 – agree
IDGT4	Processes (review, redesign, maintenance, and control of existing processes)	

IDGT5	Information Systems (IS) (introduction of new IS, modification of existing IS, integration of different IS, interoperability, IS infrastructure)	5 – strongly agree
In your organization, the process of digital transformation is hindered by:		
OMB1	Bureaucracy (organizational & managerial)	Likert (1-5)
OMB2	Complex organizational structure (organizational & managerial)	1 – strongly disagree
OMB3	Staff disinterest (organizational & managerial)	2 – disagree
OMB4	Managerial disinterest (organizational & managerial)	3 – neither agree, nor disagree
EB1	Limitations of the legal framework (environmental)	4 – agree
EB2	Complex relationships and dependence on other institutions (environment)	5 – strongly agree
EB3	Unfavorable political climate (environment)	
OMB5	Operational and IT incompatibility (organizational & managerial)	
EB4	Inability to attract qualified human capital (environment)	
OMB6	Reluctance to change (organizational & managerial)	
OMB7	Slow and centralized decision-making (organizational & managerial)	
OMB8	Lack of competencies (organizational & managerial)	
Do you agree with the statement that when planning and implementing digital transformation activities, your organization effectively:		
ITD1	Uses data for planning, analysis or decision making (IT)	Likert (1-5)
ITD2	Adapts the existing IT architecture to meet customer needs (IT)	1 – strongly disagree
ITD3	Ensures compliance with security requirements (IT)	2 – disagree
OMD1	Involves citizens and other stakeholders in the process (organizational & managerial)	3 – neither agree, nor disagree
OMD2	Develops a DGT plan, open to failure, redesign and experimentation (organizational & managerial)	4 – agree
OMD3	Develops a shared vision for transformation and change (organizational & managerial)	5 – strongly agree
OMD4	Allocates sufficient resources such as budget, people and time (organizational & managerial)	
OMD5	Defines objectives and measures of result (organizational & managerial)	
OMD6	Explores relevant new technologies (organizational & managerial)	
OMD7	Analyses and optimizes old processes (organizational & managerial)	

OMD8	Upgrades the competencies or qualifications of existing staff (organizational & managerial)	
DEM1	Specify the type of your organization	a. Ministry b. Budgetary body c. Municipality d. State-owned enterprise e. Municipality-owned enterprise f. Public body g. Other
DEM2	What is the number of employees in your organization	a. Less than 20 b. 21-50 c. 51-100 d. 101-250 e. 251-500 f. 501 and over
DEM3	How long have you worked in the public sector?	a. 0-1 years b. 1-2 years c. 2-5 years d. 5-10 years e. 10 years and more
DEM4	How long have you worked in your current job?	a. 0-1 years b. 1-2 years c. 2-5 years d. 5-10 years e. 10 years and more
DEM5	What is your current role?	a. Head of organization/manager b. Deputy Head of Organization c. Head of Unit d. Senior Specialist e. Other

Research Sample

The sample for this research was selected using the non-probability self-selection sampling technique. Since our target group—the employees of public sector in Lithuania—is very specific and cannot be addressed using anonymous internet surveys, we took a manual approach in building the respondent list for our survey. We used three different sources to build the respondent list. Although we originally intended to collect all respondents using the first source, two weeks after launching the survey we were unable to achieve the necessary number of responses. Therefore, we had to expand the respondent list using two more sources.

First, we identified 280 government institutions that own or manage at least one information system or registry (National Registry of Information Systems and Registries, 2022). Institutions that manage or own information systems or registries are critical to this research project because they have first-hand experience of implementing Digital Government Transformation. We manually browsed their websites and identified up to 5 most relevant people to participate in our research, considering their job description and organizational unit (department). The main target groups were employees of departments responsible for digital technology or innovation development, process optimization and automation, strategic planning and monitoring and public services delivery. This resulted in 570 email addresses, who were invited to participate in the survey.

Second, we used personal network connections and sent personal invitations. And third, we developed a Python script that scraped over 21 thousand email addresses of ministry, municipality and subordinated institution employees. Email addresses of all public sector workers are accessible publicly according to the Lithuanian legislation. After analyzing the collected data and prioritizing the potential respondents according to their role and department, we augmented the respondent list by 726 more subjects. Therefore, the final respondent outreach list contained over 1300 email addresses.

Regarding the minimum required number of collected responses, a sufficiently good approximation is to assume 10 samples per independent variable (Agresti, 2007). Given 23 independent variables, we need to collect responses from at least 230 subjects or achieve 18% response rate. This will provide sufficient signal to estimate a regression and help ensure reliability of the study.

Sequence of Research

The practical part of this research project was performed in the following stages. First, specific variables were selected along with corresponding items in the questionnaire. Next, the questionnaire was piloted with a several subjects to receive feedback and identify any obvious flaws.

After that, the questionnaire was distributed to the manually compiled list of respondents (as explained in the previous section). Once a sufficient response rate was achieved, the questionnaire was closed, and the data was loaded for further analysis into IBM SPSS Statistics software. The initial analysis was based on a number of descriptive statistics, including Pearson's Correlation and Cronbach's Alpha coefficients. Once the data has been validated, further analysis consisted of estimating a non-linear regression model. The results of regression analysis were used to verify hypotheses, to evaluate other significant factors and to identify theoretical and practical outcomes of this research project.

Ethical Concerns

This research study aims to meet the following core principles of research ethics: a) transparency; b) confidentiality; c) voluntariness; d) harmlessness; e) impartiality (Biggam, 2021).

Empirical Research Results

The empirical research took place during the first three weeks of November 2022. During this period, more than 1300 email invitations were sent, over 40 people were invited via other channels, and eventually, 456 survey answers were collected. After discarding unfinished and invalid responses, we were left with 265 valid responses, which will be the object of further analysis. The overall response rate was 20.4 percent. This is above the required threshold of 18%, thus we can continue with the study.

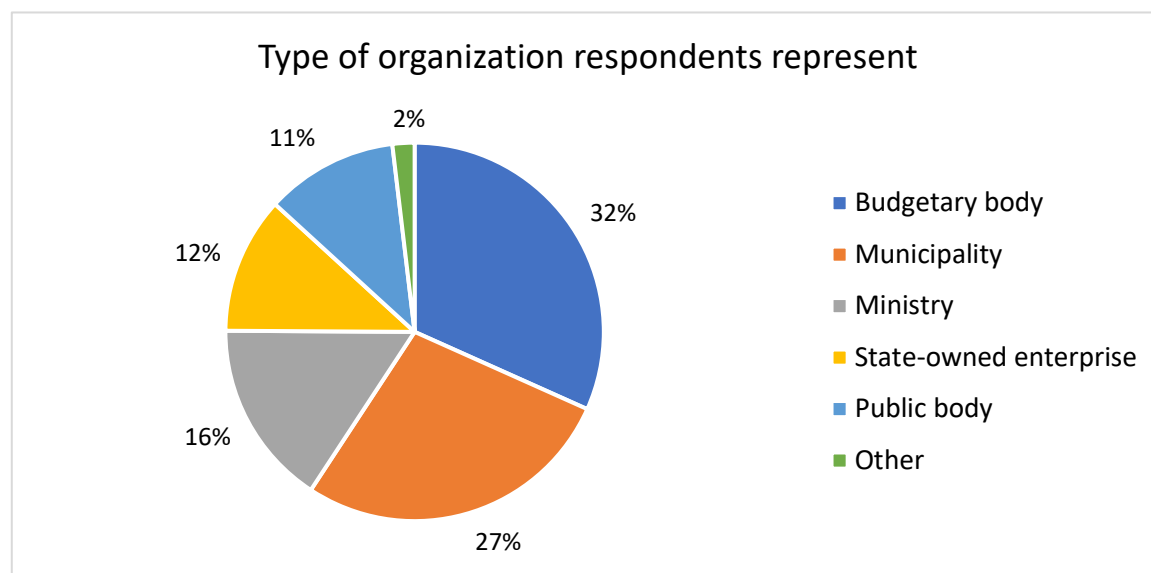
The empirical results analysis will begin with a demographic overview of the survey respondents. Next, we will analyze descriptive and reliability statistics to ensure validity and reliability of the study. Finally, research will be concluded with correlation analysis and ordinal logistic regressions, which will be used to confirm or reject the research hypotheses.

Demographic Profile of Respondents

This section presents the distribution of respondents according to the organization type, organization size, number of years spent working in the public sector, number of years spent working at the current workplace, and position within the organization.

Figure 6.

Type of Organization Respondents Represent



As shown in Figure 6, almost a third of respondents (32%) work in budgetary institutions, i.e., institutions that implement functions of the state and are supported by the appropriations of the state budget. Another 27% of respondents are employed in regional municipalities, 16% in specific ministries and 12% in state-owned enterprises. A smaller number of respondents (11%) answered that they represent a public entity, which is a type of non-profit organizations, engaged in social, educational, scientific, cultural, sport or any other analogous activities and public to the members of the community. Lastly, 2% respondents chose category “Other” and clarified by free text input that they work in municipality-owned regional enterprises.

Looking at the organization size distribution in

Figure 7, 40% respondents (106 out of 265) work in organizations with 101-250 employees. Another 20% (54 respondents) work in organizations with 251-500 employees and 12% (32 respondents) work in organizations with 501 employees or more. When analyzing the respondents’ demographic nature, we see that there are fewer responses from employees working in smaller organizations than from ones working in bigger organizations. It could be the case because of our targeted sampling, which aimed to survey employees of organizations that own or manage at least one national information system or registry. Management of IT systems requires more human resources; therefore, such institutions are naturally larger in size.

Figure 7.

Number of Employees in Respondents Organization

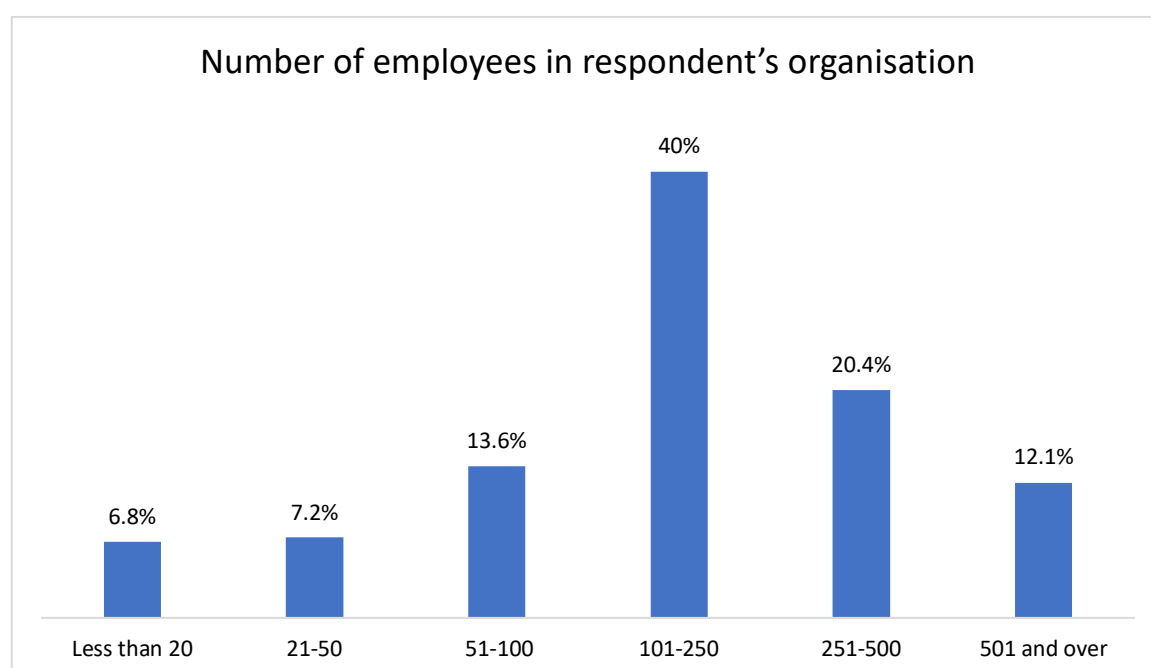
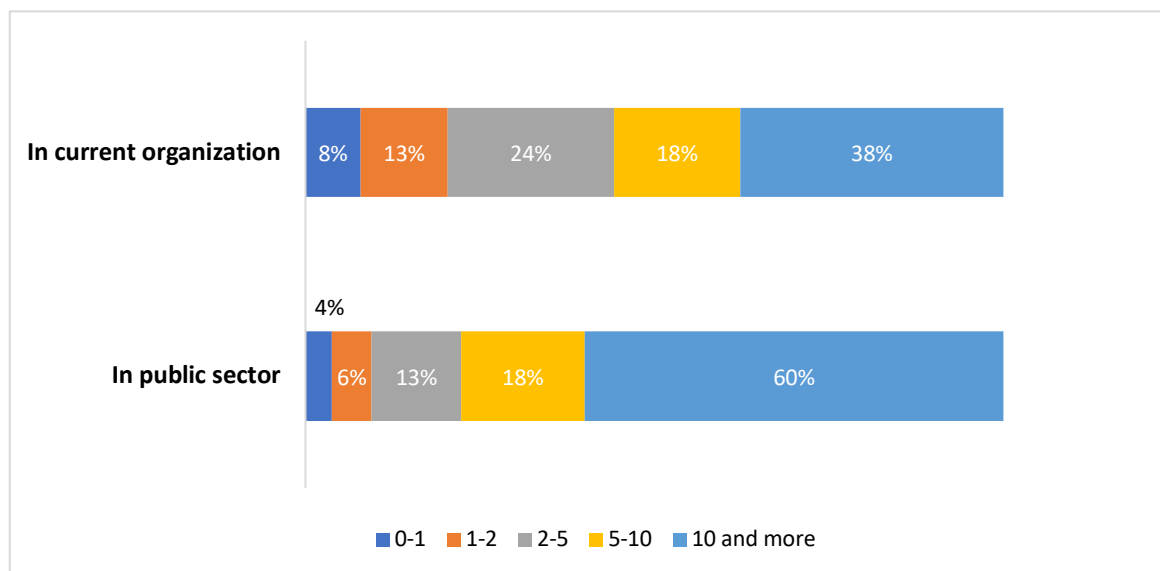
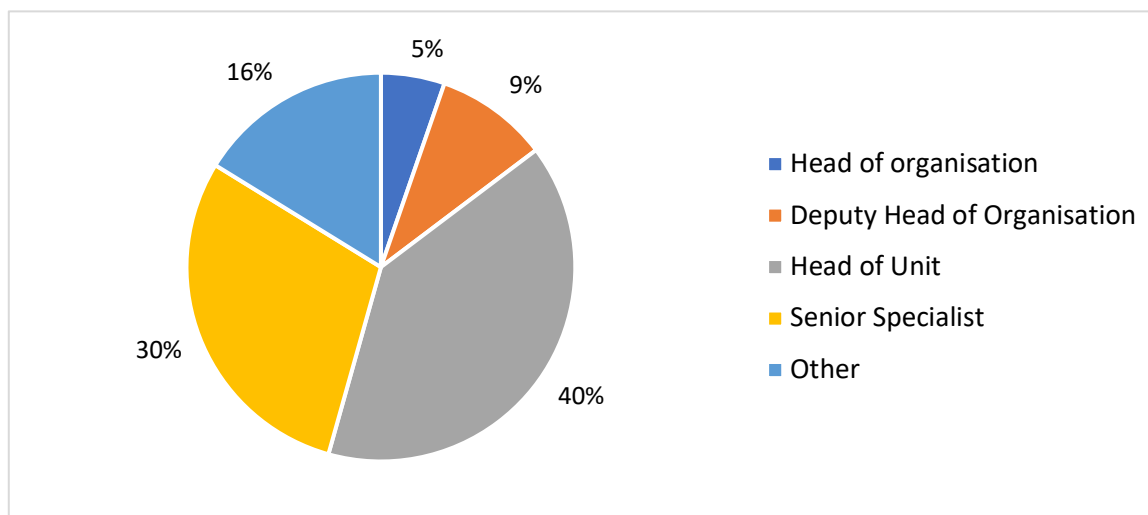


Figure 8.*Respondent Experience in Years*

In terms of respondent experience as shown in Figure 8, the majority of respondents have 5 or more years of experience in the public sector and also 5 or more years of experience in the organization they are currently working at. A small part of respondents have under 1 year of experience both in public sector and current organization. Overall, we can state that most respondents of the survey are seasoned civil servants.

Figure 9 below illustrates the distribution of the respondent roles in the organization they represent. Majority of respondents work as head of unit or senior specialist in the organization. When selecting respondents, we targeted employees responsible for digital technology or innovation development, process optimization and automation, strategic planning, monitoring and public services delivery. In this context, 40% of responses come from respondents that manage activities related to DGT as medium level managers and 30% of responses are from senior specialists working in those units. Additionally, 5% of responses arrived from heads of organizations and 9% of responses arrived from deputy heads of organizations. Lastly, 16% of respondents, who chose category “Other”, indicated that they work as analysts, project managers or advisors.

Figure 9.*Respondents Role in the Organization*

Presented in Table 4 is all the respondents' demographic information together with frequencies and percentage distribution. The groups with highest frequencies are italicized.

Table 4.*Demographic Profile of the Respondents with Frequencies*

Measure	Value	Frequency	Percent
Type of respondent's organization	<i>Budgetary body</i>	84	31.7%
	Municipality	73	27.5%
	Ministry	42	15.8%
	State-owned enterprise	31	11.7%
	Public body	30	11.3%
	Other (municipality enterprise, etc.)	5	1.9%
Number of employees in respondent's organization	Less than 20	18	6.8%
	21-50	19	7.2%
	51-100	36	13.6%
	<i>101-250</i>	<i>106</i>	<i>40.0%</i>
	251-500	54	20.4%
	501 and over	32	12.1%
Years of experience in the public sector	a. 0-1 years	10	3.8%
	b. 1-2 years	15	5.7%
	c. 2-5 years	34	12.8%
	d. 5-10 years	47	17.7%
	<i>e. 10 years and more</i>	<i>159</i>	<i>60.0%</i>

Years of experience in the current organization	a. 0-1 years	21	7.9%
	b. 1-2 years	33	12.5%
	c. 2-5 years	63	23.8%
	d. 5-10 years	48	18.1%
	e. 10 years and more	100	37.7%
Respondent's role in the organization	Head of organization/manager	14	5.3%
	Deputy Head of Organization	25	9.4%
	<i>Head of Unit</i>	105	39.6%
	Senior Specialist	78	29.4%
	Other (Analyst, Project Manager, Advisor, etc.)	43	16.2%

Descriptive Analysis

The dataset is comprised of 5 dependent variables, 23 independent variables, 5 demographic variables and 265 data points. All dependent and independent variables are based on a 5-point Likert scale; thus, their values are ordinal and range from 1 to 5. Table 5 presents the breakdown of primary descriptive statistics for each dependent and independent variable – minimum value, maximum value, mean, standard deviation, skewness and kurtosis coefficients. Figure 10 presents the distribution of response values for each dependent and independent variable.

Table 5.

Descriptive Statistics of All Variables

Variable	Variable Description	Min	Max	Mean	Std. Dev.	Skewness	Kurtosis
IDGT1	IDGT: People	1	5	3.80	0.91	-0.39	-0.33
IDGT2	IDGT: Culture	1	5	3.60	0.99	-0.44	-0.19
IDGT3	IDGT: Structure	1	5	3.25	1.08	-0.05	-0.71
IDGT4	IDGT: Processes	1	5	3.60	0.95	-0.21	-0.62
IDGT5	IDGT: IT systems	1	5	3.69	0.97	-0.32	-0.53
OMB1	B: Bureaucracy	1	5	3.41	1.21	-0.40	-0.76
OMB2	B: Complex organizational structure	1	5	2.65	1.14	0.21	-0.78
OMB3	B: Staff disinterest	1	5	2.97	1.18	0.07	-0.75
OMB4	B: Managerial disinterest	1	5	2.46	1.24	0.54	-0.66
EB1	B: Limitations of the legal framework	1	5	2.85	1.14	0.13	-0.77
EB2	B: Dependence on other institutions	1	5	3.21	1.21	-0.15	-0.91
EB3	B: Unfavorable political climate	1	5	2.40	1.24	0.60	-0.59
OMB5	B: Operational and IT incompatibility	1	5	2.43	1.10	0.35	-0.65
EB4	B: Inability to attract qualified human capital	1	5	3.34	1.19	-0.30	-0.75
OMB6	B: Reluctance to organizational change	1	5	2.89	1.17	0.06	-0.87
OMB7	B: Slow and centralized decision making	1	5	3.08	1.20	-0.12	-0.88
OMB8	B: Lack of competencies	1	5	3.08	1.08	-0.01	-0.62
ITD1	D: Uses data for planning, analysis, decisions	1	5	3.54	0.92	-0.40	-0.24
ITD2	D: Adapts existing solutions for new needs	1	5	3.57	0.89	-0.35	-0.32
ITD3	D: Ensures security compliance	1	5	3.84	0.88	-0.79	0.70
OMD1	D: Involves stakeholders in the process	1	5	3.24	0.96	-0.18	-0.37
OMD2	D: Plans DGT flexibly, open to experimentation	1	5	3.06	0.92	0.14	-0.17
OMD3	D: Develops a shared transformation vision	1	5	3.13	0.99	-0.01	-0.34
OMD4	D: Allocates sufficient resources	1	5	2.94	1.06	0.05	-0.80
OMD5	D: Defines objectives and measures of result	1	5	3.27	0.97	-0.24	-0.52
OMD6	D: Explores relevant new technologies	1	5	3.38	0.96	-0.25	-0.25
OMD7	D: Analyzes and optimizes old processes	1	5	3.48	0.92	-0.31	-0.45
OMD8	D: Invests in employee upskilling	1	5	3.46	0.97	-0.43	-0.20

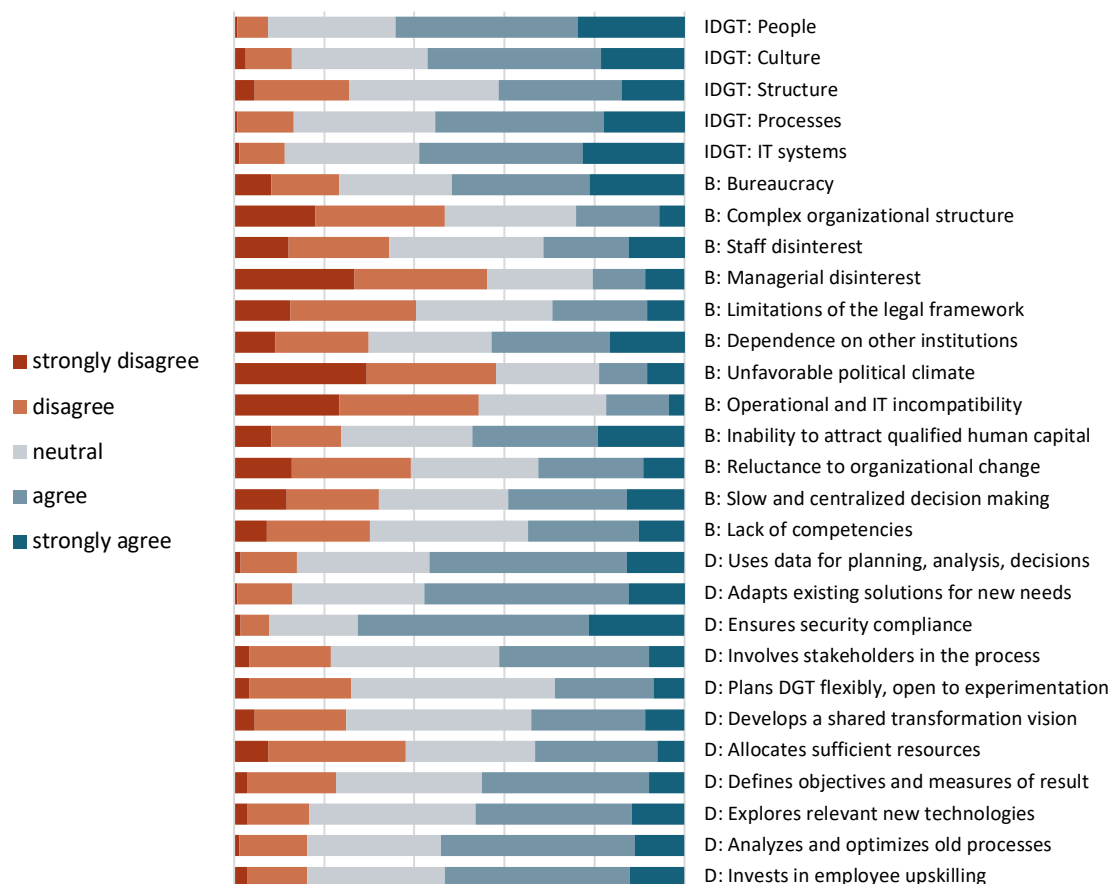
Figure 10.*Distribution of Response Values*

Table 6 lists the mean values of each variable in ascending order, grouped by variable type. Even though such comparison disregards inter-variable relationships, it is still valuable as it identifies the most popular factors regardless of their effect on the implementation of DGT. For example, the dependent variables “IT systems” and “People” have a higher mean than “Structure” or “Processes.” It might be because structure and process changes require deeper intervention into organization’s internals and is more difficult to carry out, in comparison to more superficial optimizations of human labor or communication systems. It is also interesting that “Unfavorable political climate” is the weakest barrier of all. A possible cause for this might be that respondents were afraid of their survey responses being used against them. Similarly, the highest ranked driver “Ensures security compliance” might be ranked as such because compliance is seen as a sensitive topic.

Table 6.*Comparison of Dependent Variable, Barrier and Driver Means*

Group	Variable	Mean
Dependent variables	Structure	3.25
	Culture	3.60
	Processes	3.60
	IT systems	3.69
	People	3.80
Barriers	Unfavorable political climate	2.40
	Operational and IT incompatibility	2.43
	Managerial disinterest	2.46
	Complex organizational structure	2.65
	Limitations of the legal framework	2.85
	Reluctance to organizational change	2.89
	Staff disinterest	2.97
	Slow and centralized decision making	3.08
	Lack of competencies	3.08
	Dependence on other institutions	3.21
	Inability to attract qualified human capital	3.34
	Bureaucracy	3.41
Drivers	Allocates sufficient resources	2.94
	Plans DGT flexibly, open to experimentation	3.06
	Develops a shared transformation vision	3.13
	Involves stakeholders in the process	3.24
	Defines objectives and measures of result	3.27
	Explores relevant new technologies	3.38
	Invests in employee upskilling	3.46
	Analyzes and optimizes old processes	3.48
	Uses data for planning, analysis, decisions	3.54
	Adapts existing solutions for new needs	3.57
	Ensures security compliance	3.84

Reliability Analysis

In order to determine whether the variable groups are measuring the same underlying concept, Cronbach's Alpha coefficient was calculated for the dependent variables and for each group of factors. Hinton et al. (2014) suggested an interpretation of Cronbach's Alpha values that is described in Table 7.

Table 8 lists Cronbach's Alpha values for each variable group. Per Table 7, reliability of all variable groups is high or excellent. This means that the variable groups are reliable indicators of underlying concepts and are suitable for further correlation and regression analysis.

Table 7.

Interpretation of Cronbach's Alpha Coefficients

Value Range	Reliability
0 – 0.50	Low
0.50 – 0.70	Moderate
0.70 – 0.90	High
0.90 – 1.00	Excellent

Table 8.

Reliability Analysis of Variable Groups

Variable group	Number of variables	Cronbach's Alpha	Reliability
Dependent variables – implementation of DGT	5	0.858	High
Organizational & managerial barriers	8	0.861	High
Environmental barriers	4	0.705	High
Information technology drivers	3	0.765	High
Organizational & managerial drivers	8	0.903	Excellent

Correlation Analysis

Correlation analysis is based on Pearson correlation coefficient, which is a measure of the linear relationship between two variables (Hinton et al., 2014). Pearson coefficient ranges from -1.0 to 1.0, where -1.0 represents a strongly negative relationship and 1.0 represents a strongly positive relationship. A value of 0.0 represents no meaningful linear relationship. A high absolute value of Pearson correlation coefficient between two variables signifies that the variables are likely to be related, either directly or indirectly through a latent variable. Hinton et al. (2014) states that Pearson coefficient values can be interpreted as shown in Table 9. Table 10 presents the Pearson correlation coefficients for all dependent-independent variable pairs, whereas Appendix B contains a full table for all possible variable pairs.

In this research study, correlation analysis enables us to quantify the relationship of each pair of independent and dependent variable. As seen in Table 10, all independent variables show a non-zero degree of correlation with all dependent variables. In particular, barrier variables are negatively correlated with dependent variables whereas driver variables are positively correlated, which is expected and confirms that higher barrier values indeed lead to lower implementation of DGT.

Regarding the strength of correlation, the weakest-correlated variable pair is between the barrier “Limitations of the legal framework” and the dependent variable “IDGT: IT systems”, which means that according to this dataset, restrictions of the legal system have almost zero effect on the establishment of IT systems in organizations. On the other end of the spectrum, there are multiple pairs that demonstrate medium or strong correlation. The driver “Uses data for planning, analysis, decisions” is strongly correlated with dependent variable “IDGT: Culture”, which means that there is a strong underlying relationship between these variables. Considering the barriers, “Managerial disinterest” is moderately correlated with dependent variable “IDGT: Culture”.

Table 9.

Interpretation of Pearson's Correlation Coefficients

Absolute Value Range	Degree of Correlation
0 – 0.1	None
0.1 – 0.3	Small
0.3 – 0.5	Medium
0.5 – 1.0	Strong

Table 10.*Pearson Correlation Coefficients Between Dependent and Independent Variables*

Independent Variables	Dependent Variables				
	IDGT: People	IDGT: Culture	IDGT: Structure	IDGT: Processes	IDGT: IT systems
B: Bureaucracy	-0.23	-0.24	-0.20	-0.24	-0.20
B: Complex organizational structure	-0.19	-0.28	-0.21	-0.20	-0.23
B: Staff disinterest	-0.24	-0.31	-0.25	-0.16	-0.13
B: Managerial disinterest	-0.18	-0.35	-0.26	-0.24	-0.18
B: Limitations of the legal framework	-0.09	-0.14	-0.12	-0.08	-0.01
B: Dependence on other institutions	-0.06	-0.11	-0.05	-0.10	-0.03
B: Unfavorable political climate	-0.04	-0.10	-0.03	-0.09	-0.03
B: Operational and IT incompatibility	-0.07	-0.10	-0.05	-0.10	-0.13
B: Inability to attract qualified human capital	-0.12	-0.24	-0.30	-0.21	-0.13
B: Reluctance to organizational change	-0.16	-0.29	-0.23	-0.19	-0.16
B: Slow and centralized decision making	-0.17	-0.26	-0.28	-0.30	-0.26
B: Lack of competencies	-0.11	-0.24	-0.25	-0.25	-0.17
D: Uses data for planning, analysis, decisions	0.31	0.50	0.44	0.43	0.40
D: Adapts existing solutions for new needs	0.34	0.34	0.30	0.34	0.37
D: Ensures security compliance	0.29	0.34	0.23	0.26	0.33
D: Involves stakeholders in the process	0.28	0.32	0.29	0.28	0.31
D: Plans DGT flexibly, open to experimentation	0.32	0.44	0.42	0.39	0.33
D: Develops a shared transformation vision	0.26	0.43	0.41	0.37	0.38
D: Allocates sufficient resources	0.23	0.29	0.34	0.37	0.36
D: Defines objectives and measures of result	0.28	0.42	0.40	0.42	0.43
D: Explores relevant new technologies	0.29	0.39	0.37	0.36	0.45
D: Analyzes and optimizes old processes	0.27	0.40	0.31	0.40	0.35
D: Invests in employee upskilling	0.32	0.31	0.35	0.34	0.32

Correlation analysis has a limited purpose and cannot be used to confirm or reject hypotheses because it does not address relationships between independent variables. Even if a variable pair is strongly correlated, the relationship must be interpreted in the context of other independent variables. Therefore, in the next section we will perform regression analysis, which incorporates the inter-variable correlation as well.

Regression Analysis

In terms of determining the relationship between dependent and independent variables, linear regression is the most prominent method. However, in this research study the dependent variables are ordinal, therefore we will use ordinal logistic regression instead of regular linear regression. Ordinal logistic regression is a method to create a predictive model, in which every independent variable x_i is assigned a weight α_i , and the sum of weighted independent variables γ is matched against a fixed list of threshold values $\omega_1, \omega_2, \omega_3, \dots, \omega_{k-1}$ to predict the most likely output category (C_1, C_2, \dots, C_k). Ordinal logistic regression uses an iterative algorithm to determine the values $\alpha_1, \dots, \alpha_n, \omega_1, \dots, \omega_{k-1}$ that result in the best fit (i.e., lowest adjusted R-square value) for the input dataset (Hair & Babin, 2018). Although the resulting model is usually used to generate predictions (e.g., in machine learning), in this research study we will use the model coefficients to understand the degree of influence each independent variable has over the dependent variable.

$$\gamma = \sum_{i=1}^n \alpha_i x_i$$

$$C_{predicted} = \begin{cases} C_1 & \gamma < \omega_1 \\ C_2 & \omega_1 \leq \gamma < \omega_2 \\ C_i & \omega_{i-1} \leq \gamma < \omega_i \\ C_k & \omega_{k-1} \leq \gamma \end{cases}$$

Since ordinal logistic regression (OLR) requires a single dependent variable, we use the overall implementation of digital government transformation (IDGT) as the dependent variable in the regression. IDGT is defined as the median of the five dependent variables in the questionnaire:

$$IDGT = median(IDGT1, IDGT2, IDGT3, IDGT4, IDGT5)$$

Multicollinearity in independent variables may cause the ordinal logistic regression to output incorrect results (Daoud, 2017). Multicollinearity refers to the degree to which independent variables are correlated to each other. Thus, in order to ensure the correctness of ordinal logistic regression, we must verify that the Variable Inflation Factor (VIF) and Tolerance statistics are within a certain range. Specifically, Variable Inflation Factor (VIF) must be below 5.0 and Tolerance value must be above 0.1 (Daoud, 2017). The results of collinearity diagnostics are presented in Table 11, which confirms that all independent variables meet the described criteria and are ready to be used in regression. Even though initially we had concerns about performing ordinal logistic regression with 23 independent variables as some independent variables are strongly correlated with each other (see Appendix B), the positive result of the multicollinearity check allowed us to continue with a single ordinal logistic regression without dropping or altering independent variables.

Table 11.*Collinearity Diagnostics of Independent Variables*

Variable	Collinearity Statistics	
	Tolerance	Variable Inflation Factor
<i>Acceptable range</i>	<i>> 0.1</i>	<i>< 5.0</i>
B: Bureaucracy	0.55	1.82
B: Complex organizational structure	0.57	1.75
B: Staff disinterest	0.49	2.06
B: Managerial disinterest	0.49	2.05
B: Limitations of the legal framework	0.56	1.80
B: Dependence on other institutions	0.63	1.60
B: Unfavorable political climate	0.64	1.56
B: Operational and IT incompatibility	0.67	1.50
B: Inability to attract qualified human capital	0.46	2.18
B: Reluctance to organizational change	0.42	2.38
B: Slow and centralized decision making	0.41	2.47
B: Lack of competencies	0.37	2.71
D: Uses data for planning, analysis, decisions	0.46	2.17
D: Adapts existing solutions for new needs	0.52	1.94
D: Ensures security compliance	0.60	1.67
D: Involves stakeholders in the process	0.62	1.61
D: Plans DGT flexibly, open to experimentation	0.39	2.54
D: Develops a shared transformation vision	0.34	2.93
D: Allocates sufficient resources	0.42	2.36
D: Defines objectives and measures of result	0.40	2.50
D: Explores relevant new technologies	0.36	2.79
D: Analyzes and optimizes old processes	0.45	2.23
D: Invests in employee upskilling	0.48	2.11

Ordinal logistic regression supports two different modes for ordinal independent variables: predictors can be treated either as factors, or as covariates. We decided to model our independent variables as covariates, which means that the whole independent variable will be assigned a single coefficient. Alternatively, if we modelled the variables as factors, the regression would output distinct coefficients for each value of every independent variable – or in our case, $23 \times 5 = 115$ coefficients. We opted to use covariates because our sample would be insufficient for estimating a regression model with 115 predictors, and because having a single coefficient per variable makes it easier to compare factors to each other.

Ordinal logistic regression depends on the assumption of proportional odds, which states that the effect of a predictor variable on the predicted variable should be constant across all levels of the predicted variable (Hair & Babin, 2018). In the context of this research study, this means that the influence of drivers and barriers must be similar at all four levels of the implementation of DGT. If this assumption does not hold, one would have to perform multinomial logistic regression instead. This assumption can be verified automatically using SPSS 'Test of parallel lines' functionality. The assumption of proportional odds (i.e., null hypothesis) holds if the null hypothesis is not rejected, i.e., if the p -value of non-null hypothesis is greater than 0.05. The results of SPSS calculations provided in Appendix C demonstrate that the p -value of non-null hypothesis is 0.339 and therefore the assumption of proportional odds holds.

The results of the estimated regression are provided in Table 12. The table lists the parameter estimates and p -values for each independent variable, ordered in increasing order of the p -value. Highlighted factors represent p -value smaller than 0.1, which is our cut-off p -value for rejecting hypotheses. Positive parameter estimate values indicate positive influence of a factor on DGT, and negative values indicate negative influence on DGT.

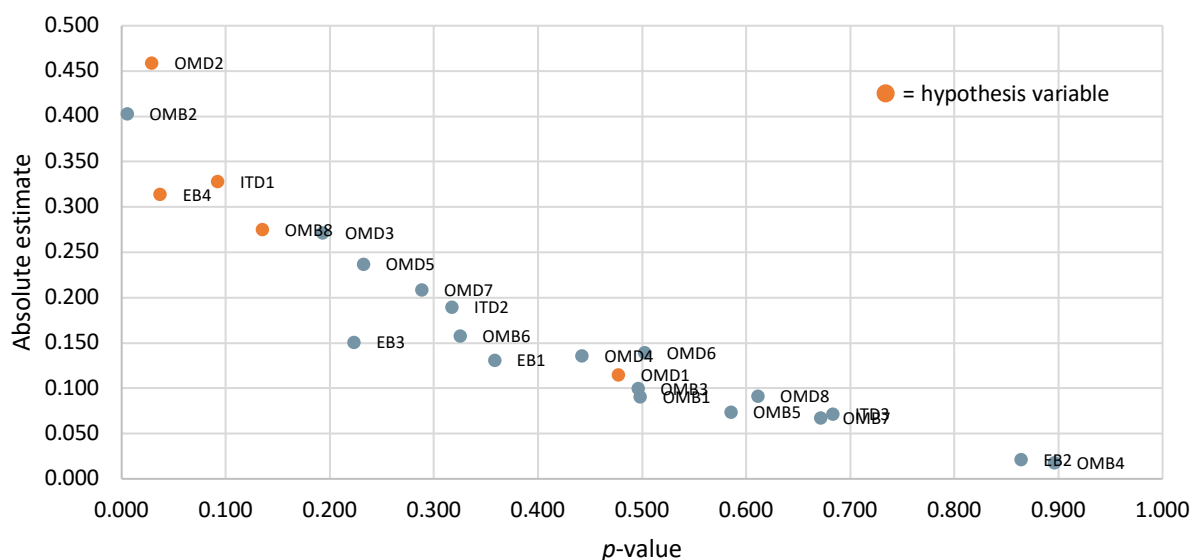
Table 12.*Ordinal logistic regression results, in increasing p-value order*

Variable	Hypothesis	Description	Estimate	p-value
OMB2		B: Complex organizational structure	-0.403	0.005
OMD2	H4	D: Plans DGT flexibly, open to experimentation	0.459	0.029
EB4	H2	B: Inability to attract qualified human capital	-0.314	0.037
ITD1	H3	D: Uses data for planning, analysis, decisions	0.328	0.092
OMB8	H1	B: Lack of competencies	0.275	0.135
OMD3		D: Develops a shared transformation vision	0.272	0.193
EB3		B: Unfavorable political climate	0.151	0.223
OMD5		D: Defines objectives and measures of result	0.237	0.232
OMD7		D: Analyzes and optimizes old processes	0.209	0.288
ITD2		D: Adapts existing solutions for new needs	0.190	0.317
OMB6		B: Reluctance to organizational change	-0.158	0.325
EB1		B: Limitations of the legal framework	0.131	0.358
OMD4		D: Allocates sufficient resources	-0.136	0.442
OMD1	H5	D: Involves stakeholders in the process	0.115	0.477
OMB3		B: Staff disinterest	-0.100	0.496
OMB1		B: Bureaucracy	-0.091	0.498
OMD6		D: Explores relevant new technologies	0.140	0.502
OMB5		B: Operational and IT incompatibility	0.074	0.585
OMD8		D: Invests in employee upskilling	0.092	0.611
OMB7		B: Slow and centralized decision making	-0.068	0.671
ITD3		D: Ensures security compliance	0.072	0.683
EB2		B: Dependence on other institutions	-0.022	0.864
OMB4		B: Managerial disinterest	0.018	0.896

Note. Factors with p -value < 0.1 are highlighted in green.

Figure 11.

Scatter plot of coefficient absolute values and p-values



As can be seen in Figure 11, there is a very strong correlation between the p -value of a parameter and the absolute value of its estimate. Therefore, both measures can be used to prioritize the independent variables according to their influence over the dependent variable. Factors with the lowest p -value also have the highest parameter estimates, therefore they are major contributors to the regression model.

The goodness of fit of a regression model is usually measured using R-squared value. However, when the dependent value is ordinal and ordinal logistic regression is being used, a true R-square value cannot be calculated; thus, we have to use a pseudo-R-squared instead. A common method for calculating pseudo-R-squared is McFadden. According to Hinton et al. (2014), a McFadden value between 0.2 and 0.4 represents an excellent model fit. In our regression model, the value of McFadden pseudo-R-squared is 0.220 (see Appendix C), which means that the resulting model parameter estimates are able to explain most of the variance of the dependent variable.

Discussion

This section of the study will assess empirical research findings and situate them in relation to the study's aim and literature analysis. All hypotheses developed from the literature review and empirically evaluated using the specified research approach will be discussed. Also, we will consider the managerial implications of the results in order to give practical guidance for existing and future managers working on digital government transformation. Finally, we'll conclude the chapter by highlighting limitations of the study.

Synthesis of Existing Theory and Empirical Research Findings

Research included 23 different managerial, organizational, IT and environmental factors as independent variables, derived from existing literature that already demonstrated positive or negative influence over the implementation of DGT. Significance of these factors differ from country to country therefore, the aim of this research was to determine key factors that have positive or negative influence over the implementation of digital transformation in Lithuanian governmental institutions. This research is among the first that analyzed factors influencing DGT in Lithuania's public sector. This study is, to our knowledge, the first one to use regression analysis to test which drivers or barriers have the strongest influence over digital government transformation in Lithuania.

The further sections will consist of two parts. Firstly, we will present hypotheses regarding drivers of DGT implementation. Afterwards, the hypotheses regarding the barriers of DGT implementation will be analyzed.

Developing a DGT plan

First hypothesis of our empirical research is that developing a DGT plan, which is open to failure, redesign and experimentation, is positively related to the implementation of DGT. Digital transformation projects are frequently difficult to design, plan and carry out, and many of them are doomed to failure. Only one in three change initiatives succeed, and an additional 16% have mixed results (Chiu & Salerno, 2019). Therefore, 50% of reform attempts will be unsuccessful. Nevertheless, Osifo (2018) argues that implementing digital government transformation with a flexible plan, open for changes and experimentation offers greater chance of success. In our empirical research, we found that public sector employees find the preparation of a flexible plan as a significant enabler of digital government transformation activities. Openness to change during the implementation process and ability to experiment offers space for continuous iterations and risk management, needed for successful transformation implementation.

It is worth mentioning that of all the drivers assessed in this study, formulating a strategy for DGT implementation was determined to be the most significant. The empirical data demonstrate a

medium positive correlation with the dependent variable, and the regression model was very significant, confirming hypothesis H4. This outcome is also consistent with past research (Carrasqueiro & Monteiro, 2018; Putri & Sensuse, 2019; Renteria et al., 2019), which found that developing plans and defining a strategy for DGT enables civil servants to implement DGT more successfully.

Using Data for DGT

Use of data for planning, analysis or decision making represented an affective positive influence on the implementation of DGT. The empirical data revealed a modest positive correlation, and the regression model demonstrated substantial significance, confirming hypothesis H3. Empirical analysis of Legner et al. (2017) discusses the importance of using data in DGT, by positioning data as a major enabler for the digital transformation. It aids organizations in finding new possibilities, improving decision-making, and increasing operational effectiveness. Organizations that are digitally advanced make use of existing data to improve analytics capability and decision-making process. Our research results go in line with this reasoning because it was found that the IT Driver “Use of data when planning, analyzing and making decisions” is one of the most significant drivers, positively influencing the implementation of DGT in Lithuania. Such result does not contradict with existing literature and is also supported by Lithuania’s government policy. Recently, Lithuania’s public sector has started various initiatives to actualize and employ data generated by the public sector. For example, Seimas of the Republic of Lithuania issued a resolution “On Future Digital Transformation and Digital Sovereignty in Lithuania”. Resolution highlights and proposes many goals that are related to the use of data (Seimas of The Republic of Lithuania, 2021):

1. “The Seimas of the Republic of Lithuania is recalling that services based on digital data can offer solutions to the contemporary challenges related to health, demography, mobility, climate and the fourth industrial revolution Industry 4.0 and contribute to a timely response to societal needs”
2. “The Seimas of the Republic of Lithuania is stressing that the key driving force and objectives of digital transformation are full optimization of societal experience, promptitude and innovation, as well as creation of new sources of income and data-informed value ecosystems”
3. “The Seimas of the Republic of Lithuania proposes to the Government to ensure the development of a data architecture and infrastructure that meets global standards, taking into account, in the concepts for the implementation of the data lake, the different architectural aspects of this formation, such as infrastructure, data storage, data flows, data

modelling, data organization, data processes, metadata management, data security and privacy and data quality”

With the example of The Resolution, we conclude the significance of use of data in DGT. Nevertheless, as previously discussed in literature review section, concepts such as “data” or “data management system” and are not uniformly interpreted or understood by the civil servants. This situation complicates the implementation of changes, agreements and communication between different institutions and could limit government ambitions.

Citizen Involvement

As mentioned in the literature, involving citizens and other stakeholders in the process positively affects the implementation of DGT. Marzooqi et al. (2017) explains that by taking a user-centric orientation of IT adaptation in the public sector, citizen approval ratings may increase. Therefore, we hypothesized this variable to positively influence the implementation of DGT, considering that the significance of this factor is based on civil servants’ aspiration for greater citizen adoption and approval. We discovered a slight positive correlation in our study findings, however the regression model revealed no significance of the effect. As a result, hypothesis H5 is rejected. This may appear odd, given that previous research (al Marzooqi et al., 2017; Lindgren & van Veenstra, 2018) shows that including individuals in the co-creation of digital services has a major beneficial influence on citizen awareness and involvement. Nevertheless, since correlation coefficient is positive, significance of this driver could be tested once again by collecting additional survey responses.

Attracting Qualified Personnel

Apart from citizen involvement, the study of Gilch & Sieweke (2021) argues that recruitment of personnel who have IT-related knowledge, skills, and talents is crucial to an organization’s ability to digitally transform its processes, services, and products. The same argument can be found in Altameem et al. (2006) empirical research, which indicates a positive relationship between the availability of skilled human capital and DGT implementation. Results of these studies coincide with our own empirical research results and show that inability to attract qualified human capital has a strong negative effect on implementation of digital government transformation. The empirical data revealed a moderate negative correlation with the dependent variable, and the regression model demonstrated significant significance, confirming hypothesis H2.

It is challenging for public organizations to employ people with the necessary skills, because they cannot offer a competitive salary or working environment, when compared to private sector

companies or startups (Diskienė, 2008). Additionally, Lithuania's society has below average basic and advanced digital skills when compared to other EU Member States, therefore the supply side of skilled workforce is also limited. These arguments confirm the findings of our empirical research, which states that inability to attract qualified human capital is negatively related to the implementation of DGT.

Lack of Competencies

In this empirical research, "Lack of Competencies" barrier displayed a small negative correlation with the dependent variable, but the regression model showed insufficient significance, slightly above the threshold ($p > 0.1$), thus hypothesis H1 is rejected. Such a result deviates from what we find in the literature and the reason may be determined by different approaches for evaluation of the level of competencies. In the research of Surya & Amalia (2017), level of competencies of public sector employees was tested by a practical assignment and the results were compared with the level of DGT in the organization they work. This way researchers obtained a more objective assessment of employees' level of competencies, than compared to our approach, which gathered the civil servant's perception of their own competencies.

Self-assessment of competencies can be biased for several reasons. One reason is that people often tend to overestimate their own abilities and accomplishments. This is known as the "self-serving bias," and it can lead individuals to overestimate their own competence in a particular area (Shepperd et al., 2008). Another reason self-assessment can be biased is that people may have a limited or incomplete understanding of their own competencies. They may not be aware of certain skills or knowledge that they possess, or they may not fully understand the requirements or standards for a particular competency. Additionally, self-assessment can be influenced by emotions and personal biases. For example, an individual may feel confident in their ability to perform a task, but that confidence may not be justified by their actual level of competence.

Several DGT researchers find that a lack of competencies is a significant barrier and can impede this transformation in several ways. According to Al-Shuaili (2019) and Surya & Amalia (2017), a lack of technical competencies among government employees can make it difficult for them to use and implement new digital technologies. For example, if employees are not familiar with software development terminology or process, they may struggle to design and implement effective digital solutions to government problems. This can lead to costly delays and inefficiencies in the transformation process.

Also, lack of competencies in project management and change management can make it difficult for governments to effectively plan and execute digital transformation initiatives. According

to Pereira (2017), without the ability to properly manage large-scale projects and navigate organizational change, governments may struggle to implement new digital technologies and processes in a way that is efficient and effective.

In this research, H1 hypothesis “Lack of Competencies” was rejected due to insufficient significance of the effect, but according to literature, lack of competencies in technical and management areas can impede digital government transformation by making it difficult for governments to effectively use and implement new digital technologies.

Table 13.

A Summary of This Study's Confirmed and Rejected Hypotheses

No.	Hypothesis	Status
H ₁	Lack of competencies is negatively related to the implementation of DGT.	Rejected
H ₂	Inability to attract qualified human capital is negatively related to the implementation of DGT	Failed to reject
H ₃	Use of data for planning, analysis or decision making is positively related the implementation of DGT	Failed to reject
H ₄	Developing a DGT plan, which is open to failure, redesign and experimentation, is positively related to the implementation of DGT	Failed to reject
H ₅	Involving citizens and other stakeholders in the process is positively related to the implementation of DGT.	Rejected

Other Factors

Apart from analyzed hypotheses, our collected data indicated one additional factor that have significant influence over the implementation of digital government transformation. Our research found that the organizational and managerial barrier “Complex organizational structure” has a moderate negative correlation over the implementation of DGT and regression analysis indicated sufficient significance of the effect. A similar conclusion is in the empirical findings of de Smet and Gagnon (2018) who states that transformation is hampered by inadequate organizational and project structures because they include hierarchical rigidities and silo structures. According to Davison et al. (2005), complex organizational structures contribute to inefficiencies and delays. Such structure results in rigid communication inside and between project implementation teams and procedures. Kretschmer & Khashabi (2020) advocate structuring an organization in such a manner that it is possible to separate the company's overall goals into smaller components that employees might feasibly complete. Secondly, it is important to monitor the successful completion of these

components, and to integrate them again into the organization's total output. Simply said, organizational design should enable the process of disaggregating and re-aggregating the ultimate organizational output. Such organizational structure is likely to better utilize digital infrastructure and activities needed to implement digital transformation.

Managerial Implications

Our research identified several additional organizational and managerial factors that showed moderate correlation with the dependent variable, but regression analysis identified lack of significance. Nevertheless, in our next chapter, we will discuss the managerial implications of those factors, because their relevance is high in terms of DGT implementation. Our findings provide guidelines for practitioners, who aim to implement DGT in their organization.

Developing the Vision of DGT

According to literature (Hatsu & Ngassam, 2017) developing the vision of DGT provides a clear direction and purpose for the transformation effort, allowing all stakeholders to understand the goals and objectives of the initiative. This helps to align the efforts of different teams and departments, ensuring that everyone is working towards the same result. In addition, a shared vision helps to build support and buy-in for the transformation from key stakeholders, including elected officials, public employees, and citizens. By clearly communicating the benefits of the transformation and involving stakeholders in the process, managers can build consensus and support for the changes being made.

Furthermore, a shared vision can help to overcome resistance and challenges that may arise during the transformation process. By providing a clear and compelling rationale for the changes being made, managers can help to address concerns and objections from those who may be hesitant to embrace the new technologies and processes. Finally, a shared vision can help to ensure the sustainability of the transformation effort. By establishing a clear direction and purpose, managers can ensure that the changes made during the transformation are sustainable and continue to provide benefits even after the initial implementation is complete.

In short, creating a shared transformation vision is important for managers implementing digital government transformation because it provides direction, builds support, overcomes challenges, and ensures sustainability. By developing and communicating a clear vision for the transformation, managers can help to ensure its success and maximize the benefits of the digital government initiatives.

Defining DGT Goals and KPIs

Literature argues that together with vision, defining goals and KPIs (key performance indicators) positively correlates to the implementation of DGT. It provides a clear and measurable way to evaluate the success of the transformation effort. By setting specific, quantifiable goals and KPIs, managers can determine whether the transformation is meeting its objectives and making progress towards its desired outcomes (Nielsen, 2019).

One of the key benefits of defining goals and KPIs is that it allows managers to identify areas where the transformation is succeeding, as well as areas where it may be falling short (Renteria et al., 2019). This can help managers to focus their efforts and resources on the areas that are most important and most likely to drive success. It can also help managers to identify and address any challenges or obstacles that may be hindering the transformation effort. Another benefit of defining goals and KPIs is that it can help to build support and buy-in for the transformation from key stakeholders, including elected officials, public employees, and citizens (Escobar et al., 2022). By clearly communicating the goals and KPIs of the transformation and involving stakeholders in the process, managers can build consensus and support for the changes being made.

In short, defining goals and KPIs is important for digital government transformation because it provides a clear and measurable way to evaluate the success of the transformation, helps managers focus their efforts and builds support. By setting clear goals and KPIs, managers can help to ensure the success and longevity of the digital government transformation initiatives.

Limitations and Directions for Further Research

Our study contains certain limitations that should be addressed, along with recommendations for further research. To begin with, a major limitation of this research is that it focused only on the civil servant's perception of driving and impeding factors, influencing DGT implementation. Such approach adds the potential for bias in the research. Civil servants may have a limited understanding of digital transformation processes or may not understand how digital technologies can improve government operations and services. In addition, civil servants may have concerns about the potential impact of digital technologies on their job security. The implementation of digital technologies can sometimes lead to job losses as certain tasks are automated or made more efficient. Lack of understanding of the topic and concerns about job security can lead to biased approach towards filling survey responses, which can greatly impact the results of the research. Alternative research method could measure factual degree of DGT implementation and evaluate key impeding and driving factors based on observations and collected data.

Another limitation of research on this topic is the lack of standardization. Different institutions may have different approaches to implementing digital government transformation, and these approaches can vary widely in terms of their goals, scope, and implementation methods. This lack of standardization makes it problematic to compare the results of different institutions or studies and to generalize findings from one study to other contexts. Even though we presented many case studies of driving and impeding factor of DGT implementation in other countries, we cannot generalize and compare the results, unless identical research would be carried out in another country.

Furthermore, Escobar et al. (2022) have outlined more drivers and barriers that have influence on DGT implementation, than were measured in this research. Author presented a total of 52 different factors that were tested in various empirical research. Many factors were left out of our research based on applicability to Lithuania's public sector. However, prior research has proved their importance, so future studies might include them to construct a more comprehensive framework.

Finally, our research did not include analysis of moderating or demographic variables influence on digital government transformation as seen in some other studies (Tangi et al., 2021). Moderating variables are important when analyzing digital government transformation because they can help to identify and better understand factors that can influence the relationship between the independent and dependent variables. By including moderating variables in the analysis, researchers can better understand the underlying reasons for any observed relationships and provide more accurate and useful recommendations for policymakers. In addition, influence of demographic variables, such as organization type, size, or respondent's role in the organization could also offer interesting insights when analyzing influence of factors towards the implementation of DGT. Therefore, we recommend including moderating and demographic variables in future research.

Conclusions

The aim of our research was to determine key factors that have positive or negative influence over the implementation of digital transformation in Lithuanian governmental institutions. Following a review of the literature and an analysis of the quantitative research findings, our study provides the following theoretical and practical conclusions:

1. Initially, the literature review explored the evolution of notions defining the use of information and communication technology to transform an organization. Concept of Digital Government Transformation proposed by Misuraca et al. (2019) was used as the primary concept for defining the study's dependent variable, because it brought together all the organizational elements (people, process, IT, structure, culture) and context-specific values that are relevant to public sector organizations (increasing efficiency, effectiveness, accountability, and transparency, delivering citizen-centric services, and designing policies that increase inclusion and trust in government). Together with the definition, literature review presented DGT effects on public sector organizations with the broader implications to economics and society. DGT benefits public organizations in cost, efficiency, and productivity improvements. It enhances the quality and effectiveness of employees' work, increases trust and transparency, but also raises new cyber security challenges. Finally, the literature review presented an analysis of other countries' experiences in implementing DGT. Review resulted in a framework of empirically tested independent variables that are evaluated in this empirical research. Due to a high count of different variables, factors are grouped into three main categories according to the factor's characteristics: managerial and organizational, IT-related and environmental factors. Analysis of other countries' experiences and factors pointed to an understanding that in different countries, different factors play a key role in DGT implementation and yet, there has been no quantitative research on factors influencing DGT in Lithuania.
2. This master thesis aimed to address the identified research gap by proposing a conceptual research model comprised of twenty-three independent variables, one dependent variable, and five hypotheses. Data for the research was collected by an online questionnaire, presented to employees of various public organizations in Lithuania. As a result of the quantitative analysis, we failed to reject three out of five proposed hypotheses and found one additional factor with significant influence over the implementation of DGT. Study found that the strongest positive influence over the implementation of DGT in Lithuania's public sector is created by the organizational and managerial drivers "Plans DGT flexibly, open to

experimentation” and “Used data for planning, analyzing, decision-making”. Both drivers have a medium positive correlation with the dependent variable and the regression model showed sufficient significance ($p\text{-value} < 0.1$). On the other hand, the study revealed the strongest negative influence over the implementation of DGT are induced by organizational and managerial barrier “Complex organizational structure” and environmental barrier “Inability to attract qualified human capital”. Both factors have a medium negative influence and the regression model showed high significance ($p\text{-value} < 0.05$). Apart from that, hypotheses “Lack of competencies is negatively related to the implementation of DGT” and “Involving citizens and other stakeholders in the process is positively related to the implementation of DGT” were rejected due to lack of significance of the effect ($p\text{-value} > 0.1$).

3. This study has expanded the current DGT literature by using regression analysis to test which drivers or barriers have the strongest influence over digital government transformation in Lithuania. Also, our study findings provide guidelines for practitioners, who aim to implement DGT in their public organization. Firstly, we suggest developing the vision of DGT, which provides a clear direction and purpose and helps to overcome resistance and challenges that may arise during the transformation process. Secondly, defining goals and KPIs positively affects the implementation of DGT, because it provides a clear and measurable way to evaluate the success of the transformation effort and identify areas where the transformation is succeeding or failing. Finally, our research has some limitations that should be addressed in future research, starting with minimizing the bias of the study subjects, increasing the standardization of DGT evaluation, broadening the scope of factors under investigation and inclusion of moderating and demographic variables.

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Appendices

Appendix A. Research Questionnaire

Research questionnaire below is presented in its raw form, as provided to the Lithuanian respondents.

Skaitmeninė transformacija Lietuvos viešajame sektoriuje

Apklausa sudaryta iš 3 pagrindinių klausimų, kurie skirti įvertinti pagrindinius faktorius, darančius įtaką skaitmeninės transformacijos įgyvendinimui Lietuvos viešajame sektoriuje. Apklausos atsakymai bus naudojami moksliniais tikslais išlaikant respondentų anonimiškumą. Prašome atsakyti iš organizacijos, kurioje dirbate, perspektyvos.

Labai dėkojame už skirtą laiką atsakant į klausimus.

Magistro baigiamojo darbo tema | Skaitmeninės viešojo sektoriaus transformacijos veiksniai Lietuvoje

Tyrimo tikslas | Nustatyti pagrindinius faktorius, veikiančius skaitmeninę transformaciją Lietuvos viešajame sektoriuje.

Jūsų IP adresas bus žinomas tyrimą atliekančiam studentui, jo darbo vadovui ir kitiems universiteto atstovams: programos direktoriui, kvalifikacinės gynimo komisijos nariams, etikos komisijos nariams. IP adresai bus saugomi slaptažodžiu apsaugotame kompiuteryje. Kiti asmeniniai duomenys, tokie kaip Jūsų fizinė buvimo vieta, nėra renkami aktyviais veiksmais.

Jei turite kokių nors klausimų, susijusių su duomenų apsauga prieš arba po dalyvavimo tyrime, prašome susisiekti su tyrimą atliekančiu studentu (057438@stud.ism.lt) arba dpo@ism.lt.

☐

Aš perskaičiau aukščiau pateiktą informaciją ir duodu sutikimą rinkti mano asmeninius duomenis aukščiau nurodytais tikslais.

Viešojo sektoriaus skaitmeninė transformacija – tai tiek radikalių, tiek smulkių pokyčių įdiegimas į viešojo sektoriaus veiklas, vidinius ir išorinius procesus ir struktūrą su tikslu pasiekti didesnį atvirumą, efektyvumą, atskaitomybę, skaidrumą, bendradarbiavimą ir pasitikėjimą viešuoju sektoriumi. Transformacija gali apimti įvairių tipų technologijų pritaikymą, inovacijas, valdymo, procesų, kompetencijų ar organizacijos kultūros pokyčius.

1. Įvertinkite dabartinį jūsų organizacijos skaitmeninės transformacijos lygį.

Iki šiol skaitmeninė transformacija jūsų organizacijoje pakeitė:

(1 – visiškai nepakeitė; 5 – stipriai pakeitė)

	1	2	3	4	5
Žmonių darbo pobūdį					
Darbas naudojant informacines technologijas (IT), automatizuotos užduotys, reikalaujama IT kompetencijų atliekant užduotis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organizacinę kultūrą					
Atvirumas naujovėms ir technologijoms, naujiems darbo metodams, aukštas pasitikėjimas darbuotojais	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Struktūrą					
Decentralizavimas, autonomiškos komandos, skatinamas bendradarbiavimas su kitais, lankstumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Procesus					
Esamų procesų peržiūra, pertvarka, priežiūra ir kontrolė	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Informacines sistemas					
Naujų informacinių sistemų (IS) įdiegimas, esamų keitimas, skirtingų IS integravimas, sąveika, IS infrastruktūra	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Kiek Jūsų organizacijos skaitmeninei transformacijai trukdo šie veiksniai?

(1 – visiškai netrukdo; 5 – stipriai trukdo)

	1	2	3	4	5
Biurokratija	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sudėtinga organizacinė struktūra	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Darbuotojų nesuinteresuotumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vadovų nesuinteresuotumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teisinės sistemos ribojimai	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sudėtingi ryšiai ir priklausomybė nuo kitų institucijų	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nepalankus politinis klimatas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Veiklos ir IT nesuderinamumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nesugebėjimas pritraukti kvalifikuoto žmogiškojo kapitalo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nenoras keistis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lėtas ir centralizuotas sprendimų priėmimas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kompetencijų trūkumas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Ar sutinkate su teiginiu, jog planuojant bei vykdant transformacijos veiklas, jūsų organizacija efektyviai:

	visiškai nesutinku	nesutinku	nei sutinku, nei nesutinku	sutinku	visiškai sutinku
Panaudoja duomenis planuojant, analizuojant ar priimant sprendimus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pritaiko esamą IT architektūrą, kad ji atitiktų kliento poreikius	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Užtikrina atitiktį saugumo reikalavimams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Įtraukia piliečius ir kitas suinteresuotas šalis dalyvauti procese	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Parengia lankstų planą, atvirą nesėkmėms, perplanavimui ir eksperimentavimui	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sukuria bendrą transformacijos ir pokyčio viziją	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Skiria pakankamai išteklių, tokių kaip biudžetas, žmonės ir laikas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apibrėžia tikslus ir rezultato matavimo priemones	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Išnagrinėja naujas aktualias technologijas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Išanalizuoja ir optimizuoja senus procesus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pakelia esamų darbuotojų kompetencijas ar kvalifikaciją	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Ačiū, kad atsakėte į pagrindinius klausimus. Būtume dėkingi, jei atsakytumėte keletą paskutinių klausimų apie jūsų organizaciją ir jūsų rolę joje.

Jūsų organizacijos (institucijos) tipas:

- ☐ Ministerija
- ☐ Biudžetinė įstaiga
- ☐ Valstybės įmonė
- ☐ Savivaldybė
- ☐ Savivaldybės įmonė
- ☐ Viešoji įstaiga
- ☐ Kita: _____

Darbuotojų skaičius:

- ☐ Mažiau nei 20
- ☐ 21-50
- ☐ 51-100
- ☐ 101-250
- ☐ 251-500
- ☐ 501 ir daugiau

Kiek laiko dirbate viešajame sektoriuje?

- ☐ 0-1 m.
- ☐ 1-2 m.
- ☐ 2-5 m.
- ☐ 5-10 m.
- ☐ 10 m. ir daugiau

Kiek laiko dirbate esamoje darbovietėje?

- ☐ Mažiau nei vienerius metus
- ☐ 1-2 metus
- ☐ 2-5 metus
- ☐ 5-10 metų
- ☐ 10 metų ir daugiau

Kokias pareigas šiuo metu užimate?

- ☐ Organizacijos vadovo
- ☐ Organizacijos vadovo pavaduotojo
- ☐ Skyriaus vadovo
- ☐ Vyriausiojo specialisto
- ☐ Kita: _____

Appendix B. Variable Correlation Matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1 IDGT: People		.60	.45	.54	.58	-.23	-.19	-.24	-.18	-.09	-.06	-.04	-.07	-.12	-.16	-.17	-.11	.31	.34	.29	.28	.32	.26	.23	.28	.29	.27	.32
2 IDGT: Culture	.60		.64	.55	.49	-.24	-.28	-.31	-.35	-.14	-.11	-.10	-.10	-.24	-.29	-.26	-.24	.50	.34	.34	.32	.44	.43	.29	.42	.39	.40	.31
3 IDGT: Structure	.45	.64		.55	.48	-.20	-.21	-.25	-.26	-.12	-.05	-.03	-.05	-.30	-.23	-.28	-.25	.44	.30	.23	.29	.42	.41	.34	.40	.37	.31	.35
4 IDGT: Processes	.54	.55	.55		.62	-.24	-.20	-.16	-.24	-.08	-.10	-.09	-.10	-.21	-.19	-.30	-.25	.43	.34	.26	.28	.39	.37	.37	.42	.36	.40	.34
5 IDGT: IT systems	.58	.49	.48	.62		-.20	-.23	-.13	-.18	-.01	-.03	-.03	-.13	-.13	-.16	-.26	-.17	.40	.37	.33	.31	.33	.38	.36	.43	.45	.35	.32
6 B: Bureaucracy	-.23	-.24	-.20	-.24	-.20		.49	.30	.36	.48	.37	.29	.33	.40	.34	.46	.44	-.27	-.28	-.21	-.08	-.18	-.30	-.25	-.25	-.23	-.20	-.21
7 B: Complex organizational structure	-.19	-.28	-.21	-.20	-.23	.49		.37	.39	.38	.25	.27	.40	.29	.43	.53	.33	-.24	-.19	-.15	-.08	-.09	-.18	-.12	-.16	-.21	-.20	-.17
8 B: Staff disinterest	-.24	-.31	-.25	-.16	-.13	.30	.37		.57	.38	.10	.22	.23	.39	.64	.48	.50	-.28	-.20	-.16	-.06	-.17	-.16	-.13	-.17	-.17	-.19	-.24
9 B: Managerial disinterest	-.18	-.35	-.26	-.24	-.18	.36	.39	.57		.43	.14	.31	.30	.37	.57	.53	.48	-.35	-.29	-.24	-.12	-.20	-.27	-.19	-.24	-.30	-.27	-.26
10 B: Limitations of the legal framework	-.09	-.14	-.12	-.08	-.01	.48	.38	.38	.43		.42	.43	.34	.36	.37	.43	.37	-.15	-.12	-.16	-.09	-.09	-.14	-.12	-.07	-.13	-.12	-.13
11 B: Dependence on other institutions	-.06	-.11	-.05	-.10	-.03	.37	.25	.10	.14	.42		.45	.39	.29	.12	.29	.26	-.16	-.06	-.16	-.06	-.07	-.10	-.19	-.13	-.11	-.18	-.16
12 B: Unfavorable political climate	-.04	-.10	-.03	-.09	-.03	.29	.27	.22	.31	.43	.45		.41	.30	.19	.30	.32	-.16	-.10	-.21	-.08	-.11	-.12	-.19	-.14	-.19	-.18	-.20
13 B: Operational and IT incompatibility	-.07	-.10	-.05	-.10	-.13	.33	.40	.23	.30	.34	.39	.41		.28	.28	.37	.35	-.16	-.08	-.15	-.04	-.09	-.12	-.10	-.10	-.11	-.10	-.16
14 B: Inability to attract qualified human capital	-.12	-.24	-.30	-.21	-.13	.40	.29	.39	.37	.36	.29	.30	.28		.43	.46	.67	-.26	-.19	-.14	-.06	-.23	-.22	-.32	-.15	-.13	-.13	-.19
15 B: Reluctance to organizational change	-.16	-.29	-.23	-.19	-.16	.34	.43	.64	.57	.37	.12	.19	.28	.43		.58	.54	-.21	-.18	-.10	-.04	-.16	-.20	-.11	-.20	-.13	-.18	-.21
16 B: Slow and centralized decision making	-.17	-.26	-.28	-.30	-.26	.46	.53	.48	.53	.43	.29	.30	.37	.46	.58		.61	-.35	-.27	-.20	-.12	-.21	-.28	-.34	-.28	-.32	-.32	-.31
17 B: Lack of competencies	-.11	-.24	-.25	-.25	-.17	.44	.33	.50	.48	.37	.26	.32	.35	.67	.54	.61		-.34	-.28	-.25	-.11	-.25	-.32	-.32	-.30	-.28	-.25	-.31
18 D: Uses data for planning, analysis, decisions	.31	.50	.44	.43	.40	-.27	-.24	-.28	-.35	-.15	-.16	-.16	-.16	-.26	-.21	-.35	-.34		.57	.50	.41	.47	.51	.49	.57	.51	.55	.43
19 D: Adapts existing solutions for new needs	.34	.34	.30	.34	.37	-.28	-.19	-.20	-.29	-.12	-.06	-.10	-.08	-.19	-.18	-.27	-.28	.57		.49	.47	.47	.47	.44	.46	.49	.49	.46
20 D: Ensures security compliance	.29	.34	.23	.26	.33	-.21	-.15	-.16	-.24	-.16	-.16	-.21	-.15	-.14	-.10	-.20	-.25	.50	.49		.39	.39	.40	.42	.40	.47	.47	.37
21 D: Involves stakeholders in the process	.28	.32	.29	.28	.31	-.08	-.08	-.06	-.12	-.09	-.06	-.08	-.04	-.06	-.04	-.12	-.11	.41	.47	.39		.52	.46	.36	.43	.42	.37	.36
22 D: Plans DGT flexibly, open to experimentation	.32	.44	.42	.39	.33	-.18	-.09	-.17	-.20	-.09	-.07	-.11	-.09	-.23	-.16	-.21	-.25	.47	.47	.39	.52		.71	.54	.60	.60	.52	.52
23 D: Develops a shared transformation vision	.26	.43	.41	.37	.38	-.30	-.18	-.16	-.27	-.14	-.10	-.12	-.12	-.22	-.20	-.28	-.32	.51	.47	.40	.46	.71		.60	.67	.65	.55	.54
24 D: Allocates sufficient resources	.23	.29	.34	.37	.36	-.25	-.12	-.13	-.19	-.12	-.19	-.19	-.10	-.32	-.11	-.34	-.32	.49	.44	.42	.36	.54	.60		.58	.59	.48	.58
25 D: Defines objectives and measures of result	.28	.42	.40	.42	.43	-.25	-.16	-.17	-.24	-.07	-.13	-.14	-.10	-.15	-.20	-.28	-.30	.57	.46	.40	.43	.60	.67	.58		.65	.54	.49
26 D: Explores relevant new technologies	.29	.39	.37	.36	.45	-.23	-.21	-.17	-.30	-.13	-.11	-.19	-.11	-.13	-.13	-.32	-.28	.51	.49	.47	.42	.60	.65	.59	.65		.64	.61
27 D: Analyzes and optimizes old processes	.27	.40	.31	.40	.35	-.20	-.20	-.19	-.27	-.12	-.18	-.18	-.10	-.13	-.18	-.32	-.25	.55	.49	.47	.37	.52	.55	.48	.54	.64		.58
28 D: Invests in employee upskilling	.32	.31	.35	.34	.32	-.21	-.17	-.24	-.26	-.13	-.16	-.20	-.16	-.19	-.21	-.31	-.31	.43	.46	.37	.36	.52	.54	.58	.49	.61	.58	

Appendix C. SPSS Collinearity Diagnostics and Regression Output

Collinearity Diagnostics

Syntax	REGRESSION /MISSING LISTWISE /STATISTICS COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT IDGT /METHOD=ENTER OMB1 OMB2 OMB3 OMB4 EB1 EB2 EB3 OMB5 EB4 OMB6 OMB7 OMB8 ITD1 ITD2 ITD3 OMD1 OMD2 OMD3 OMD4 OMD5 OMD6 OMD7 OMD8.
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Model		Collinearity Statistics	
		Tolerance	VIF
1	B: Bureaucracy	.549	1.823
	B: Complex organizational structure	.571	1.750
	B: Staff disinterest	.485	2.061
	B: Managerial disinterest	.487	2.051
	B: Limitations of the legal framework	.555	1.800
	B: Dependence on other institutions	.625	1.601
	B: Unfavorable political climate	.642	1.557
	B: Operational and IT incompatibility	.666	1.502
	B: Inability to attract qualified human capital	.460	2.175
	B: Reluctance to organizational change	.420	2.379
	B: Slow and centralized decision making	.406	2.466
	B: Lack of competencies	.369	2.706
	D: Uses data for planning, analysis, decisions	.460	2.172
	D: Adapts existing solutions for new needs	.517	1.936
	D: Ensures security compliance	.600	1.667
	D: Involves stakeholders in the process	.621	1.611
	D: Plans DGT flexibly, open to experimentation	.394	2.540
	D: Develops a shared transformation vision	.341	2.933
	D: Allocates sufficient resources	.424	2.356
	D: Defines objectives and measures of result	.400	2.501
	D: Explores relevant new technologies	.359	2.786
	D: Analyzes and optimizes old processes	.449	2.227
	D: Invests in employee upskilling	.475	2.107

Ordinal Logistic Regression

Syntax	PLUM IDGT WITH OMB1 OMB2 OMB3 OMB4 EB1 EB2 EB3 OMB5 EB4 OMB6 OMB7 OMB8 ITD1 ITD2 ITD3 OMD1 OMD2 OMD3 OMD4 OMD5 OMD6 OMD7 OMD8 /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5) PCONVERGE(1.0E-6) SINGULAR(1.0E-8) /LINK=LOGIT /PRINT=FIT PARAMETER SUMMARY TPARALLEL.
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Case Processing Summary

		N	Marginal Percentage
IDGT: Overall	low	23	8.7%
	medium	91	34.3%
	high	107	40.4%
	very high	44	16.6%
Valid		265	100.0%
Missing		0	
Total		265	

Note that there are no data points where IDGT = 1.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	659.054			
Final	514.216	144.838	23	.000

Link function: Logit.

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	862.688	769	.010
Deviance	514.216	769	1.000

Pseudo R-Square

Cox and Snell	.421
Nagelkerke	.459
McFadden	.220

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[IDGT = 2]	1.694	1.061	2.548	1	.110	-.386	3.774
	[IDGT = 3]	4.535	1.088	17.359	1	.000	2.402	6.668
	[IDGT = 4]	7.293	1.146	40.513	1	.000	5.047	9.539
Location	OMB1	-.091	.135	.459	1	.498	-.355	.173
	OMB2	-.403	.143	8.012	1	.005	-.683	-.124
	OMB3	-.100	.147	.463	1	.496	-.387	.188
	OMB4	.018	.140	.017	1	.896	-.256	.293
	EB1	.131	.142	.844	1	.358	-.148	.410
	EB2	-.022	.127	.029	1	.864	-.271	.228
	EB3	.151	.124	1.486	1	.223	-.092	.393
	OMB5	.074	.136	.298	1	.585	-.192	.340
	EB4	-.314	.151	4.340	1	.037	-.609	-.019
	OMB6	-.158	.161	.968	1	.325	-.473	.157
	OMB7	-.068	.160	.181	1	.671	-.381	.245
	OMB8	.275	.184	2.229	1	.135	-.086	.636
	ITD1	.328	.194	2.846	1	.092	-.053	.709
	ITD2	.190	.190	1.003	1	.317	-.182	.562
	ITD3	.072	.176	.167	1	.683	-.273	.417
	OMD1	.115	.162	.506	1	.477	-.203	.433
	OMD2	.459	.210	4.764	1	.029	.047	.870
	OMD3	.272	.209	1.692	1	.193	-.138	.683
	OMD4	-.136	.176	.592	1	.442	-.481	.210
	OMD5	.237	.198	1.431	1	.232	-.151	.624
	OMD6	.140	.209	.450	1	.502	-.270	.551
	OMD7	.209	.197	1.128	1	.288	-.176	.594
	OMD8	.092	.180	.258	1	.611	-.262	.445

Test of Parallel Lines^a

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	514.216			
General	464.825 ^b	49.391 ^c	46	.339

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.^a

a. Link function: Logit.

b. The log-likelihood value cannot be further increased after maximum number of step-halving.

c. The Chi-Square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.