Doctoral School of Regional and Business Administration Sciences

László Buics

Servitization of Public Services:
Examination of Hungarian Public Services in a Process Management
Approach

Doctoral dissertation

Supervisor: Edit Süle, PhD, Associate Professor
Széchenyi István University, Győr
Department of Marketing and Management
Kautz Gyula Faculty of Economics

Győr, 2021

SZÉCHENYI EGYETEM
UNIVERSITY OF GYŐR

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Author's Declaration

No portion of the work referred to in this dissertation has been submitted in support of an application for another degree or qualification of this or any other university or any other institution of learning.

Furthermore, this dissertation contains no material previously written and/or published by another person, except where an appropriate acknowledgement is made in the form of bibliographical references, etc.

Acknowledgement

Most of all I would like to thank to my parents, Erzsébet and Lajos, my sister, Réka, and my whole family for their support and encouragement during this extraordinary journey. Four years have passed like a blink of an eye but they were always there when I needed. The most important experience I have gained is that successful involvement in a doctoral program requires at least as much a supportive atmosphere as relentless determination.

I would like to express my special gratitude to my supervisor Dr. Edit Süle for all her support, patience and kindness during the previous years. She guided me along this journey and helped me to develop my skills and find the right direction every time when I felt lost.

I also would like to thank to my former supervisor, Professor Gyula Vastag, who involved me into the doctoral program and shaped my vision and attitude regarding the world of academic life.

I also want to thank to Eisingerné Boglárka Balassa, my best co-author who always pushed me forward when I felt stuck and motivated me with her passion and ideas.

I am very grateful for all the knowledge and experience I gathered during my studies thanks to the talented professors who shared their wisdom with us. For this opportunity, I am especially grateful for the SzEEDS^M management team, Professor Zoltán Baracskai, Professor László Komlósi, Professor Márta Konczosné Szombathelyi, Dr. Katalin Feketéné Czakó and Tihana Vasic who together made this possible.

I would like to also express my gratitude towards my colleagues and friends who supported me along the road with encouraging words and patience.

Finally yet importantly, I would like to thank to my fellow students László Szendrődi, Attila Sóti, Zoltán Dobra, and Máté Tóth for the mutual support and amazing experiences. Guys, because of you this was not just a journey of knowledge, but also an adventure of a lifetime.

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Key to Abbreviations

UST – Unified Services Theory

PAM – Public Administration and Management

PSDL – Public Service Dominant Logic

NPM – New Public Management

NPG – New Public Governance

NWS – Neo-Weberian State

OSS – One-Stop Shop

DESI - Digital Economy and Society Index

KPI – Key Performance Indicator

SBP – Service Blueprinting

PCN – Process-Chain Network

BPM – Business Process Modeling

DES – Discrete Event Simulation

WT – Waiting time

PT – Process Time

LT – Lead Time

UT – Utilization

ITIL - Information Technology Infrastructure Library

COBIT - Control Objectives for Information and Related Technologies

ProcessSim – Process Simulation Software created for Government Window Operations

PlantSimulation – Tecnomatix Plant Simulation Software created by Siemens

1. Introduction

The scope of public services and the way public services are provided have undergone a significant transformation in recent decades. The role of the state and public administration, the relationship between the public administration and society can be examined from several approaches. In addition to the traditional values of legitimacy, impartiality and operation according to formalized rules and procedures, in the last decades types of expectations have emerged towards the operation of public administration. These expectations include more transparency, greater accountability, the more efficient operation of public services and the provision of "personalized" public services that are better tailored to the needs of citizens.

According to Frederickson (1996), the main aspects that public service providers must keep in mind are economy and efficiency regarding the available resources such as time, money, human resources, etc. Public service providers should pursue the most reasonable, optimal use of these resources while providing public service meaning that during the operation the amount of expenditure and wasted resources should be minimal.

On the other hand, when assessing the functioning of the public administration, a key question is whether the public service provided has achieved its intended purpose. To what extent it has contributed to meeting social needs, and to what extent it has been adapted to individual expectations? This is a question of the effectiveness of public services. Improving the efficiency and effectiveness of public administration, and more specifically of public service delivery, is closely linked to streamlining public service processes (Kovács, 2019).

One way to rationalize public service delivery is supporting it through better process management. The aim of process management is to harmonize processes with the goals of the system, designing processes in a way that they can fully support the desired goal. The transparent planning and implementation of processes helps to monitor and measure performance thus identifying and correcting possible dysfunctions in the public service delivery process becomes easier.

In the age of ever-increasing stakeholder expectations, developing new and improving on existing public services is a challenge for every government (Lathrop, Ruma, 2010; Ringold et al., 2013; O'Toole, 2015). These expectations in the globalized and rapidly digitalizing world are pushing governments to find new ways to meet the needs of their citizens at the same or higher levels of efficiency than before (Casalino et al., 2013). Because of this public administration as a profession is facing increasing stakeholder expectations (Lathrop, Ruma,

2010; Ringold et al., 2013; O'Toole Jr., Kenneth, 2015). Solving the complex problems of knowledge economy requires the collaboration of different actors in order to the regions to mobilize and utilize sources, accelerate growth and improve competitiveness (Tamándl et al., 2014). The satisfaction with actors in public sector can improve the competitiveness of the cities (Filep et al., 2010). The citizens of a state can be considered as customers, but customer satisfaction is a complex concept which is difficult to define properly (Stoker, 2006; Meynhardt, 2009). Moreover, the most attractive opportunities for IT companies are the solutions required by governments, manufacturing companies, and banks, so the IT companies are also interested in entering a new market (Reicher, 2014). The dominant approach in the public service sector is the Weberian model in Eastern European countries (Jenei, 2009; Drechsler, 2014; Kovács, Hajnal, 2016). After the regime changing the governments started to improve the public sectors in the Eastern European countries. First they used the New Public Management model to change the public services as there were several positive examples out there (Barberis, 1988; Kettl, 1995; O'Toole, 1997; Kaboolian, 1998; Terry, 1999; Lindquist, Paquet, 2000; Stark, 2002; Hood, Peters, 2004). The expectation of the NPM was to improve the methods used and to make them more flexible with higher consumer satisfaction in the public sector. But of course there were also examples for making things worse than before (Osbore, Gaebler, 1992; Mintzberg, 1996; Drechsler, 2005) and proved to be ineffective in several aspects later, especially in Eastern European countries (Pollitt-Bouckaert 2000; Hajnal, 2004; Drechsler, 2005, 2008; Nemec, 2010; Bouckaert, 2011; Drechsler et al., 2014).

Public management is undergoing a major transformation today. Processes that are considered traditional have become obsolete, and this fact forces the actors of the public sector to face new challenges on the field of public management. The processes of public management need to be reconsidered and transformed according to the standards and expectations of modern process management, and the tasks of public service operators must be reconsidered. The role of the public servant can no longer be interpreted only as the executor of the steps of the processes. Public servants know their processes, with all their advantages and disadvantages, strengths and weaknesses. This means that partially they bear the knowledge, which can lead to the solution of changing the processes. On the other hand, customers also have useful knowledge about public service processes and procedures. This means that their opinion is also needed to create new types of systems.

The Author holds an economist BSc degree and a logistics management MSc degree and has a special interest in service process management. The Author had the opportunity to participate in several research projects during the doctoral program including the Hungarian Public Administration and Public Service Development Operational Program (KÖFOP), which provided valuable insights about the current Hungarian administration system and largely contributed to the completion of the thesis.

1.1. Objectives and Methodology of the Dissertation

The purpose of the thesis is to approach Hungarian public services from a managerial angle, focusing on service process management with the help of Servitization (Vandermerwe, Rada, 1988) and Unified Services Theory (Sampson, 2001, 2010). The thesis aims to offer a combination of practical tools for analysis in order to improve the efficiency and effectiveness of public service delivery, thus affecting customer satisfaction positively.
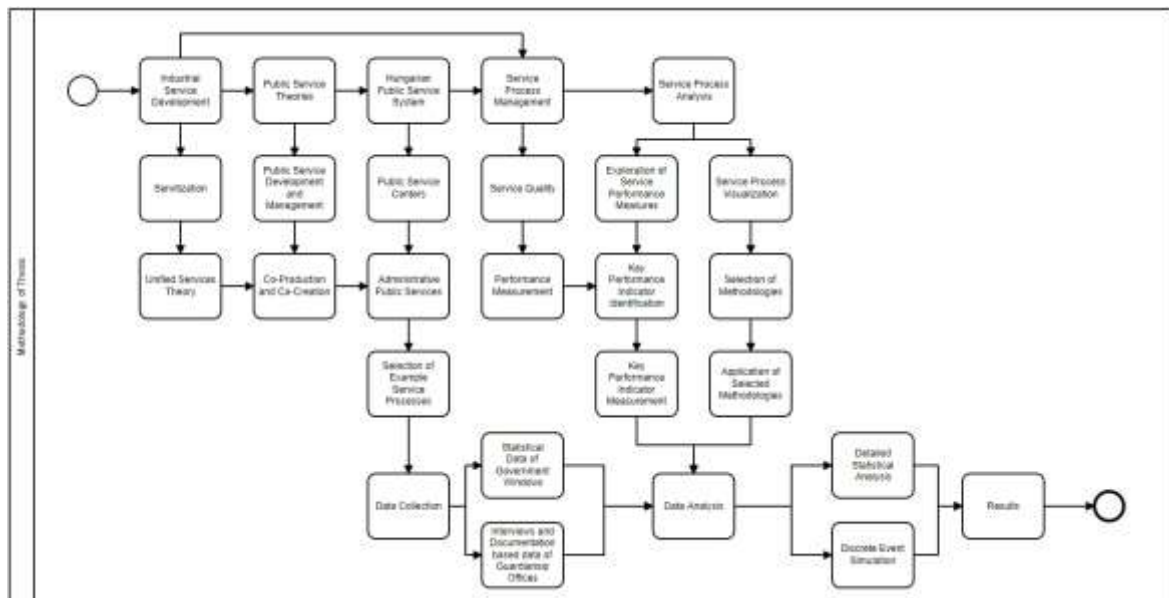
Figure 1: Research Methodology of the Thesis
Source: Author's own creation

The thesis uses a grounded theory (Glaser, Strauss, 1967) approach to examine the literature of public services and industrial service process management in order to formulate new connections, to find research gaps and to develop research questions in the process.

According to Goulding (2002), this research strategy is particularly helpful to explore a wide range of business and management issues.

The grounded theory methodology offers systematic and at the same time flexible guidelines for data collection and analysis as according to Eisenhard and Grabener, (2007) this process works as a recursive cycling between literature reviews, theory conceptualization and data collection, thus it can be interpreted as a sequential research process in order to find connections and discover research gaps.

There are several grounded theory approaches (Collis, Hussey, 2003; Suddaby, 2006; Eisenhardt; Graebner, 2007; Bryman, Bell, 2007), but generally grounded theory is an interpretive process, as a highly creative one according to Suddaby (2006) which requires researchers to develop a tacit knowledge of, or feel for, their data. According to Bailey et al. (2017), this methodological approach is appropriate to examine organizational operations from an employee perspective and according to Charmaz (2006), it is a good approach when studying individuals and their interactions with larger processes.

According to Edmondson and McManus (2007) grounded theory applies particularly well in underdeveloped research areas where the research is focusing on answering research questions that address "what", "how" and "why" type questions.

Service development and performance measurement has a large international literature as measuring service quality and performance bear key importance for private companies. The quality and performance of service delivery is also an important issue for public service providers, however we know little about the quality and functions of these selected services in details. By using performance indicators these services become measurable and descriptive and the measured values can be associated with the perceived level of service delivery which impacts customer satisfaction.

Performance measurement is a broad topic, and the measurement of efficiency and effectiveness bears key importance in any organizations life in order to be successful. One aspect of the dissertation is why it is difficult to interpret and measure service processes compared to physical processes. The thesis shows how the necessary data from the service processes can be extracted in order to be measured under different conditions, and how does analyzing this statistical data contribute to determine the efficiency and effectiveness of the system with the help of an industrial approach. The thesis draw attention to the fact that the

available data is not uniform, based on the characteristics and complexity, different approaches are needed but nevertheless the same measurement methods can be applied.
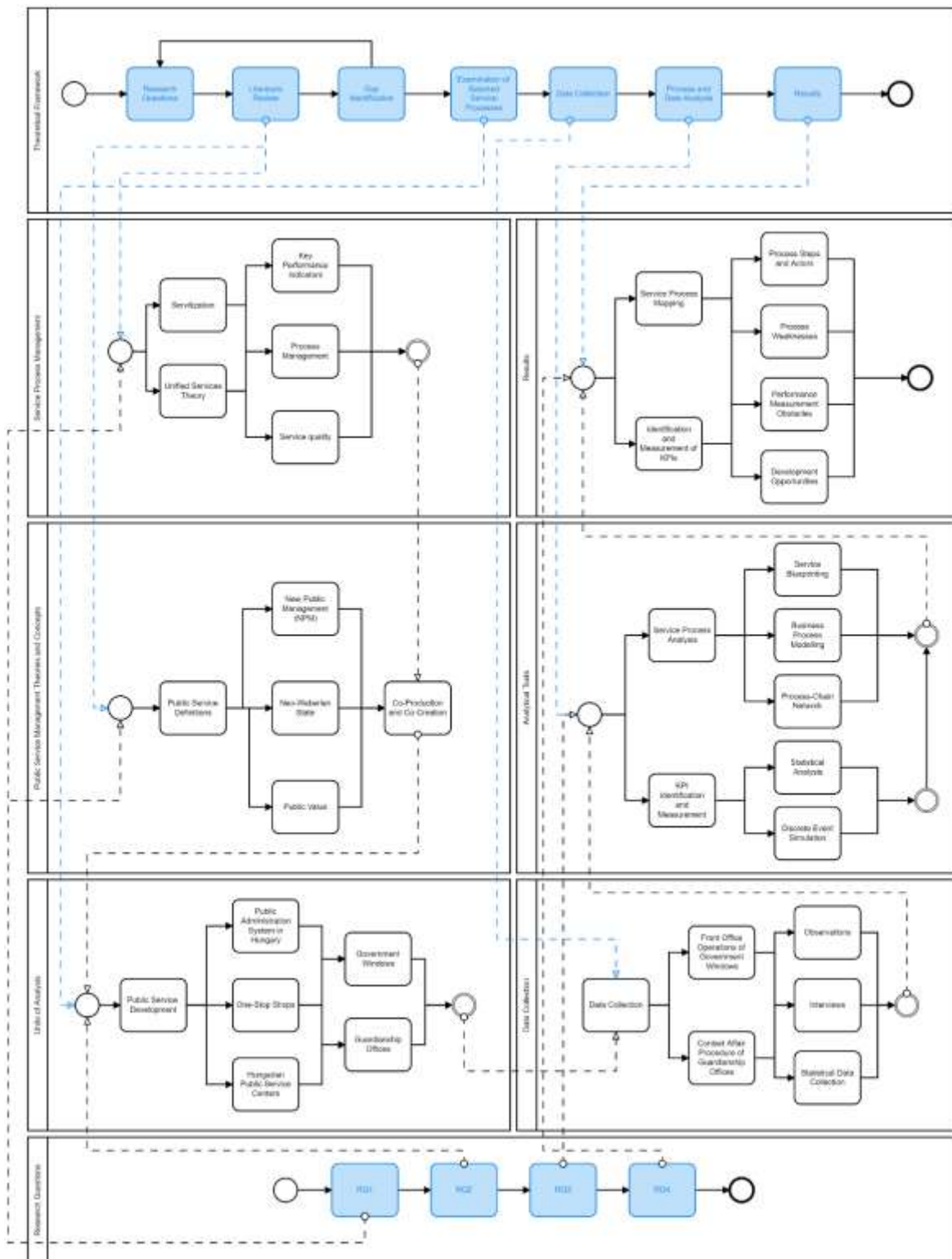
Figure 2: Structure of the Thesis
Source: Author's own creation

The major objectives of the dissertation can be summarized as follows:

To show how Hungarian public services can be examined comprehensively by providing a new approach towards public service management.

- The structure of Hungarian administrative public service system is examined in details
- Two service process examples were selected for analysis
- Analysis is based on data collected by observation, interviews and statistics
- Selected combination of analytical tools were used to map and analyze public service processes

To provide a theoretical approach and methodological toolkit with which these services can be measured and improved.

- The dissertation presents how the selected methods and measures can be used generally to review processes based on the collected data

To identify and measure objective time-related key performance indicators in public service context.

- Quality and performance of service delivery is important issue for public service providers as well to enhance measurability/quantifiability of public services
- KPIs help to measure and describe important service characteristics and the perceived level of service delivery which affects customer satisfaction
- For better design, planning, development and delivering of public services we need to know the main indicators, which define these service processes

For the better planning, developing and delivering of public services we need to know the performance indicators, which define these service processes. The thesis aims to provide help for public service managers by connecting private and public service development theories and by providing a set of practical tools which can be used together to analyze service processes in order to understand and manage them better. The goal of the thesis is to offer an analogy by presenting how the selected methods and measures can be used generally to review processes whether we are speaking about an industrial, manufacturing or a public service if we use a holistical management approach.

The thesis aims to show how Hungarian public services can be examined comprehensively through two examples with a selected combination of analytical tools based on the

international public service, and process management literature. The goal of the thesis is to recommend the application of these tools in public service development. The thesis present how these tools can be applied together to map and analyze public service processes, building on observations, interviews and available statistical data in order to identify and measure objective time-related key performance indicators. The results of the thesis can be useful for decision-makers and legalisators to evaluate service processes to gain deeper insights about the level of service quality and efficiency based on the analyzed data, using an industrial process management perspective.

The thesis aims to provide a cross-sectional picture of the actual service operation in case of the selected public services based on real data collected by observation, interviews and statistics. The thesis aims to show how these services are typically conducted, and to present how process mapping and analyzing can contribute to the better understanding of the selected processes, and thus result in the better delivery of public services.

The thesis analyze selected service processes from the Hungarian public services to show the way of service delivery from the point of view of the service provider and to show what are the most important service phenomenon which can describe the service characteristics and performance based on the available data. The thesis do not aim to give a complete picture about the national public service system, it only analyzes the selected types of services to gain insights about service quality by emphasizing the importance of the used key performance indicators as they show how the customer perceives the examined services.

The thesis examines both simple and more complicated public services and to create a comprehensive picture of the service process of the selected public services. As an example, the thesis is using the front office operations of Government Windows and the Contact Affair Procedure of Guardianship Offices as examples of simple and more complex services. The thesis performs an international literature review to identify theoretical connections and objective key performance indicators, then performs a detailed statistical analysis to show how the data needed to measure the KPIs can be extracted from the available dataset. The thesis also applies service process mapping methodologies to map and visualize the selected service processes in order to create a comprehensive overlook.

Government Windows, as part of the Hungarian administrative reforms, were established almost a decade ago and serve as the main access point between the citizens and the state ever since (Buics, Süle, 2020). The thesis statistically analyze collected data (45234 records)

from a Government Window and identify key performance indicators regarding service quality and excellence based on the related literature. The analyzed data contains the arrival times, waiting for times and processing times of citizens and their cases during the front office operations between 1st December 2016 and 31st November 2017. The processed data is not open source, it was provided by higher authorities and government window officials upon request during the KÖFOP project.

In a Contact Affair Procedure separated parents are involved to settle their differences with the help of the Guardianship Office administrator. The thesis presented and analyzed an individual case to show the complexity of this procedure as customers can submit several applications and appeals against previous decisions, which altogether can trigger the process multiple times. The processed data is not open source, it was provided by higher authorities and guardianship office administrators upon request during the KÖFOP project.

In case of the contact affair procedure, we collected both qualitative and quantitative data by making deep interviews with Guardianship Office administrators and by processing systematic information of individual contact affair procedures. We presented and analyzed an individual case in order to show the complexity of the process. According to Buics and Eisingerné Balassa (2020) due to legal restrictions, the administrators have 60 days to finish a process or they have to pay a fine. Partially because of this burden and because other service inefficiencies administrators are sometimes forced to exclude the involvement of outside parties from the process as waiting for their response could potentially lengthen the process beyond the deadline. Administrators generally consider this process very stressful as they have to manage multiple cases at the same time and especially because due to the dissatisfaction of the customers regarding the result they often submit applications to trigger the start of the process again, which can lead to the distortion of a family case for several months, even a year in extreme cases.

The intention of the thesis is to provide a new approach towards public service management by examining the special environment and components of these kinds of services from the point of view of process management and offering a set of management tools never used together before on Hungarian public services in order to analyze them and to increase their efficiency and effectiveness resulting in the increase of customer satisfáction as well.

The theoretical and methodological background of the thesis stands on three main pillars:

- Public service management theories and concepts (New Public Management, Neo-Weberian State, E-Government, E-Governance, Public Value, Co-Production, Co-Creation)

- Service process management and the importance of customer involvement in service processes (Servitization, Unified Services Theory, Process Management, Service Quality)

- Process analysis centered approach by using analytical service process management methods (Service Blueprinting, Business Process Modeling, Process-Chain Network, Discrete Event Simulation)

The thesis aims to examine how these selected public service processes could be servitized in order to make them more effective, efficient and customer centric both on a broader level (Government Window front office operations) and on a deeper more specialized level (Contact Affair Procedure). By using the same set of tools, the thesis aims to show the usefulness of the combined theoretical and methodological approach on both levels.

The thesis builds on the theory of Co-Production and Co-Creation in case of public service development and delivery presenting its importance whether we are speaking about a New Public Management or a Neo-Weberian State approach. After establishing the theoretical background, the thesis presents the methods used to model, analyze and evaluate public service processes:

- Service Blueprinting (Shostack, 1981a, 1981b, 1984, 1987; Kazemzadeh et al., 2015; Zeithaml et al., 2009; Fließ and Kleinaltenkamp, 2004) is based on the customer view and can be used to map and visualize the interactions between the service providers and service users to get a whole picture about a given service from the start to the end.

- Business Process Modeling (Ko, Lee & Lee, 2009; Recker, 2010, 2011) categorizes activities in a way to represent organizational responsibilities and communications between participant entities (especially customer and provider), organizational departments, systems, and roles, and has a higher capability to add additional information about concepts when it is needed.

- Process-Chain Network (Sampson 2011, 2012a, 2012b; Kazemzadeh et al., 2015) is another process visualizing method, which helps to identify and link actors of a given process in a systematic way. It has several similarities with service blueprinting but it

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differs from blueprinting in terms of line of visibility for example and has advantages in terms of representing the internal complexities of the processes

• Discrete Event Simulation (Zeigler et al., 2000; Bohács, 2012; Vuksic et al., 2017)The purpose of discrete event simulation is to analyze the behavior of a given system as it allows us to apply changes during experiments to see how the system reacts without affecting the real system.

1.2. Research Questions and Research Gaps

The topic of the thesis is the service process analysis and development of public services with a special focus on selected public service processes. The units of analysis are within the Hungarian public administration system, more closely the front office operations of the Government Window system and a complex service process of Guardianship Offices called contact affair procedure. The thesis aims to use these selected service processes as examples to demonstrate the usefulness of the combined analytical methods and approaches.

The aim of the thesis is to find answers for the following research questions:

RQ-1: What are the relevant theories in public service management and how can it benefit from the industrial process management perspective?

The first (2.1.) and second (2.2.) subchapters of the Literature review chapter are connected to research question one (RQ-1). The first subchapter (2.1.) addresses the public service theories and approaches providing an overview of important definitions and theories. The second subchapter (2.2.) addresses service process management concepts providing an overview of the importance of service quality and key performance indicator measurement.

RQ-2: How does the current Hungarian public service system look like and how does it perform compared to other European Union countries?

The third subchapter (2.3.) of the Literature review chapter is connected to research question two (RQ-2). This subchapter provides an overview of the Hungarian public service system, its development compared to other EU countries and discusses the background of the selected public service processes, which are analyzed later.

RQ-3: What methods are suitable for the exploration and mapping of the structure and process of public services?

The fourth subchapter (2.4.) of the Literature review chapter is connected to research question three (RQ-3). This subchapter provides an overview of the methods used to map, visualize and analyze the selected public services, providing details on process mapping methodologies and discrete event simulation, regarding advantages, disadvantages and applicability in public service context.

RQ-4: How can the public service performance be measured? What performance indicators could best be used to describe the quality and performance of public services?

The first (3.1.) and second (3.2.) subchapters of the Results chapter are connected to research question one (RQ-1). The first subchapter (3.1.) discusses the application of selected process mapping methodologies on Government Window front office operations, the statistical analysis of the collected data, and an example of the application of discrete event simulation based on the analyzed data by using the ProcessSim program. The processed data is not open source, it was provided by higher authorities and government window officials upon request during the KÖFOP project.

The second subchapter (3.2.) discusses the application of selected process mapping methodologies on the Contact Affair Procedure of Guardianship Offices, the statistical analysis of the collected data regarding a complex case with multiple sub-cases, and an example of the application of discrete event simulation based on the analyzed data by using the Plant Simulation program. The processed data is not open source, it was provided by higher authorities and guardianship office administrators upon request during the KÖFOP project.

Figure 3: Research Questions and Main Chapters
Source: Author's own creation

Figure 3 shows the connections between the research questions, the main chapters of the dissertation and also the conceptual link between the results and each other.

The first research question (RQ-1) serves the goal to provide the theoretical framework for both the context of public service management and for the service process quality and performance measurement on a macro level. These both are serving as the background of the topic of the dissertation regarding the examined services and the applied methods.

The second research question (RQ-2) serves the goal to provide the details of the Hungarian public service system with a focus on the context of the selected service processes (Government Window front office operations, Contact Affair Procedure of Guardianship Offices) to show the major characteristics and environment of these service processes.

The third research question (RQ-3) serves the goal to provide the description of the methodologies, which are applied during the analysis of the selected service processes, and present how these methodologies can be connected and used in case of public services and why they are valuable in public service development.

The fourth research question (RQ-4) serves the goal to provide examples on the micro level by analyzing the selected public service processes, building on the topics of the previous research questions and connecting the results to each other. Collected data is analyzed both in case of Government Window front office operations and Contact Affair Procedure of Guardianship Offices do measure key performance indicators identified previously.

Findings of RQ-1 show that the current Hungarian public service system is built on the Neo-Weberian State concept, which emphasizes efficiency and effectiveness and for the successful service development co-production with the customers is vital, but due to the special context cooperation does not necessarily work which makes performance improvement especially difficult. However, performance of service processes can be measured in this context as well by applying key performance indicators well known in the private sector.

Findings of RQ-2 show the current structure of the Hungarian public service system itself, presenting the details necessary to understand the background and context of the later analyzed selected services. It also shows the current development level of the Hungarian public service delivery system compared to other EU countries, emphasizing on the importance of digitalization which is currently the major direction of service process development. Advantages and disadvantages of E-government are also discussed in details.

Findings of RQ-3 show how the used process mapping and simulation methods can be used together to uncover the important steps of service processes in order to find key points where development can be executed for example by the help of digitalization, building on the results and findings of research question two (RQ-2), in order to increase efficiency and effectiveness.

Findings of RQ-4 show the application of the selected methodologies on the selected public service processes (Government Window front office operations and Contact Affair Procedure of Guardianship Offices) providing examples of how the collected data can be used to measure key performance indicators. The thesis presents results in case of simple

and more complex service processes, building on the findings of both research question one (RQ-1), research question two (RQ-2) and research question three (RQ-3).

The thesis aims to contribute towards public service literature in several ways.

It is highly difficult to optimize these service processes, and analyze their elements. The NPM cannot provide practical solutions for this problem, so we have to find other methods and approaches. The theory of Co-Production and Co-Creation (Boyle & Harris 2009; Durose et al., 2013; Nambisan & Nambisan 2013; Osborne et al., 2013, 2016) gives us a practical way to plan and deliver public services, and by the application of servitization a unique approach can be used to involve new methods into the analysis and development of public services.

Servitization (Vandermerwe, Rada, 1988; Neely, 2009; Neely et al., 2011) can be defined as the innovation of an organization's capabilities and processes to better create mutual value. Numerous good examples show in different sectors including finance, transportation, manufacturing (Dachs et al., 2012) and in education (Arantes, 2020) how to create better service offerings that deliver value in use and increase customer satisfaction.

According to Sampson (2001) and Sampson and Froehle (2006) the Unified Services Theory states that services are made service by the significant contribution of customers to the "production" process. Customer input is a necessary and sufficient condition for defining a production process as a service process.

Customer satisfaction bears key importance in successful service delivery and in the public administration and management literature the theory of Co-Production aims to put more focus on customer involvement in service processes. According to Osborne et al. (2016), in this theory the focus is on the way of adding service user participation to the whole service process, and Nabatchi et al. (2017) defines co-production as the involvement of both users and public sector professionals in the delivery of public services.

First of all the thesis aims to link the process development approach of Servitization Vandermerwe, Rada, 1988; Neely, 2008; Neely et al., 2011) with public services by using Unified Services Theory (Sampson, 2001, 2010) to generally define service processes and by connecting it with the theory of Co-Production (Ostrom, 1972; Alford, 2014; Osborne et al., 2016) from public service literature. These industrial and public service development and delivery methodologies share the similar approach, which emphasizes both the

importance of customer participation and the fact that customer participation is actually an inseparable part of the production and consumption of services.

Hood and Peters (2004) pointed out the importance managerialization of public service delivery and its effects regarding the approach of New Public Management. After the regime changing in Easter European Countries the governments started to improve the public sectors according to the principles of the New Public Management model to change the public services as international literature provided many positive examples from developed western countries (Barberis, 1988; Kettl, 1995; O'Toole, 1997; Kaboolian, 1998; Terry, 1999; Lindquist, Paquet, 2000; Stark, 2002; Hood, Peters, 2004). However later the approach of NPM proved to be ineffective, sometimes even contradictive especially in case of Eastern European countries (Bouckaert et al., 2011; Drechsler & Randma-Liiv, 2014; Drechsler, 2005; Drechsler and Kattel, 2008; Hajnal, 2004; Nemec, 2010).

A critical trend called the Neo-Weberian State (NWS) emerged against NPM at the beginning of the 21st century (Frederickson, 1996; Pollitt, Bouckaert, 2004; 2011; Byrkjeflot et al., 2018). While NPM supports the concept of "small state", NWS supports the concept of a "strong state". The NWS approach seeks to strengthen the state and administration through regulation and the restoration of moral values. Nowadays the dominant approach in the public service sector is the Neo-Weberian model both in Hungary and in other Eastern European countries (Jenei, 2009; Drechsler, 2014; Hajnal et al., 2018). However, the efficiency in case of the use of resources, and customer focus and satisfaction are important aspects of the Neo-Weberian State approach as well (Torma, 2014).

Despite of this according to Nemec et al. (2019) while there are many research papers focused on Co-Production and Co-Creation in the international literature, few of these are coming from the Central and Eastern European region. Because of this, secondly, the thesis aims to contribute to literature by the application of Co-Production in the Hungarian public service context by the above mentioned way as the theoretical approach of Co-Production and Co-Creation were not applied before in Hungary during the close examination of public service processes and highlight the importance of customer and provider participation in the process. The thesis aims to help filling in this gap by focusing on selected public services, emphasizing how important is the role of public service employees in such service processes, as they are essential part of the service just as the customers themselves.

In the second part, the thesis uses three service process mapping methodologies, Service Blueprinting, Business Process Modeling and Process-Chain Network to examine, map and visualize public service processes. These methods are commonly used in international literature and there are several examples of using them specifically in public service literature as well regarding Western European countries.

However, these methods, except the proposal of the Electronical Administrative Supervision of Hungary, which highlights the advantages of BPM and marks it as a suitable tool for potential public service development, there were not applied before in Hungary to map, visualize and analyze public service processes in order to increase efficiency and effectiveness. Hence, thirdly, the thesis aims to contribute to literature by the application of these methodologies in a Hungarian context, both to reflect on the previous proposal of the Electronical Administrative Supervision of Hungary, and to provide detailed information about Hungarian public service processes, which could be used to create comparisons with other countries' public services, which bear similar purposes.

Building on the theoretical background and analytical methodologies the thesis aims to examine the front office operations of Government Windows more closely on an every-day level, create a comprehensive picture and identify key performance indicators regarding service quality and excellence based on the related literature. As part of the Hungarian administrative reforms, these service centers were established almost a decade ago and serve as the main access point between the citizens and the state ever since. The analyzed data contains the arrival times, waiting for times and processing times of citizens and their cases during the front office operations between 1st December 2016 and 31st November 2017.

While numerous articles and books discuss the details and effectiveness of the different levels of the newly reformed Hungarian administration system, only a few of them offer an inside (statistical) look into the daily operations of a Government Windows, based on time-related numerical data. Therefore, the thesis aims to contribute to the literature by analyzing the front office operations of Government Windows from this point of view and provide statistical details. Besides this, so far there was no detailed statistical and service process analysis in case of the contact affair procedure of Guardianship Offices, therefore the thesis also aims to contribute to the literature by analyzing this complicated public service in details.

The goal of the thesis is to identify objective key performance indicators and to demonstrate how these KPIs can be measured in a public service context nevertheless of the type and complexity of the given service. The thesis aims to contribute to the literature by applying these performance measurement indicators to public service processes, which bear different characteristics and complexity. The thesis presents how these commonly used KPIs can be measured in different conditions to provide valuable insights about these service processes, which can be used by legalisators to adjust the services in order to increase efficiency and effectiveness.

The thesis also aims to contribute to literature by applying discrete event simulation in public service context to further analyze the selected public service processes and to provide additional details regarding key performance measures. According to literature, there are a few examples in the Eastern-European literature of applying discrete event simulation to public services (Devjak, Peček, 2012; Kovačič, Peček, 2007; Comas et al., 2008), however this thesis is the first, which applies this approach in a Hungarian context in case of the selected and discussed public service processes.

2. Literature review

This part of the dissertation is connected to research questions one, two and three. The first (2.1.) and second (2.2.) subchapters are connected to research question one (RQ-1). The first subchapter (2.1.) addresses the public service theories and approaches providing an overview of important definitions and theories. The second subchapter (2.2.) addresses service process management concepts providing an overview of the importance of service quality and key performance indicator measurement.

The third subchapter (2.3.) is connected to research question two (RQ-2). This subchapter provides an overview of the Hungarian public service system, its development compared to other EU countries and discusses the background of the selected public service processes, which are analyzed later.

The fourth subchapter (2.4.) is connected to research question three (RQ-3). This subchapter provides an overview of the methods used to map, visualize and analyze the selected public services, providing details on process mapping methodologies and discrete event simulation, regarding advantages, disadvantages and applicability in public service context.

As citizen expectations are increasing on the field of public administration the development of new and the improvement of existing public services is a challenge for every government (Lathrop, Ruma, 2010; Ringold et al., 2012; O'Toole et al., 2015; Casalino et al., 2013). These expectations in the globalized and rapidly digitalizing world are encouraging governments to find new methods to satisfy the needs of their citizens at the same or higher levels of efficiency than before.

The cheap and efficient operation of the public administration system poses serious challenges to all governments. Reducing bureaucratic burdens, making administrative processes more efficient and simple, ensuring transparency and comprehensibility, and exploiting the potential of technological development are among the top priorities in this area. However, the development of the public administration and the increase of its efficiency can only be achieved in the long run, which is proven by more than the fact that the modernization of territorial public administration bodies has been on the agenda of Hungarian governments for decades.

In the late seventies and early eighties, to rationalize public spending in some Anglo-Saxon countries, a change in administrative concepts took place: along with the principles of

economy, effectiveness, efficiency, new forms of public organization and public management techniques became widespread. The New Public Management (NPM) was based on the efficiency-oriented business model of the private sector. Among the guiding values are consumer focus, competition between public service providers, which enables consumers to make decisions, the need for performance management of public service organizations, and service and result focus based on consumer satisfaction (Hood & Peters, 2004; Lindquist & Paquet, 2000; Stark, 2002).

The NPM model (which was not implemented consistently in developed countries) has been the subject of many criticisms since the 1990s. One of the most important of these is that it could not deliver on its promise: it seems futile to adopt the business model, the operation of the state has not become more cost-effective from it (Bouckaert et al., 2011; Byrkjeflot et al., 2018; Drechsler & Randma-Liiv, 2014; Drechsler, 2005; Drechsler and Kattel, 2008; Hajnal, 2004; Nemec, 2010).

A critical trend called the Neo-Weberian State (NWS) emerged against NPM at the beginning of the 21st century (Frederickson, 1996; Pollitt, Bouckaert, 2004; 2011; Byrkjeflot et al., 2018). While NPM supports the concept of "small/minimal state", NWS supports the concept of a strong state. The NWS approach seeks to strengthen the state and administration through regulation and the restoration of moral values. Efficiency and customer focus are important aspects of the use of resources (Torma, 2014).

Compared to the situation before 2010, the Hungarian public administration system has undergone several significant changes at both the central and regional levels and the concept of this service-centric, customer-focused public administration system fits well into the trend of Neo-Weberian State (Pollitt, Bouckaert, 2011). As part of these reforms, the Government Window system was created based on one-stop shop like service centers used by several countries worldwide. Government Windows are the customer service offices of the county government offices and district offices that form the backbone of the territorial administration, where citizens can currently handle, initiate and receive information on the progress of the procedure (Buics, 2019; Jenei, 2019; Kovács, 2016, 2019).

The literature review first explores the directions of public administration management such as Public Value (Moore, 1995; Meynhardt, 2009; Alford, Hughes, 2008; Bozeman, 2002), Public Administration and Management (PAM) (Ostrom 1972, Alford 2014, Osborne et al., 2016), New Public Management (NPM) (Barberis, 1988; Kettl, 1995; O'Toole, 1997;

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Kaboolian, 1998; Terry, 1999; Lindquist, Paquet, 2000; Stark, 2002; Hood, Peters, 2004), Public Service-Dominant Logic (PSDL) (Alford, 2016), and E-Governance (Dunleavy et al., 2006; Jeong, 2007; Jun, Weare, 2011). After that the thesis discusses the theoretical approach of Co-Production and Co-Creation theory (Osborne et al 2013, 2016; Boyle, Harris 2009; Nambisan & Nambisan 2013, Durose et al., 2013; Ostrom 1972, Alford 2014), highlighting the importance of citizens in the public service processes. The literature defines co-production "as the voluntary or involuntary involvement of public service users in any of the design, management, delivery and/or evaluation of public services" (Osborne et al., 2016:2). In this international literature review, the thesis focuses on how the role of administrators and clients (participants) of public services are changing and becoming more and more essential during the plan and execution of public services by adapting the approach of Co-Production and Co-Creation theory in public service delivery.

The second part of the literature review discusses Servitization (Vandermerwe, Rada, 1988; Neely, 2008; Neely et al., 2011), Unified Services Theory (Sampson, 2001, 2010) which states that services can be seen as processes. Further on service quality and excellence (Parasuraman et al., 1985; Reichheld and Sasser, 1990; Zeithaml et al., 1990; Randall & Senior, 1994; Ramseook-Munhurrun et al., 2010; Robinson, 2003; Kueng 2000; Neely et al. 2000; Dumas et al., 2013; Van Looy et al., 2016), and key performance indicators (Cachon. Terwiesch, 2013; Brignall et al.,1991; Kaplan and Norton, 2004; Atkkinson, Brown, 2001; Neely et al., 2005; Spitzer, 2007) are discussed regarding service processes which can be used in case of public service processes as well to measure the important characteristics of the examined public services.

In the third part of the literature review the current Hungarian public administrations system (Csite, Oláh, 2011; Gyurita, 2014; Temesi, Linder 2015), One-Stop Shops (Navrasics, 2013, Kovács, Hajnal, 2013), and public service centers like Government Windows (Barta, 2012; Faluvégi, 2012; Hoffman, 2012; Kovács, 2014; Kovács, Hajnal 2016; Kovács, 2016, 2019; Buics, 2019; Jenei, 2019) are discussed. The literature review also discusses the public service development and digitalization levels of Hungary compared to other European Union countries.

In the fourth part of the literature review the service process mapping, visualization and analytical methodologies of Service Blueprinting (Shostack, 1981a, 1981b, 1984, 1987; Kingman-Brundage 1989, 1991, 1993; Bitner et al., 2008; Kazemzadeh et al., 2015;

Zeithaml et al., 2009; Fließ and Kleinaltenkamp, 2004), Business Process Modeling (Ko, Lee&Lee, 2009; Recker, 2010, 2011), Process-Chain Network (Sampson 2011, 2012a, 2012b; Kazemzadeh et al., 2015) and Discrete Event Simulation (Banks et al., 2013; Zeigler et al., 2000; Bohács, 2012; Mes, 2017; Prateek, 2015; Vuksic et al., 2017) are discussed.

2.1. Public service theories and approaches

This subchapter is connected to research question one (RQ-1).

Public service processes can be examined from several approaches. According to Kovács (2019), the primary goal of public administration is to provide public services to members of society that meet their needs and that individuals would not be able to produce individually. The emerging economic, social, political or environmental issues have reshaped continuously the tasks of public administration and the scope of public services. In addition rising civic awareness, rising expectations for quality and efficiency in public services, and, in contrast, shrinking government resources have reshaped thinking about public services and affected the practice of organizing and delivering public services. It is precisely because of the above that the literature dealing with the conceptual definition and description of public services is extremely diverse and colorful. In this context according to Figure 3, this chapter aims to provide insight into the different forms and models of public service provision.
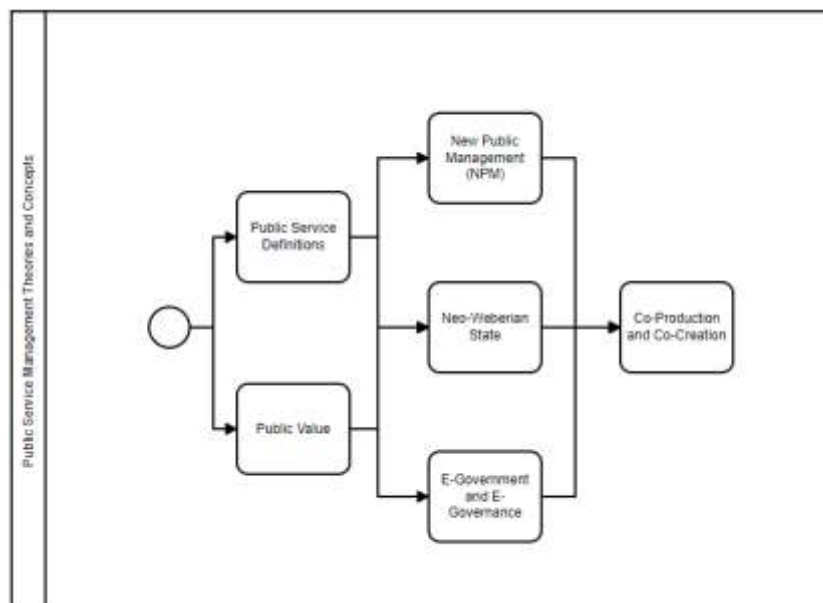
Figure 4: Public Service Management Theories and Concepts
Source: Author's own creation

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2.1.1. Defining public services

In case of public services, there is no single accepted definition (Seley, 1981). According to Boulding, public services are to unilateral or nonreciprocal benefits, provided whether or not the recipient can pay (Boulding, 1971). Public services can also be categorized by broad goals like adequate income and economic opportunity; optimal environmental conditions and provision of basic material needs; optimal health; adequate knowledge and skills; optimal social and personal adjustment and development; and adequately organized social instrumentalities (UWASIS, 1972).

Seley (1981) offers a broader definition according to which public services are services where one or more of the following conditions met: unilateral provision, some public funding, public organization and administration, public planning, public evaluation. This definition also denotes the involvement by the public in paying for, using, and assessing these services (Seley, 1981).

Each discipline seeks to define public services from a different approach and by highlighting their different characteristics (Boda, Scheiring, 2010; Hoffman, 2009).

The economics approach focuses on the distinction between market services, where public services differ most from market services in that they are mostly capital-intensive, slow or non-returnable investments, and no one can be excluded from consuming these goods in most cases, thus consumption of public sservices is not competitive (Kovács, 2019). Therefore, it is not possible to organize public services on a purely market basis. For this reason, it is primarily the responsibility of the state to provide them (Samuelson, 1954).

Jurisprudence examines the legal content of public services and the legal rules of the conditions and framework for the provision of public services. The most important public services are manifested as a fundamental right in the constitutions of most individual countries (Dietz et al., 2011).

The scope, form and range of public services are legally regulated by the state (Hoffman, 2009). For example, it regulates the scope of shareholders, the conditions and quality criteria for the provision of services, may designate the competent administrative body, or limit the forms of provision of services. In most of the developed countries the term of public services often includes healthcare services, emergency services, education, postal service, security and infrastructure on many fields such as transportation, water supply or energy. The

numbers of publicly provided services are different in every state but even if they are not publicly provided or financed, they usually are highly regulated by the government for social or political reasons.

The interpretation of public services in a sociological approach emphasizes the satisfaction of social needs and considers the reduction of social inequalities, the increase of social justice and the solution of social problems to be its main functions (Sullivan, Thompson, 1990).

Political science focuses on the fact that the definition of the scope and form of public services is the result of the bargaining and decision of the current political actors and interest groups. The public services that the state spends more or less on, which public policy programs it supports reflect the values of the political forces in power.

The administrative and management approach focuses primarily on the processes of organizing public services, management, governance and coordination mechanisms, and optimizing the operation of public service providers.

In this thesis, we interpret public services as services that can be used equally by all members of society or a narrower community, target group (circle of beneficiaries). The use of which is not necessarily free, but the primary purpose of providing services is not to make a profit but to contribute to the common good and reduce social inequalities and problems.

These public services can be grouped around the main function of public administration, whether they are related to the general administrative functions, defense functions, safety functions, economic functions, environmental functions, health functions, social protection functions and so on.

To secure the availability of these public services the state is forced to build and maintain a statewide supporting infrastructure. It is necessary to ensure the local accessibility through local offices. Civil servants or public employees who are hired by the elected officials perform these services. The public administration offices are conduits between the government and the citizens, and these local access points where the services can be accessed are considered the most common interface between the people and the state.

Because of this the efficiency and functioning capability of these services shapes people's thoughts about the government itself. At a national level, public services underpin human welfare and economic growth. To supply and provide these public services without any major problems are key tasks for the government (Rondinelli, 2007).

Public services need to be centered on citizens, and need to be responsive to their needs, while delivered with integrity. Promoting greater transparency and enabling ordinary citizens to assess the quality, adequacy and effectiveness of basic services, to voice their needs and preferences and to become involved in innovation offers an opportunity to enable better use of public funds, and improve service delivery (Ringold et al., 2013).

Public services are traditionally organized in a way that puts the public in a passive role, as the recipient of a standardized service. Trying to involve the citizens and make their role from completely passive to at least partially active requires both long time and long-term solutions (Lathrop, Ruma, 2010). However, the relationships between citizens, policy-makers, program managers, and service providers are complicated and are not easily altered through a single intervention (Ringold et al., 2013).

The quality of service delivery is critical for both the government and the citizens. Because of this most governments struggle to respond to present day needs driven by complex challenges, such as those created by aging populations, chronic health conditions, poverty and inequality. Even if the integrity of public resource flows can be secured, these new challenges require new solutions and completely new approaches (Ringold et al., 2013).

In response to the changed circumstances, different government models and public management tendencies have emerged in the last half century with the aim of providing a better answer to today's social and economic challenges. These new trends also represent different solutions in the field of public service provision. The organization and management of public services can differ greatly depending on which actors are involved in the provision of public services, how tasks and responsibilities are divided between the administration and social and economic actors. The tasks and roles of public administration managers and professionals also change depending on the form in which an organization provides public services.

Public service models are related to new public management trends, i.e. the New Public Management paradigm (NPM), which emphasizes neoliberal values and puts the market, the creation of a competitive situation, the suppression of direct state intervention at the center. The other main trend, which were essentially a response to the failures of the NPM, are the Neo-Weberian Paradigm (NWS), which essentially emphasizes the renewal of traditional bureaucratic values and puts the state at the center. The shift from traditional "in-house"

public service delivery to corporate, integrated public administration and socially inclusive public service delivery models can be linked to these new trends.

2.1.2. Public value

According to H. M. Moore (1995), the main goal of the public services is to create public value. As in case of the public services the concept of public value seems to be also hard to define properly, but generally it can be anything, which benefits society as a whole and perceived as beneficial by the citizenship. Moore (1995) states that the main purpose of public administration is to create public value for the citizens. Ultimately, public value can be defined as a value of consumed collectively by citizens, is created by government through laws, regulations and services and reflects the collective construction of what matters for society (Moore, 1995; Meynhardt, 2009; Alford, Hughes, 2008; Bozeman, 2002).

The concept of public value can be understood in an analogous way as the concept of private value. However, there is a big difference between those concepts. In case of private businesses the private value generation is always related to income and profit generation, and trough them it is easily to measure success. In contrast, there is no general indicator in public sector to show evaluators the key variables necessary to determine public value. Public value definition depends on the nature of the public initiative and in the context in which the initiative is developed (Moore, 2014). Public value definition must also consider different views from the stakeholders of the public initiative (Stoker, 2006).

Regardless of the approach, citizens need to be benefited from public initiatives but to determine public value, public officers need to listen to stakeholders' demands (Bozeman 2007; Bozeman, Moulton, 2011). However, it is not as easy as it sounds. Usually different stakeholders have different visions on public value. Something that benefits a particular group of society may harm a different group and vice versa. According to Jacobs (2014) ideological differences can raise complexity even more which lowers acceptance rate among different factions even if their members gain neither harm nor benefit in case of a given public initiative. This makes the creation and implementation of an inclusive public program, policy, or project that creates value for society as a whole, one of the biggest challenges in public administration (Bao et all, 2012).

The outlined complex situations demand from public officers the capability to generate public value for the citizenship by looking for balance between the needs, interests, and

expectations of citizens, between economic development, social justice and environment sustainability. Justice and fairness are hard to achieve in reality because of the difficulties (in time, resources and logistics) to consult citizens constantly using traditional participative methods, and because of the risks of conflicts between social groups and between values or positions that usually appear as mutually exclusive.

2.1.3. New Public Management

New Public Management is one of the modern public administration approaches, which try to give space to new ideas within the field of public administration while also highlights the importance of the citizens' real needs and states that citizens should be treated as customers of the state. In this case, different kinds of management techniques from the private sectors are taken over and used in the public sector for the benefit of the government to enhance efficiency and effectiveness and while doing so it centers the actions on the citizens.

New Public Management originates from the eighties and gained popularity at the beginning of the nineties. The foundations of the New Public Management were laid off in the eighties mostly in England, Australia and especially New Zealand (Stark, 2002; Hood, Peters, 2004), and until the nineties it was mostly seen as a developed country, particularly Anglo-Saxon phenomenon. At the beginning of the nineties, the popularity of the New Public Management started to grow and several variants of NPM techniques appeared in some developing and transitional economies such as management decentralization, performance increasing and more customer orientation (Stark, 2002; Hood, Peters, 2004).

There is a wide set of ideas connected to NPM. According to Kettl New Public Management can be interpreted as the competition between public and private service providers, decentralization and delayering of government bureaus, benchmarking and output measurements, using private sector management tools, and more importantly offering more choice for citizens (Kettl, 1995).

One of the main factors of the New Public Management is the thought that the public administration serves the people and not the other way around and citizens can be effective contributors. However, of course the effectiveness of these NPM solutions can be different and there were examples for making things worse than before (Osborne, Gaebler, 1992; Mintzberg, 1996).

According to literature several contradictions occurred. For example, while Kaboolian states that NPM gives public managers much more discretion (Kaboolian, 1998), while Barberis claims that NPM attempts to limit the discretion of public managers.

Because of these conflicts one of the leading critics, Mintzberg (1996) determined that even though government can learn from business, but the most efforts NPM make to improve governmental structures is just simply useless or even make think worse, (Thomas, 2000) while Osborne's and Gaebler's (1992) opinion were in contrast with Mintzberg's opinion.

As for the critics it is true that during the evolution of NPM techniques the efforts produced several paradoxes (Hood, Peters, 2004) but the basics of this concept can be summarized in these principles: (O'Toole, 1997)

- Suppression of the role of the government, dismantling its functions and increasing the involvement of private market participants
- Effectiveness, efficiency and economy in government (the less is sometimes more)
- Decentralization of decision-making, the transfer of powers to the lower levels of political decision-making and managerial levels (let the driver drive)
- The reduction of hierarchical levels of the administration, by creating quasi-autonomous (agency-type) structures.
- "Marketization", introducing market-type mechanisms and methods in the creation of public services such as outsourcing tasks, complex outsourcing of public services, privatization
- "Managerialism", introducing corporate management techniques in public administration, such as performance measurement, performance-based assessment, strategic planning, benchmarking, and management control systems.
- Another main objective of the New Public Management is the reform and deregulation of the complicated legal system

In the case of most developing countries, reforms in public administration and management have been driven more by external pressures and have taken place in the context of structural adjustment programs. Common reasons behind choosing the NPM approach in case of countries has been the experience of economic and fiscal crises, which triggered the quest for efficiency and for ways to cut the cost of delivering public services (Larbi, 1999; Hood, Peters, 2004).

As we can see the concept of New Public Management can be considered as a set of ideas with the common effort to extend the principles of economic sectors to the state (public) institutions while citizens of the state are also treated as customers. Its goal is the economic modernization of both the public institutions and the state has to create efficient public administration processes. The NPM concept is not simply a corporate management approach to the public administration; it is also an effort to achieve higher rate of efficiency and effectiveness in the operations of the state, while it prefers the neo-liberal state concept, which only supplies the most important social responsibilities. The NPM methods require both economic performance and cost-oriented thinking, and they try to achieve with minimal cost the maximum performance (Buics, 2017).

Later on according to Alford (2016) the public service dominant logic (PSDL) (Osborne et al., 2015; Osborne et al., 2014) came as a reaction to the deficiencies of New Public Management. While NPM focused more on the adoption of manufacturing management elements many scholars argued that certain techniques of business management were unsuited for government services (Alford, Hudges, 2008).

PSDL however stated that public services are produced and consumed at the same time and the users are not only the consumers but also the producers of the service as well. Thus, co-production is an unavoidable part of the service delivery and from the perspective of PSDL co-production is linked directly to the co-creation of value in public service delivery (Alford, Hudges, 2008).

2.1.4. Neo-Weberian State

According to the classical, Weberian bureaucratic model, the operation of the state apparatus is mechanical, impersonal according to written rules (Rónay, 2014). As early as the 1940s, Zoltán Magyary stated, "One of the basic conditions for the renewal of the Hungarian public administration is the reorganization of the relationship between the state, the public administration and the people". According to another well-known saying: "the state must be brought closer to the citizens, the public administration must become more human-centric". He held that the administration has no other right to exist, no other degree than the service of the people and the nation (Balaskó, Molnár, 2019; Kovács, 2019).

Around the 2000s, in parallel with other governance models, another trend emerged, the Neo-Weberian State (NWS), which appears primarily as a critique and counterpoint of the

NPM in the literature (Bouckaert, Pollitt, 2004, 2011; Byrkjeflot, Du Gay, Greve, 2018). In addition to the Scandinavian countries, this concept is popular among the governments of Central European countries as well, including Hungary. NWS emphasizes the importance of a strong state, as it counteracts the harmful effects of market developments, offsets market distortions, and does so democratically and in partnership, in the service of the common good (Torma, 2014).

The state-centered integrated public service model, based on the values of the Neo-Weberian paradigm and whole-government (joined-up government), focuses primarily on strengthening coordination between public administrations. The key motives for this form of public service are the "revitalization" of the role of the state, integration within public administration, planning and public service delivery across sectors and public administrations, and the elimination of departmentalism and insight (Kovács, 2019).

In the case of "general government" type public administration reforms, it can be observed that the promotion of integrated public service can take place in two directions. The vertical direction means the strengthening and extension of the powers of central government actors. In the field of public service delivery, this could mean centralizing the performance of certain public tasks, placing them under central supervision from the local level, extending stronger central control, tightening control and accountability, reducing financial autonomy, and reducing the autonomy of quasi-autonomous organizations. In Hungary, this tendency can be observed in connection with certain public services that were previously under the competence of local governments, such as the operation of schools or the performance of waste management tasks.

The horizontal direction refers to the strengthening of coordination between public administrations in the organization and provision of services, the spread of integrated service points or the common organization of services. In contrast to vertical integration, this is about strengthening cooperation between actors at the same level of the administrative hierarchy. Common forms of this can be one-stop shops or various forms of public service cooperation between local authorities, such as the creation of an association or the conclusion of a public service contract between neighboring municipalities (Kovács, 2019; Jenei, 2019). In this model, public service providers remain predominantly public bodies, with the emphasis on legitimacy as a primary value, but the priority is to develop a citizen- and customer-friendly administration, one of the means of which is a more integrated

administration with strong central management and control (Halligan, 2007). In addition to representative democracy, the possibility of expanding social inclusion is considered feasible primarily through the means of direct participatory democracy (consultation, involvement of civilians in decision-making) (Pollitt, Bouckaert 2004).

In addition to the regulated operation of the state and public administration, the representatives of the trend include the restoration of moral values, the restoration of legality and the high professional standard of public administration. The model treats the principles of efficiency and the operation of a citizen- and customer-friendly administration as a key aspect in the use of financial resources for the performance of community tasks. The ideal is an administration that treats citizens as partners and not subordinates, while maintaining legitimacy, a high level of professionalism, and the authority of the administration (the state) (Torma, 2014).

Based on the above, the Hungarian public administration reform, the structural transformation of the institutional system, the highly centralized apparatus, and the concept of the service state, customer-centered public administration appearing in the Magyary Program and the Public Administration Development Strategy are most in line with the Neo-Weberian approach.

2.1.5. Co-Production and Co-Creation

In the last decades as our technology and society developed governments realized the necessity to develop new ways and methods to improve public services to maintain efficiency and serve the changing needs of citizens in order to secure public satisfaction. With high expectations from people, the old school bureaucratic processes and the lack of fast and efficient solutions often turn people against the government leaving permanent bad impressions (Richwine, 2012).

The NPM model has been the subject of numerous criticisms since the 1990s. One of the most important of these is that it failed to deliver on its promise: no matter how it adopts the business model, the operation of the state will not be more cost-effective than it was before (Byrkjeflot, Du Gay, Greve, 2018).

In the Anglo-Saxon countries, and then in an increasing number of Western European countries, a new type of value- and participatory governance model was experimented with in the late 1990s. When applying the NPM model, it seemed that those who were most

involved in the decision-making processes (stakeholders) were left out. The NPM was intended to be supplemented or replaced by a new model, the New Governance model, which seeks to return to democratic basic values and emphasizes the importance of social participation and the need for broad social coordination of decisions.

The solution seemed to be a new type of governance model based on the involvement of people and joint decision-making: the adaptation of the New Governance model in 2001, which was widely suggested by the White Paper on European Governance (COM 428 EC, 2001).

The governance models following the New Governance model (Networking Governance, Interactive Governance, and Good Governance) approached public administration based on values and participation. While the NPM focused on the market and market mechanisms, all governance models considered important the involvement of residents and NGOs, and were based on the cooperation of different sectors (institutional, business and civil). The state/municipality appears in governance models as a kind of conductor, coordinating between the representatives of each area (Kovács, 2019).

Regarding these approaches besides the values of economy, effectiveness, efficiency, equity, and environment controllers, we usually talk about co-creation, co-design, co-production, collaboration in service delivery, and co-responsibility (Osborne, 2006, Bovaird, 2007, Oldfield, 2015). In governance models, the service culture remains as a value, but the design, organization, production, and delivery of public services itself emerges as a result of cross-sectoral collaboration.

According to Nemec et al. (2019) while there are many research papers focused on co-production and co-creation in the international literature, few of these are coming from the Central and Eastern European region. The thesis aims to help filling in this gap by focusing on intricate public services such as the contact affair procedure of the Hungarian Guardianship Office. With our research we would like to emphasize how important is the role of public service employees in such service processes, as they are essential part of the service just as the customers themselves.

According to Osborne et al (2013, 2016) co-production is one of the public policy reforms, which can be considered as effective way to plan and deliver public services (Boyle, Harris 2009; Durose et al., 2013; Nambisan & Nambisan 2013). In their paper, Osborne et al. presented the conceptualization of co-production and highlighted how it is theoretically

rooted in both public management and service management theory (Osborne & Strokosch, 2013).

In public administration and management (PAM) literature co-production is originated from the work of Ostrom (1972) and Alford (2014) who re-evaluated Ostrom's work. In the literature of New Public Management we can find co-production as 'consumerism' and it can be also found in the literature of New Public Governance as well as a system level approach to public service delivery methods.

According to Osborne et al. (2016) in the theory the focus is on the way of adding service user participation to the whole service process to increase quality but from the service management perspective the literature says that co-production is already an essential and core component of service delivery and delivery cannot be done without co-production (Osborne et al., 2016). Users have no choice, which means that co-production happens whether they know it, or do not, thus co-production is an intrinsic process of interaction between service providers and users when the service delivery happens (Osborne et al., 2016).

In their work, Osborne et al. (2016) focused on the relationship between co-production and the co-creation of value through public service delivery and explored this relationship further through a detailed literature review. It resulted in the definition of "co-production as the voluntary or involuntary involvement of public service users in any of the design, management, delivery and/or evaluation of public services" (Osborne et al., 2016, p. 2).

Nabatchi et al. (2016) also defines co-production as 'the involvement of both users and public sector professionals in the delivery of public services', however also highlights that "this definition is neither used consistently nor applied in ways that make clear what does (and does not) constitute coproduction" (Nabatchi et al., 2016).

Because various other definitions and interpretations exist as Nabatchi et al. (2017) summarized we need to clarify whether Guardianship Office related services in general and the contact affair procedure in particular can be examined from co-production point of view especially because of the nature of this complex service. According to Alford (2014) in case of co-production, we can identify public service providers as the regular producers and the customers (citizens) as the co-producers of the service process. However while some authors (Brudney & England 1983; Parks et al., 1981; Pestoff 2006) state that involuntary participation when one of the parties feels obligated to participate in the service process

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cannot be looked as co-production, other authors (Alford 2002, 2006, 2009; Osborne et al., 2016) disagree. Because of this contradiction, we would like to state that we agree with the latter and thus we examine the contact affair procedure from co-production point of view.

According to the author's opinion each of the discussed public service theories and approaches, the New Public Management, the Neo-Weberian State and the theory of Co-Production and Co-Creation strengths and limitations, advantages and disadvantages. Depending on the development level, economic environment, community attitude and authorial arrangement not every country is suited for every approach. As we seen, the New Public Management was flourishing in developed western countries but other countries like Hungary were unable to adapt it to the local conditions right after the regime change. However nevertheless of the concept of the system level approach of a country as technology evolves and the customers' need is growing for better, faster, more efficient and more comfortable service delivery. In order to develop and provide these services governments have to address the need of citizens on a new, immediate level, which can only be achieved by applying the principles of Co-Production in service development.

2.2. Applying Process Management in Public Services

This subchapter is connected to research question one (RQ-1).

In manufacturing lead times are critical and customer satisfaction is crucial for long-term survival. In business life, customer satisfaction translates into money and profit, but in public administration satisfaction does not necessarily relate to money. In business to be successful companies fight for customers and always try to improve themselves and their goods in order to not loose current customers or even gain new ones. There is always a competition between companies, thus they try to involve customers and their opinions more and more in the development processes and offering additional services. However, in the public sector, in most cases governments do not have competitors and this monopolistic state seems to allow them to change slowly and offer generalized services without great efforts of citizen involvement. Because of these advancements and changes citizens can also express their needs more and more accurately towards public services but the lack of options deprive them from the possibility of moving on. They are forced to use the same services even if their

level of needs changed. As they are using more improved services offered by private companies, they also expect the improvement of public services on the same rate.

Because of this according to Hewitt (2002) both academia, business and government pay increasing attention towards in service-led competitive strategies. One of the reasons of this increasing interest is the belief that the application of the servitization concept creates a line of defense against competitors by creating value-adding capabilities that are distinctive and sustainable and many governments see such moves downstream as key to competitiveness.

According to Vargo and Lusch nowadays to gain competitive advantage a large number of companies are transforming themselves from goods-dominant into service-dominant logic companies (Vargo and Lusch, 2004; 2008) and manufacturers are constantly introducing new services to accompany their existing products in order to satisfy the needs of their customers and differentiate themselves from the competition (Sawhney, Balasubramanian, & Krishnan, 2003; Lusch, Vargo, & O'Brien, 2007).

As seen on Figure 4, the first part of this chapter discusses the theories of Servitization, Unified Services Theory. The second part of the chapter covers the important topics of service quality, process management and performance measurement.
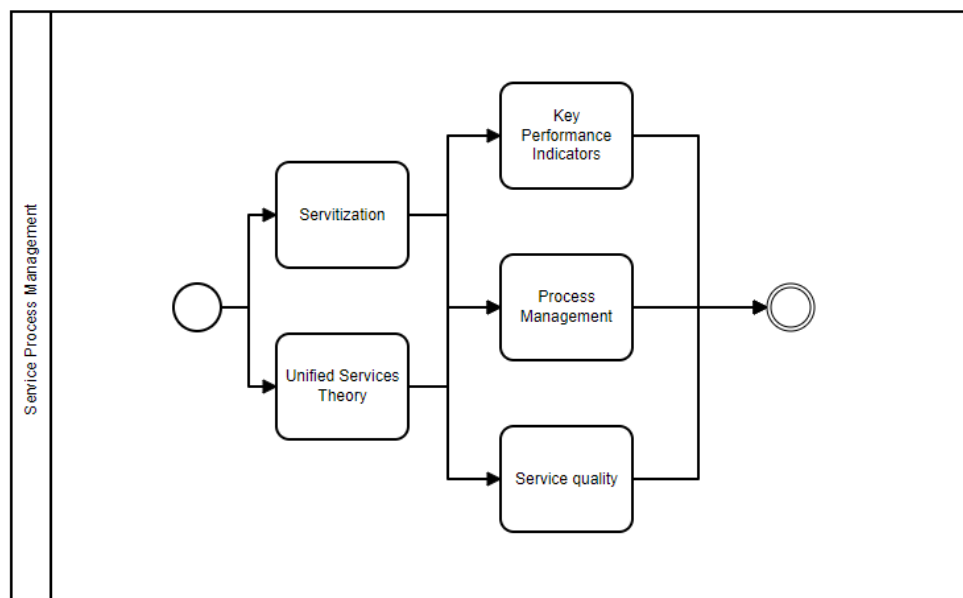
Figure 5: Service Process Management
Source: Author's own creation

In order to give additional value to preferred customers, new value propositions are generated through product-oriented and customer's process oriented services (Kujala et al.,

34

2010). This method creates new value realization patterns, which eventually switches the focus from goods-centric to a service-centric approach (Vargo and Lush, 2004).

But in order to make a differentiation amongst the other firms one have to know the requirements of the customers which is also the part of the servitizing process during the attempt to obtain a better competitive position to increase the flow of revenues (Wise, Baumgartner, 1999).

2.2.2. Servitization

Servitization can be defined as the innovation of an organization's capabilities and processes to better create mutual value through a shift from simple selling to an integrated product and service offering that delivers value in use (Vandermerwe, Rada, 1988; Neely, 2008; Neely et al., 2011). There are similarities between private organizations and public service providers as they both aim to improve customer satisfaction, efficiency and effectiveness, but they also differ from each other in many ways.

Servitization is now refers to the process of creating value by providing additional services to products (Vandermerwe, Rada, 1988). Since the first appearance, scholars to uncover the different kind of methods and implications of service-led competitive strategies for manufacturers (Wise, Baumgartner, 1999; Oliva, Kallenberg, 2003; Slack, 2005) studied this term from several angles.

In the last three decades servitization has been a popular strategy in the manufacturing sector and according to the relevant literature in the manufacturing industry an increasing number of companies are complementing their products with value-added services (Vandermerwe, Rada, 1988; Wise, Baumgartner, 1999; Fang, Palmatier, Steenkamp, 2008; Baines, Lightfoot, 2009) and scholars have shown also a steady interest in understanding how firms create value by adding services to products (Cusumano et al., 2015; Németh-Dőry, 2019).

There are numerous examples of servitization including finance, transportation, manufacturing (Dachs et al., 2012) and in education (Arantes, 2020). According to the literature, servitization is usually a subscription model and can be applied to most industries in one way or another. It developed out of the necessity for businesses to remain profitable and competitive in an age where the financial aspects of design and manufacturing are becoming increasingly challenged by emerging markets and as we can see, the concept of servitization is in strong connection with value delivery.

Manufacturing organizations across the world seem to realize the potential in engaging with the their customers though the relationship based revenue model of servitization where they can sell not just a pure product but they can also deliver additional value connected to it and provide complete solutions thus sell their outcome as a service in order to increase customer satisfaction. Another very important part of the servitization concept is that it treats people as essential parts of the service providing process because their needs and feedbacks shape the creation process and they have to include additional services in order to improve the performance and profitability of a company.

According to Baines and Lightfoot (2013), servitized organizations can offer various services, which can be categorized into three types: base, intermediate and advanced. The more advanced the service, the more value the company can offer to the customers (Baines, Lightfoot, 2013).

- Base Services or Product Provision is the basics of manufacturing business, simply creating and selling products, once it leaves the factory, the product ceases to be a concern to the manufacturer, but it also ceases to be a revenue stream (Baines, Lightfoot, 2013).
- Intermediate Services or Aftersales often includes servicing, product repairs, condition monitoring, field service and customer help desk. In this case, the maintenance of a product provides an ongoing source of revenue for manufacturers (Baines, Lightfoot, 2013).
- Advanced Services often includes pay per use, fleet management or integrated solutions. Advanced services are more relationship focused and customer-centric than just selling and maintaining a product (Baines, Lightfoot, 2013).

Product providers on each level of this service hierarchy take on more responsibility and risk (Baines, Lightfoot, 2013).

As we can see by applying a servitization concept companies can gain numerous benefits and essentially they can meet with the demands of their customers, which lead to greater customer satisfaction. Customers are becoming more demanding with their requirements and offering additional services that can meet those demands is crucial for companies. What's more, a manufacturer can gain useful insights into future R&D processes by analyzing the performance of a product sent to a customer and using this information to strive towards continuous product improvement.

However, of course there are also several risks when a company decides to adopt a servitization model. They have to face with specific challenges because a service-centered culture is different to a simple product-centered culture. The design of services is different to the design of products, requiring a shift in corporate mind-set to make the implementation of this model successful. A further challenge for businesses implementing a servitization model is the uncertainty of profitability according to Neely (2008) because the effects of servitization takes time to develop, and will not be generate quick satisfactory results (Neely, 2008).

"In essence servitization is a transformation journey - it involves firms (often manufacturing firms) developing the capabilities they need to provide services and solutions that supplement their traditional product offerings" (Neely, 2009).

"To make this transformation - to sell services and solutions - requires significant change inside many traditional manufacturers. They have to recognize that the product is a platform to deliver a service. They have to build solutions that deliver the outcomes their customers want and value. In essence, these solutions are often capturing in product-service systems, combinations of products and services. Customers only realize value from these when they actually receive the service - hence the concept of value in use." (Neely, 2009)

Servitizing public services seem to be a noble but also a tricky challenge. There are several significant differences between private and public service providers in many aspects including for example the lack of competitors. However, in essence the ultimate goals of the governments and the private companies are basically the same. Although the approach may be different (top-down, bottom-up) they both want to spare money while increasing efficiency and effectiveness and satisfy their customers (Kurucz, 2016). Despite there are other reasons behind it but public satisfaction is important for the government as much as for the companies. However, in order to satisfy the customers we have to know what they think about our existing products and services in order to shape them further and to create new and even better products and services.

According to Hockerts and Waver (2002), we can differentiate three main forms of Product-Service-Systems. The first one is the product oriented and in this case, the customer gets the ownership of the product while the manufacturer provides additional services, which are directly related to the product. The second one is the use oriented where the service provider retains the ownership of the product and uses a modified distribution and payment system

like sharing or pooling to sell the functions of the product. The third one is the result oriented in which case the provider replaces services for products (Hockerts, Weaver, 2002).

Neely (2009, 2012) extends this list with two additional categories in order to be able to include the total scale of servitization applications and results (Neely, 2009, 2012).

The two new categories are the integration oriented Product-Service-Systems and the service oriented Product-Service-Systems. In case of the integration oriented systems companies are conducting a vertical integration while adding services at the downstream of their value chain. In case of the service-oriented systems, companies are providing new services for their products in a way that they are integrating those services into their products themselves (Neely, 2009, 2012).

According to Neely (2012, 2013) there are four main category of reasons behind the application of this phenomenon: economical, strategic, environmental and technological (Neely, 2012, 2013). Companies usually consider the first three main categories as more or less responsible for applying the concept of servitization, but there is one more category, which accelerates the shift more and more and can be considered as a major driver of servitization. This category is the category of technological reasons (Neely, 2012, 2013).

At one point technology was only considered as an enabler of servitization approaches but with the tremendous amount of new innovations introduced in the last three decades the world is now one big pool of infinite data which can be collected and analyzed many ways in order to gain valuable information about customer demands and trends so the potential for new and innovative services grows year by year. According to Lightfoot and other researchers, technology will enable a higher level of service delivery and future products and services can be tailored to the customer's individual product needs thanks to the upcoming age of The Internet of Things (IoT) which will greatly accelerate the servitization in the future because it will turn the physical world into a digital information center (Baines, Lightfoot, 2013).

"The technology – and particularly the ability to capture and analyze "big data" open up some new opportunities for service innovation." (Neely, 2013; p. 3).

While the governments are trying to meet the growing expectations of the citizens, the relations between the citizen and the public institution become more and more complex and they have mutual influence on each other. There are numerous IT tools which can be

transferred to the public sector to increase both customer satisfaction both efficiency and effectiveness (Süle, 2018).

As we can see in manufacturing, there are economical, strategic, environmental and technological reasons of why the companies choose to servitize. These same reasons can be found on the governmental side as well. Digitalization and new technological solutions are already present in most public administrations systems on different levels as we are stepping into the age of E-Government and E-Governance (Jeong, 2007). While as we can see private companies and public organizations are different in many terms but fundamentally, they both aim to create more effective and efficient solutions, which are not just economically acceptable but also satisfy the needs of the customers. In other words, governments started to try to servitize public services. The literature clearly shows that servitization is much more than simply the creation of additional services. It is also the changing of how we see products and services themselves.

The customer satisfaction depends greatly on the level of the service and the quality of the product and the private companies do everything they can to acquire information about citizens needs in order to convert these expressed needs into new kind of products, shorter lead times, increased service levels. While the governments are trying to meet the growing expectations of the citizens, the relations between the citizen and the public institution become more and more complex and they have mutual influence on each other.

Because of this in order to servitize public administration the right way, first we have to apply manufacturing approaches and se public services as product creation processes. Unified Services Theory can be a good approach to help future public managers to think differently. By seeing these services as processes maybe we can discover previously hidden options, which allows us to create better solutions.

In this process, IT systems are important elements in shaping changes in public administration for several decades now and their influence is growing because as the behavior of consumers and corporations in the private sector change, so there are direct demands for government information and transaction practices to shift in parallel ways (Dunleavy et al., 2006).

While digitalization is not the only way of servitizing government services, the technological developments, in themselves, can make significant impacts (Sabbagh et al., 2012) on service operations and processes which makes digitalization a promising venue

to persuade. Trends in the private sector can provide good examples of innovation in terms of servitization approaches which are using digitalization methods to increase efficiency and effectiveness (Dinges et al., 2015), and these innovative ideas could be useful in the public sector as well.

Researchers who studied servitization in private businesses generally agree that the technological advancements can lead to new ways of servitizing solutions because the customers create more and more data, which can be analyzed and used not just as a feedback but also as a resource to predict future needs. In the very same way governments could use the feedback of the citizens and employees too to create better services and to predict future needs better which could lead for example less queuing and faster operations in case of administrative services.

2.2.1. Service Processes and the Unified Services Theory

Services have been defined in many ways in the past decades. The previous definitions distinguished services from production based on three characteristics. First, services are considered intangible as nothing tangible remains, for example after a teaching class. Second, services cannot be stored like products thus in case of services the production and consumption take place at the same time. Third, the nature and intensity of the customer relationship, for example, some services require high-level customer relationships (for example restaurants) or low-level relationships (for example back-office operations in a bank) (Sampson, Froehle, 2006).

However, while these definitions are in discussing certain issues the main question remains whether something is a service because it has these properties, or because it has these properties it is a service. The definitions also tend to emphasize the personal nature of the services and the resulting diversity, but with the proliferation of automated services, this also does not lead to a clear definition. The personal physical presence of the customer in the service process is not necessarily a precondition either for the establishment of the service (Sampson, Froehle, 2006).

According to Sampson (2001) and Sampson and Froehle (2006) the Unified Services Theory states that services are made service by the significant contribution of customers to the "production" process. Customer input is a necessary and sufficient condiion for defining a production process as a service process.

To understand the Unified Services Theory, we must embrace the thought that every service can be considered as a process. From this viewpoint, we can see services as production processes where each customer provides additional input for the production. With non-service processes, groups of customers may contribute ideas to the design of the product, but individual customers' only participation is to select, pay for, and consume the output (Sampson, 2010).

Co-creation of customers can take several forms. The customer's presence can be seen as a contribution where there is no production without the customer or there is no reason for production without the customer (for example watching a movie in a cinema). Another form is when the customer provides physical assets to the service process (car washing only happens if there is a car to wash) or the customer provides information to the service process (for example providing personal information to create an insurance contract) (Sampson 2001, 2010).

The basis of UST is the process itself (and not the company or industry in which service and production processes are mixed) that transforms customer inputs. Service processes based on customer inputs are fundamentally different from production processes and require other management methods. These discrepancies can be captured by the previously mentioned characteristics related to customer contributions, which were also used to varying degrees in the previous service definitions, but the UST includes all of them and puts them in a single framework (Sampson 2001, 2010).
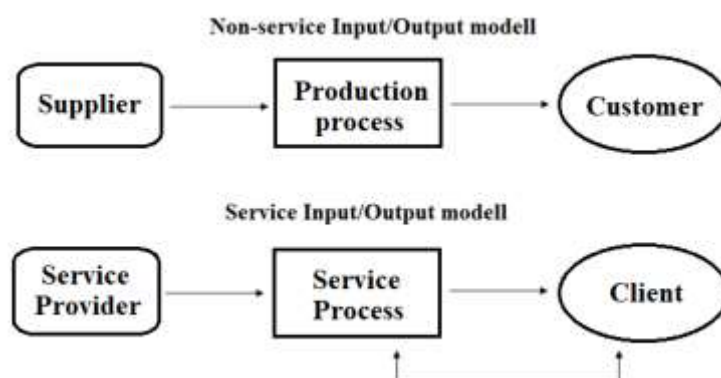
Figure 6: Customer's passive and active role in a non-service and service model according to UST
Source: Sampson (2001, 2010)

As we can see in the Unified Services Theory, the customer has a key role in the service system and support the process with additional information to create more benefits for the benefit of both the future customers and the owners of the service operation.

According to traditional thinking when we are speaking about manufacturing something only the suppliers provide inputs, and the customers simply buy and consume the outputs. In this case, the customers provide no input at all just simply pay for the given outputs. By contrast, the Unified Services Theory claims that every manufacturing production and traditional service can be considered as a process in which the customers can provide additional input and may even contribute ideas to the design of the product. Of course in normal cases, one customer will not redeem the world and change the particular attributions of the product he pays for, but the additional information, in general, can cause changes in the design of the overall service or the overall service process.

Because the Unified Services Theory is based on the idea of customer inputs, it is necessary to define who the customer is and rethink the definition of buyer/customer. Customers are individuals or entities that determine whether a provider receives compensation for service. This definition allows us to differentiate between consumer decision-makers and consumers to deal with complex situations and distinguish between direct and indirect customers (Sampson, 2001).

In the case of services, a company's production process can be defined as a company effort to add value to customer inputs. Company effort in preparation for the production is the pre-production process. When the production process concludes the customer use the production outcome to continue to add value. This post-production process is primarily based on customer action. Often, well-designed service outcomes will enable the customer to create value in the post-production process. This principle occurs because the only ways companies can add value is through efforts and outputs. Efforts can add value directly to customer inputs (given by the Unified Services Theory). Outputs, or outcomes, can allow customers to add value after the company's production efforts are complete (Sampson, 2010).

In summary, in services, the customer (all customers) has a significant contribution to the "production" process, while in production, typically only customer groups are asked for their opinion on product design; customers are only individuals involved in the selection and consumption of the product. Accordingly, Sampson calls service supply chains two-way

compared to typical production chains, whose downstream side is shorter compared to typical production networks (Figure 6) (Sampson, 2010).

2.2.3. Service Quality and Excellence

Performance measurement is an important issue for both scholars and practitioners (Heckl and Moormann, 2010; Neely 2005; Richard et al., 2009), who developed different measurement systems and frameworks during the last decades (Kaplan and Norton 2001; Kueng 2000; Neely et al., 2000).

Providing quality service is considered essential in the private sector to secure survival and success (Parasuraman et al., 1985; Reichheld and Sasser, 1990; Zeithaml et al., 1990). Regarding the public sector, the urge to deliver quality public service is not related to a profit goal in the majority of the most cases; nevertheless, public service providers are also under pressure to improve service quality, efficiency and effectiveness (Randall & Senior, 1994; Ramseook-Munhurrun et al., 2010; Robinson, 2003;).

While in the private sector companies can adapt relatively fast to changing customer needs and expectations to ensure success, the adaptation of public service organizations is rather slow, is restrained from confined by the laws, regulations and decision-making process) which cause a general lack of freedom to act (Teicher et al., 2002).

Service quality can be defined as the ability of an organization to meet or exceed customer expectations (Parasuraman et al., 1988), which precedes the overall customer satisfaction (Zeithaml, Bitner, 1996). According to Zeithaml et al. (1990), the service quality perceived by customers is the result of comparing their expectations with their observations. If the experienced service is not on par with the expectations, it will result in customer dissatisfaction due to the quality of the service deemed unsatisfactory (Lewis, Mitchell, 1990; Parasuraman et al., 1985, 1991).

According to the literature, the greater attention of scientific research is focused on the customers' opinion regarding service quality and less amount of attention is focused on the internal perspective (Babakus & Boller, 1992; Babakus & Mangold, 1992; Carman, 1990; Cronin and Taylor, 1992; Carvalho et al., 2009; Parasuraman et al., 1988; Parasuraman et al., 1991).

However, despite a large number of articles little has been written about service excellence and how organizations can achieve satisfied customers. According to Johnston (2004),

service excellence can be defined as the ability to handle challenges and problems well and efficiently.

Besides organizational performance measurement models which aims to provide a holistic view of an organization's performance by considering different performance perspectives (Kaplan and Norton 2001; EFQM, 2010), there are also business process performance measurement models which are less holistic and mostly focus on a single business process, such as statistical process control, or process performance measurement systems (Kueng 2000; Neely et al., 2000). Dumas et al. (2013) identify time, cost, quality and flexibility as the typical performance perspectives of business process performance measurement.

Neely et al. (2000) and Richard et al. (2009) both present evaluation criteria for performance indicators, which summarize the consensus in the performance literature. The literature strongly agrees that performance indicators are organization dependent and should be derived from an organization's objectives, strategy, mission and vision. There is also a consensus in the literature regarding the need to combine financial and non-financial performance indicators. Nonetheless, disagreement still seems to exist in terms of whether objective and subjective indicators need to be combined, with objective indicators preferred by most advocates.

Van Looy et al. (2016) identifies several time performance indicators regarding business process models, which were frequently used by scholars in their research such as throughput, waiting time, processing time and lead time.

Throughput

- According to Cachon and Terwiesch (2013), troughput can be measured based on how many units (customers, materials, information) can be processed in a given amount of time. In general, throughput is the rate of production or the rate at which something is processed.

Waiting time

- Waiting time is also an important indicator of service quality, it is the total time elapsed between when an action (order, service) is requested and when it happens (Cachon, Terwiesch, 2013).

Processing time

- According to Hopp (20008a), processing time is the amount of time needed for a machine or a service provider to transform the inputs of the process into a finished product or service. Minimizing processing time of specific products or services are important goals of companies but it could also compromise quality.

Lead time

- Lead time is the amount of time needed to complete a process from the start until the end. In manufacturing, lead time often represents the time needed to create a product and deliver it to a consumer. Lead time is the amount of time that passes from the initiation of a process until its conclusion. Companies review lead time in manufacturing, supply chain management, and project management during pre-processing, processing, and post-processing stages. By comparing results against established benchmarks, they can determine where inefficiencies exist (Hopp, 2008a).

2.2.4. Process Management and Performance Measurement

According to Hopp (2008a) supply chains can be defined as follows: "A supply chain is a goal-oriented network of processes and stockpoints used to deliver goods and services to customers." (Hopp, 2008a, p1.) According to Vastag (2019), this definition emphasizes the process approach and at the same time creates a common basis for a coherent examination of production and services. In order to define a process, we must specify the unit (flow unit) that goes through the process, the individual steps of the process and the connections between the steps, which shows how they follow each other.

The simplest system is a workstation consisting of a storage point and a worker. Incoming units are queued and wait there until they are processed. In case of multiple workstations, there can be multiple units both in the queue and in process. With multiple workstations, we can talk about a parallel system (if a queue leads to several identical workstations), a serial system (a production / service system where the product is produced in a series of successive steps), and a general network that can be built by a combination of the previous two (Cachon. Terwiesch, 2013).

The resource that limits the capacity of the system is called the bottleneck. Although very often the slowest process is the bottleneck (e.g., the process with the longest processing time), this definition can be misleading. The bottleneck is the resource with the highest actual capacity utilization. Capacity utilization is measured by the quotient of the number of units arriving at a given resource in a given time and issued in the same time unit (Cachon. Terwiesch, 2013).

According to the literature in the case of services, due to customer input, both the arrival times (and the arrival time differences derived from them) and the processing times can show a high degree of fluctuation. Because of arrival and processing uncertainties, the availability of production / service resources and the processing sequence can also become uncertain. These fluctuations, even at low average capacity utilization, can lead to queuing and waiting. The waiting problem illustrates a situation where customers are patient (never get bored of waiting) and the waiting room (or warehouse) is very large (everyone fits in), there is no overflow (Hopp, 2008b, Cachon. Terwiesch, 2013).

Performance measurement is a broad topic, and the measurement of efficiency and effectiveness bears key importance in any organizations life in order to be successful (Neely et al., 2005; Spitzer, 2007).

Whether we are speaking about private or public companies, they are using different types of performance management systems. There are various, major methods and movements to increase the performance of organizations like Balance Scorecard, Benchmarking, Continuous Improvement, Total Quality Management (TQM), Management by Objectives (MBO), Quality Control Circle (QCC) and also Key Performance Indicators (KPIs) (Brignall et al.,1991; Kaplan and Norton, 2004). Each includes regular recurring activities to establish organizational goals, monitor progress toward the goals, and make adjustments to achieve those goals more effectively and efficiently (Brown, McDonnell, 1995) This type of performance measurement is now becoming the interest to a wide range of bodies including governments as well as educational institutions (Atkkinson, Brown, 2001).

In the private sector and industry, KPIs have been used for a long time, compared to the public sector. Companies are often use KPIs as a tool to measure the performance of individual processes and whole departments, with their help they can determine whether they meet with the expectations, perform above the expectations or they fail to meet with the expectations which require intervention to deal with the consequences (Bourne et al., 2000).

Measuring performance in the private sector is critical because private companies are profit oriented and their lower performance can result in loss of customers and revenue. However while public sector service providers are often in a monopolistic situation as the demand for quality services is increasing from the citizens the performance measurement also becoming a hot debate in public sector as well. According to Bourne et al. performance management system positively influences organizational behavior, organizational efficiency or organizational effectiveness.

Key performance indicators are quantifiable measures that reflect the critical success factors of an organization. Specific attention should be given to developing indicators related to outputs, economy, efficiency and equity. Regardless of the indicators selected, each must mirror one or more of the organization's goals. Key performance indicators that are reliable, well defined, verifiable, cost effective, appropriate and relevant should be sought, with baseline information and targets expressed in terms of actual numbers (Ibrahim, 2001).

Each KPI has its own set of measurement criteria it must meet to be able to determine success or failure. Setting the time period for measuring the KPI is important. An organization can choose between a repeating time period, a rolling time period or a fixed time period. A repeating time period takes place at intervals over a one-year period. Numerical values are to be assigned to the categories of the KPI range. Organization can create its own scale of measurement for the KPI. Target criteria should be set to quantify the performance measurement.

Overall, a KPI can shows how effective a company is in achieving its goals. KPIs can be interpreted at multiple company levels (high-low). The high-level ones focus on the overall operation of the business, while the lower-level ones focus on individual departments, processes, and employees. It focuses on the characteristics of an organization that most influence present and future success. A measurable, quantifiable value shows how effective a company is in achieving its goals as a compass. It makes the company's strategic goals measurable, acts as a diagnostic tool, facilitates corporate decisions, and increases transparency.

In case of a well-designed KPI the definition and the method of calculation are always clear defining the used metric and the method of value generation, describing how the indicator is constructed, what is the unit of measure and what is the origin of the data used in the

calculation. The target value is also defined accordingly as well as the tolerance limit and actions needed to be done if the measured value is below or over of the target value.

KPIs are useful to measure the organization performance not only for private sector companies but also in the public sector. KPIs can ensure the effective and transparent service delivery by setting appropriate targets thus helping public institutions to meet with customer demands. With their help, we can measure efficiency in terms of how fast and accurate is the service provided and delivered to customers by using objective measures like waiting time, processing time and lead time.

According to the author's opinion in order to create more effective and efficient services, better tailored to the needs of citizens, the first step should be always to thoroughly examine the existing processes in order to be able to determine what should be changed to achieve the development goals. In this process measuring service characteristics with the help of key performance indicators are vital. Private businesses are well aware of the importance of performance measurement because fulfilling customer needs is the only way of survival on the market. While in case of public services in most cases there are no competitors, the way of service delivery is also should be important for governments, because a better-developed service process could also save costs, resources, work force and eliminate administrative burdens hindering the system. Because of this key performance indicator measurement is also very important in case of public service management as well.

2.3. Public Service Management and Development in Hungary

This subchapter is connected to research question one (RQ-2).

The key players in the regime change followed the centralized state model during Hungary's regime change in 1989–1990. As a result, the central and local levels in the Hungarian public administration have strong powers, and an extremely weak territorial level (county) has been established. The resulting structure brought to the fore several problems, such as low efficiency and lack of cooperation.

The county level municipalities had few licenses and administrative tools, so the civic control of territorial services was weakly enforced, as the citizens of the area who used the services did not choose the management of the municipality hosting the given administrative service. In addition to the weak county municipalities, a medium-level state administration

with strong powers was established over time, and decentralized territorial units of subordinate state bodies were formed. The boundaries of the individual sectors hardly matched each other during the territorial delimitation, the areas of competence were disorganized, and overlapping competences developed between the actors. As a result, the territorial and local administration was characterized by fragmented, uncoordinated operation, which resulted in low efficiency (Csite, Oláh, 2011).

As seen on Figure 7, this chapter discuss the structure of the Hungarian public administration system with a focus on One-Stop Shops, public service centers and Government Windows. The second part of the chapter discusses the current level of public service development in terms of digitalization and availability based in Hungary and other EU member countries based on the Digital Economy and Society Index.
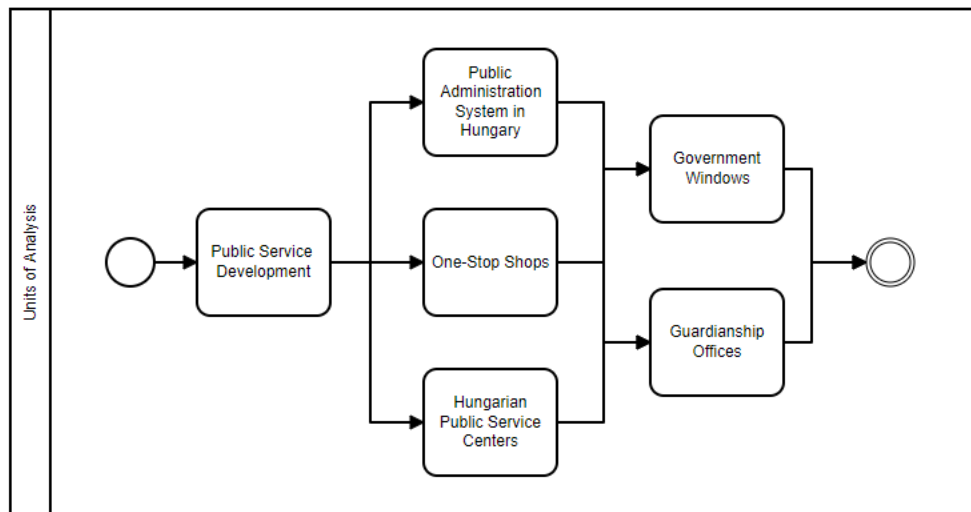
Figure 7: Units of Analysis
Source: Author's own creation

2.3.1. Structure of the Hungarian public service system

In 2010 and before, the middle level of the Hungarian public administration system was characterized by a fragmented organizational system, in which the realization of organizational integration was hindered, even in spite of the efforts made to do so (Gyurita, 2014). One of the first steps of the public administration reform was organizational integration, in the framework of which the government offices of the capital and the counties were established, laying the foundations for the transformation of the public administration system (1191/2010. (IX. 14.) Government Decree).

2.3.1.1. Capital and County Level Government Offices

With the dissolution of the regional state administration offices, as well as their legal successors, the capital and county government offices were established in September 2010, which can be considered as general, territorial bodies of the government, representing the government at the county and capital district level. Within this framework, the main tasks of the county government offices include the exercise of official powers, the performance of coordination tasks, and the supervision of legality (Act CXXVI of 2010).

Organizations with county-level competencies have been formed from the former regional state administration offices, into which the individual territorial administrative bodies have been integrated. The county government offices thus established have become the highest-level organizational units of the central administration organized on a territorial basis. At present, the organizational structure of government offices is regulated by Government Decree 39/2016 (XII. 30.).

The government office is divided into organizational units directly headed by a government commissioner. County district offices and capital district offices are also subordinate units of the government offices. Seventeen specialized administrative bodies started operating in 2011, which were then integrated into ten departments in 2015. The tasks within the remit of the government office are functional and professional tasks. The duties and powers of the government office are expressed as a supervisory and coordinating role in the operation of the organization as a whole.

The director, who reports directly to the government Commissioner, supervises the operation of each department as a professional leader, exercising their powers independently in individual cases. The district offices, which form the third element of the organizational structure, also have an independent authority and organizational structure, headed by the head of the district office (Hoffman, 2012; Virág, 2014).

2.3.1.2. District Offices

In Hungary, the institution of district offices dates back hundreds of years they were established first in the 13th century. During the centuries, they had different goals and juristictions until they were abolished in 1983. Three decades later the district offices were re-established in 2013 as the second step in the government's reform program (Barta, 2013; Csizmadia, 1976). As the citizen meets with the state in person most of the time on the

district level, the operation of the districts also affects the population's perception of the functioning of the state as a whole (Csite – Oláh 2011).

The district offices were set up as organizational units of the capital and county government offices as of January 1, 2013. The district system contains 175 units in rural Hungary, and 23 district offices have been established in 23 districts of the capital.

There is a district office in each district capital, the capital and jurisdiction are regulated by Government Decree 86/2019. (IV. 23.). Districts are exclusively a territorial unit of state administration. The most important task of the district offices is to perform public administration tasks at a lower level than the county level.

The district offices were established as general, first-instance authorities and organizational units of the capital and county government offices. The aim of the state was to create districts of the modern age that would contribute to the creation of a system with a lower social cost than the previously existed administrative system (Hoffman 2012). With the comprehensive transformation of the public administration, the modern districts were established as the lowest territorial level of the public administration, which can thus provide the vast majority of public administration activities and services in close proximity and high quality to all Hungarian citizens (Virág, 2012; Barta, 2012; Kéki, 2013).

In connection with the establishment of districts, the state commissioned comprehensive investigations to ensure that the establishment of districts took place as efficiently as possible (Ivancsics, Tóth, 2012). The demarcation of the districts took into account the need to reduce the social costs already mentioned and the importance of adapting to the land use habits and territorial identity of the citizens (Szalkai, Jakobi, Szabó, 2012).

The government has also decided on the tasks to be transferred to the district offices. The most important task of the district offices is to perform administrative public administration tasks at a lower level than the county level. The district offices took over mainly document office tasks, child protection and guardianship matters, as well as the administration of certain social, environmental and nature conservation administrative matters from the municipalities. The majority of cases referred to the district office are document office tasks, such as personal data and address registration, passport administration and vehicle administration. These administrative services are provided by the Government Window System, which is a separate department of each district office, and operate as One-Stop Shop service centers.

The district office provides customer service to citizens in two ways. In cities where it is justified by the number of residents and the number of cases to be handled, it operates a permanent office every working day. In smaller settlements, the municipal assistant holds a client reception 1-2 times a week in the room provided by the local municipality.

The headquarters of the district offices and the area of competence of the district offices are determined by a government decree. The principle of establishing districts is to ensure quick and easy access to public administration services for citizens, in line with the borders of the counties, and to maintain previously existing administrative locations where possible (Barta, 2012; Szalkai, 2012)).

2.3.2. Public Service Centers

In this chapter, the origin of One-Stop Shop like service centers and the creation and operation of Hungarian Government Windows are discussed in details.

2.3.2.1. One-Stop-Shops

One-stop shops (OSS) were first established in the 1980s, typically in the Anglo-Saxon countries representing the principles of New Public Management and in Singapore. One of the first and most successful is Accèss Montreal (1988), which won the Institute of Public Administration of Canada (IPAC) Grand Prize in Innovation Management in 1990 (Seidle, 1995). In the European Union, Directive 2006/123/EC urged individual countries to serve customers on a similar basis. The Hungarian system of Government Windows won the EPSA (European Public Sector Award) in 2015 for its equal access services.

Although according to the World Bank Report 2017, the administrations of 82 countries provide citizens with a one-stop shop, there is a significant difference in the operation of the "windows". Depending on the administration system in a given country, administrative customer services may appear at different levels.

In many countries, at the municipal level, the public administration is decentralized and can be operated either by the municipality itself or by a private entrepreneur or by an NGO. The name "window" itself varies from country to country: "multifunctional center", "citizens' window", "government window", etc. There may also be differences in the type of work performed by one-stop administrative customer services: some only have a front office (it is

possible to submit applications and request information), and some, where both front and back-office work takes place (both are performed in Hungary).

There are also differences in the range of services (tasks) between the practices of individual countries. Depending on which level of the given one-stop customer service is located and what matters it is entitled to handle (for example, it cannot deal with the issuance of passports at the municipal level), but the difference between the number and type of cases that can be handled falls within the remit of the administration.

Another difference in each country is that the one-stop shop is really integrated, or rather just functions primarily to help customers to find all administrative services in one place while the databases used are not interconnected, not interoperable with each other or only partially. Finally, there is a difference in what other public benefit services can be arranged in the given window in addition to the administrative services (payment of a utility bill or a telephone bill, for example).

There is also a difference in how transparent and traceable the individual cases are and how long the administration time is. Of course, the opening hours of the individual windows also differ from country to country, and often even from settlement to settlement, or even within them (if the administration is not electronic).

Finally, customer satisfaction is also measured differently. Not to mention the aspects, customer satisfaction can be measured regularly or at set intervals, on paper or electronically; the results may be fully public, possibly displayed in real-time, displayed on a huge display to everyone on all administrative customer services in the country, but may also be public in the sense that it is issued by the appropriate ministry of the country upon reasoned request.

2.3.2.2. Government Windows

The aim of the wave of reforms launched within the framework of the Zoltán Magyary Public Administration Development Program (Magyary Program) announced in 2010 was to establish a customer-centric service operation that takes into account the needs and interests of customers. In the Magyary Program, the legislators set the goal of simplifying procedures, reducing customer burdens and creating uniformly high-quality services accessible to all citizens. In order to raise the standard of public services, a multi-channel government customer service system was created through the establishment of one-stop shops, the so-called Government Windows.

The creation of Government Windows introduced the one-stop shop model into the Hungarian public administration, which already exists as a common administrative solution in several countries. The essence of the system is that customers can settle several cases at the same time at one point of administration, in the case of a more complex procedure; they can initiate the procedure or receive information (Temesi, Linder 2015).

In order to operate more efficiently, several ministries and background institutions have been merged, the number of central administration institutions has been reduced, and the tasks they perform have been integrated under fewer institutions than before. The most noticeable results of this transformation process became visible in the reorganization of the territorial administration, where the government carried out a comprehensive transformation by unifying the highly fragmented system of territorial administrative organization (Navrasics, 2013, Kovács, Hajnal, 2013).

The timeliness of the change was justified by several things, in the overly fragmented system, in addition to the overlaps and parallels of tasks and competencies, the tasks left abandoned were not uncommon either (Balázs, 2004). In addition to the citizens, the actors of the territorial state administration also had an interest in creating a more transparent, cost-effective organizational system. The establishment of appropriate coordination mechanisms was lacking not only between local governments and public administration bodies but also within the territorial state administration (Navrasics, 2013; Kovács, Hajnal, 2013, Kovács, 2016).

The Magyary Program has set the strategic goal of making the operation of public administration more efficient and raising the standard of public services, reforming the administrative tasks and improving the regulation of administrative procedures. Furthermore, the main goals of the Magyary Program were to ensure that the system to be developed is proportionate to the country's territory and population, logical, transparent and predictable for customers, regulates the clear, non-overlapping division of public administration and local government tasks and competencies, and last but not least it was designed to culminate in the implementation of one-stop shops (Kovács, 2016, 2019; Buics, 2019; Jenei, 2019).

As one of the first significant steps in the transformation, the county-level government offices have been established and a significant part of the territorial public administration

bodies have been integrated into them (Act CXL of 2004; 288/2010. (XII. 21.) Gov. Dec.; Act CXXVI of 2010).

Customer services were set up at government offices to start a one-stop shop for administrative services, which was the first step towards creating the Government Windows known today. In this case, however, as they were county-level departments, they were not yet ideal for the user, partly due to the distances and partly due to the initially low number of cases that can be handled there (Csite, Oláh, 2011a, 2011b, 2011c, Csite et al., 2011).

As the next step in the transformation of the public administration system, in 2013, with the start of the district offices, the Hungarian public administration underwent another major change. The districts were set up as departments of the capital and county government offices, which resulted in several transformations that resulted in a more transparent, structured, customer-focused administration. The currently operating Government Windows were designed on the bases of document offices, primarily in district headquarters. These integrated customer services have a unified image and provide the same level of service to citizens. The aim was to implement a one-stop shop for citizens not only at the county level but also at the lower level, thus facilitating and speeding up the official processes (Barta, 2012, Faluvégi, 2012, Hoffman, 2012; Kovács, 2014; Kovács, Hajnal 2016).

Since then Government Windows are the customer service offices of the county government offices and district offices that form the backbone of the territorial administration, where citizens can handle, initiate and receive information on the progress of many administrative procedures. In 2011, 29 Government Windows started operating in the county capitals and the capital city, and then the number of Government Windows was gradually increased from 2013. Finally, in 2014 they were established not only in county capitals and cities with county status but also in district capitals. By the end of the process, there were about 360 Government Windows in the country with a unified image and services (Kovács, Hajnal, 2013, 2015; Temesi, Linder, 2015).

The territorial administrative reform aimed to enable citizens to conduct their official affairs in a single place, at Government Windows set up as an organizational unit of district offices. Thus, Government Windows ensure that citizens can initiate or settle their public administration affairs at the headquarters of Government Windows (Act CL of 2016).

One of the most important objectives of the transformation and reorganization of the public administration system was the faster handling of cases. With the establishment of

government offices and then districts and Government Windows, tasks and authorities were also reorganized (Temesi, Linder, 2015).

The Government Window and the document office operated by the district office, unless otherwise provided by law, perform the tasks assigned to them by law in the territory of the county. Cases that can be handled in individual Government Windows are regulated by 86/2019. (IV. 23.) Gov. Dec. and the general procedural framework is regulated by Act CXL of 2004.

With the help of Government Windows, it was possible to submit applications, pay fees and charges, settle activities requiring the permission of several authorities, and report changes to customer data in several official registers.

After the transformation of the public administration system, the Government Windows have become the points where citizens most often come into direct contact with the state apparatus. Thus, it can be stated that the image and opinion of the citizens about the state is fundamentally determined by how they encounters the state through the Government Windows during the management of their affairs. The basic expectation of the system at all times is to be able to deal with matters efficiently, quickly and easily, and regarding this, the state should provide as much assistance as possible to everyone. Government Windows embody one-stop shops with all their benefits, and the goal is to increase efficiency further, through which citizen satisfaction would also increase (Kovács, Hajnal, 2014).

The image of the Government Windows is uniform, their services are the same everywhere, and the locations are designed to be barrier-free, thus enabling easy administration for the disabled, the elderly and small children. The established Government Windows used the infrastructure of the document offices in terms of both buildings and personnel. The main purpose of designing Government Windows is, therefore, to enable customers to arrange and initiate their affairs easily and quickly.

There are cases where Government Windows can only provide information and there are cases where they can also provide service. This eliminates the need for citizens to go to more places and adapt to multiple customer reception regimes. The activities of the Government Windows have been constantly expanding since their establishment, as of 2020 the Government Windows can provide help for citizens in over 2000 different available cases, which can be classified into several categories based on the 86/2019 (IV. 23.) Government Decree:

1. submissions that can be dealt with immediately (for example: issuing an official identity card for a new identity and address card);

2. submissions that can be dealt with within the authority of the Government Window (for example issuance of a driving license, issuance of a passport);

3. submissions that cannot be dealt with within the authority of the Government Window but can be transferred by the Government Window to the higher authority (for example a request for the issuance of a birth certificate);

4. providing information in case of submissions which cannot be handled or transferred by the Government Window (for example Guardianship Office issues or establishment of a registered partnership);

5. Providing additional services (for example ClientGate registration).

2.3.3. Public Service Digitalization in Hungary and the European Union

Digitalization and the spread of information technology inevitably transform our environment. Adaptation is indispensable, so the players of the economy cannot avoid major changes for long. Meeting the constantly changing and expanding consumer demands is becoming more and more difficult. The rapid development of information and communication technologies induced a transformation. The increase in the performance of electronic data processing, information and communication technology, digital data storage and data transfer together affected many areas. It affects citizens' lives, the behavior of the economy (e-commerce), and the work of state organizations.

The ever-changing environment and the development of information technology make the administration and the economy more transformative. As a result, public administration started to undergone major changes in many countries in recent years, pursuing the goal to make the administration and the economy more efficient, creating the possibility for citizens and businesses to manage their administrative affairs online on some level. The transformation of public administration into e-administration is an ongoing process ever since.

The purpose of electronic administration is to create a more convenient, efficient and more economical electronic system that reduces the administrative burden on businesses by improving the efficiency of their operations. However, this can be achieved only by the expansion of the use of digital communication tools and services, the expansion of

electronically manageable issues, the application of a customer-centric approach, and the e-inclusion of businesses.

2.3.3.1. E-Government and E-Governance

The concept of E-Government focuses on the use of information and communication technologies as a tool to achieve a better working government and it tries to optimize service delivery, constituency participation and governance by transforming internal and external relationships through technology, the Internet and media. The main difference between E-Government and e-governance is that while E-Government traditionally centered more on the operations of government, e-governance tries to extend the scope by including citizen engagement and participation in governance (Jeong, 2007).

In electronic government systems, government operations are supported by web-based services. It involves the use of information technology, specifically the Internet, to facilitate the communication between the government and its citizens. The customer satisfaction depends greatly on the level of the service and the quality of the product and the private companies do everything they can to acquire information about citizens needs in order to convert these expressed needs into new kind of products, shorter lead times, increased service levels (Jeong, 2007).

We could say that the private sector and the technological advancements spoiled the customers, because as soon as they meet with governmental infrastructure, which is robust, much less flexible, and seem to act slowly, the level of their satisfaction drops exponentially. While the governments are trying to meet the growing expectations of the citizens, the relations between the citizen and the public institution become more and more complex and they have mutual influence on each other.

There are several definitions of E-Government such as "the employment of the Internet and the world-wide-web for delivering government information and services to the citizens." (United Nations, 2006) or "the utilization of Information Technology (IT), Information and Communication Technologies (ICTs), and other web-based telecommunication technologies to improve and/or enhance on the efficiency and effectiveness of service delivery in the public sector." (Jeong, 2007, p.8)

Ideally the solutions of E-Government allows two-way communications between an agency and the citizen, a business, or another government agency, and enable the citizen transition

from passive information access to active citizen participation on several ways such as informing or even involving them.

Information technology can play key roles in IT based changes in management systems and in methods of interacting with citizens and other service-users in civil society in the underpinning and integrating of current bureaucratic adaptations. Its effect is could not be just directly technological but it also affects a wide range of cognitive, behavioral, organizational, political, and cultural fields. Summarized this new set of ideas and reform changes is called digital era governance (Dunleavy et al., 2006).

E-Governmental approach builds on New Public management in some aspects while also recognizes the deficiencies of NPM and tries to undo them by slenderizing over-decentralized public administration solutions. Besides that, it tries to transplant and integrate modern solutions into the administration system to resolve the increased need to interact with citizens, and effectively serve those (Dunleavy et al., 2006).

IT systems are important elements in shaping changes in public administration for several decades now and their influence is growing ever since the first automated data processes were deployed to abolish clerical positions and produce smaller but recurrent savings and more significant alterations in administrative decision processes (Dunleavy et al., 2006).

According to Dunleavy as the behavior of consumers and corporations in the private sector change, so there are direct demands for government information and transaction practices to shift in parallel ways. Digital-era changes have triggered several significant shifts such as the large-scale switchover internal and external communications, intranets in organizational information networks, the growth of electronic procurement systems, fundamental transition from paper-based to electronic record-keeping and last but not least the development of electronic services for different client groups (Dunleavy et al., 2006).

The impact of digital-era governance practices can be considered under several main themes such as reintegration, which is mostly a reaction to New Public Management,'s increasing problems, and advanced digitalization changes. It focuses on building a more agile governmental system and processes with more speed, flexibility and responsiveness towards the needs while it is trying to make the decision making more competitive in order to be capable of quickly reconfiguring to changing needs and responding to a volatile external environment (Dunleavy et al., 2006).

However, implementing private business solutions are sometimes seem to be hard. Political or bureaucratic failures on higher levels often lead local governments to adopt ineffective and costly development programs. According to Jun and Weare there is a difference between adopting a solution and replicating with modifications trough reinvention it. In most cases the expectations are high and the deadlines are low but reinvention can lead to relatively superficial and ineffective rather than deeper and more efficacious implementation (Jun, Weare, 2011).

E-government's advantages:

- Communication: The implementation of e-government could also promote better communications between government and business sectors. For example e-procurement as a subsidiary of e-government services could facilitate communication between G2G and B2B that this will allow smaller businesses to compete with bigger companies in public tenders. Hence the benefit of e-government could be creating open and transparent market and a stronger economy.

- Speed: Technology makes communication swifter. Internet, smartphones have enables instant transmission of high volumes of data all over the world. The primary benefit would be replacing and optimizing the Paper Based System while implementing electronic government. That could save lots of time, money and also environment in return due to reducing paper consumption.

- Saving Costs: The e-government's ultimate objective is offering enhanced portfolio of public services in an efficient and cost-effective way to citizens. A lot of Government expenditure goes towards the cost of buying stationery for official purposes. Letters and written records consume a lot of stationery. However, replacing them with smartphones and the internet can saves crores of money in expenses every year.

- Transparency: The e-government also could provide more transparency for the government because it enables the public to be informed about what government is working on and the policies which are enforced. The use of e-governance helps make all functions of the business transparent. All Governmental information can be uploaded onto the internet. The citizens access specifically access whichever information they want, whenever they want it, at their convinience.

- Accountability: Transparency directly links to accountability. Once the functions of the government are available, we can hold them accountable for their actions.

In summary, more efficiency, enhanced services to better serve citizens, better accessibility of public services, more transparency and accountability of government are the expected advantages of e-government. However, for this to work the Government has to ensure that all data as to be made public and uploaded to the Government information forums on the internet.

E-government's disadvantages

- Inaccessibility for all: e-government couldn't be accessible by all including those who are living in distant regions, or have low rates of literacy and income on the poverty line. The primary disadvantages of e-government is the absence of public Internet access for all citizens, reliability of the published information on the web by the governmental agencies, and also capabilities of government and its agencies which can affect public opinions potentially.

- Loss of Interpersonal Communication: The main disadvantage of e-governance is the loss of interpersonal communication. Interpersonal communication is an aspect of communication that many people consider vital.

- High Setup Cost and Technical Difficulties: Implementing, maintaining and optimizing e-government is not cheap and requires to spend lots of money. Technology has its disadvantages as well. Specifically, the setup cost is very high and the machines have to be regularly maintained. Often, computers and internet can also break down and put a dent in governmental work and services.

- Illiteracy: A large number of people in India are tech-illiterate and do not know how to operate computers and smartphones. E-governance is very difficult for them to access and understand.

- Cybercrime/Leakage of Personal Information: There is always the risk of private data of citizens stored in government serves being stolen. Cybercrime is a serious issue, a breach of data can make the public lose confidence in the Government's ability to govern the people.

- Higher surveillance and monitoring: Once government implement e-government, people will be compelled to communicate with it on a wider scale electronically. As

the government receives more and more information about its citizens, this could possibly lead to a lack of privacy for civilians.

In conclusion, E-Government can be seen as a set of technologies and services that can be employed by a wide range of public organizations. The development of such structures often requires significant resources and the results can be uncertain but have the potential to achieve great improvement. It is not an easily feasible concept but the potential benefits offering effective service delivery, improved internal management, and better political communication may worth the risk (Jun, Weare, 2011).

2.3.3.2. Hungarian and European Union Development Programs

In order to maintain and strengthen the international competitiveness of European businesses first the Bangemann report in 1994 made concrete proposals to promote information development, thus opening a new chapter in developing an information society policy. The report suggested the active involvement of the European Council to preserve the international competitiveness of European businesses, which is needed to accelerate the process of liberalization that has already begun to maintain and ensure the unity of existing services. According to the recommendation, the information infrastructure and its functioning should primarily be based on business logic, and the indispensable regulatory framework should be based on for harmonized legislative work of the Member States and the Union institutions (Fáber, 2002).

The European Union information policy, which emerged in 1994, defined the tasks of the information society primarily as an economic and secondly as legal-regulatory task. The report represented a theoretical point of view that presented the economic aspects of the information society (Csáki, 2010).

In March 2000, the European Council proposed the establishment of a knowledge-based economy (Losoncz, 2011). The decision-makers of the European Union have seen not only the new technology opportunities in the use of digital communication tools, but they have also recognized its social potential. By adopting action plans, the Member States agreed to work out a common set of standards to accelerate the becoming of an information society.

Following the changes of the Lisbon meeting, the European Commission published the eEurope 2002 Action Plan in 2001. The E-Government area got its own program, aimed at making public services available to the business community and citizens. The European Union's aim was to make 20 public services like corporate tax, VAT, statistical data

providing, environmental licenses available electronically to business and citizens by every Member State (Budai, 2014).

The next step was the eEurope2005 Action Plan, which aimed to develop services, applications, and content while it also deals with the development of the infrastructure and the security issues (Csáki, 2009). After that the i2010 eGovernment and eGovernment 2011-2015 Action Plan both draw attention to the link between national competitiveness, strong innovation capacity and the quality of public administration, indicating that good governance is vital in world economic competition, and mentioned the acceleration and modernization of electronic government as a priority. They were followed by the Europe 2020 strategy, which is an integrated strategy that seeks to address competitiveness aspects, innovation, environmental sustainability and social convergence (Csáki, 2009).

In Hungary, the development of e-administration is based on the domestic strategic plans, which take into account the strategic documents of the European Union. They define the principles, goals to be achieved and indicators. The Computing Center Development Program (Számítástechnikai Központ Fejlesztési Program) (1971-1985), later the Electronic Economic Development Program (Elektronizációs Gazdaságfejlesztési Program) (1985-1990), provided the IT background of the administration. As a result of the program, the preparation and coordination of the IT strategy plans at the government level have started (Budai, 2014).

The next important milestone was the E-Administration 2010 strategy, which was quite similar to EU policy guidelines at several points. In Hungary, a major part of the developments in e-administration was implemented through EU co-financing. The strategic framework was included in the Digital National Development Program (DNFP) and in the Magyary Program for the years 2007-2013 and in the Public Administration and Public Service Development Program (KÖFOP) for the years 2014-2020 (Budai, 2014).

Strategic programs
• Public Administration and Public Service Development Strategy (2014-2020)
• Green Book on the development directions of the infocommunications sector 2014-2020
• Digital National Development Program (DNFP)
• Public Administration and Public Service Development Operational Program (KÖFOP)
• Draft of E-administration law
Goals
• Development of E-Government
• Bringing e-public services closer to customers (e-access, e-inclusion)
• High quality customer service

Table 1: Hungarian governmental strategies and goals of the last decade regarding electronic public administration development
Source: Author's creation based on Ignácz (2015)

Due to the complexity of digitalization and peculiarities of state administration, the development is a huge challenge. At the same time, it is necessary to renew the public administration because of the changing and more concrete demands of citizenship.

In Hungary, the foundations for rules on digital services were created by the Act CVIII of 2001 on certain issues of electronic commerce activities and information society services. Electronic administration was regulated in the official procedure in 2004, in accordance with Act CXL of 2004 on the General Rules of Administrative Proceedings and Services.

The legislation entered into force after joining to the European Union, carrying with it the peculiarities arising from the EU legal harmonization regulations. One illustrative example of this is Chapter X on electronic procedures, which is the first to name the possibility of using electronic means in official proceedings. Until that, regulations on electronic procedures has been unknown in Hungarian legislation. For the first time, the legislation named the concepts of electronic administration and electronic means, opening the door to the use of electronic documents in official proceedings.

During this period, the cornerstone of E-Government, the central electronic service system, was established, laying the foundations for the front office and back-office process of E-Government. The central system included the basic communication infrastructure, the electronic government backbone network, the central government portal (magyarorszag.hu),

the government customer information center, the electronic customer ClientGate and lately the CompanyGate (Buics, 2019).

Later the Electronic Public Services Act repealed the electronic procedural rules regulated in Chapter X of the 2004 Act, which were essentially technical rules, and created a way for service-type public administration by creating its own conceptual framework. The electronic procedure was replaced by the electronic public service, which will have allowed the use of the digital path more widely in official procedures. The legislation regulated the scope of services with a framework character and implemented detailed rules at the level of a government decree. Later the Act CLXXIV of 2011 replaced Act LX of 2009 leading to a liberalized model that encourages individual development, case- and customer-specific industry solutions instead of centralized E-Government organization (Czékmann, Cseh, 2014).

In Hungary, the range of issues that can be accessed via the Internet is expanding ever since. There is a wide range of cases that can be done or at least initiated digitally. Things that can be handled without a personal appearance can be launched online at any time and from anywhere. Issues that can be initiated begin with the submission of documents, but citizens still must be present in person at some stages during the process. However, even in this case, administration is much faster than it was traditionally before.

Client Gate can be considered as the most important E-Government application in Hungary. It is the official central electronic administration web service of the country. The Client Gate service is currently available on www.magyarorszag.hu. To use the Client Gate a citizen needs to register, which can be done personally at any of the Government Window.

It can be used for administration and communication with the authorities, and some administrative procedures can be administered entirely online via the Client Gate (e.g. the annual tax declaration). In 2017 Client Gate reached 3 million registered users, more than two thousand forms are available for download (tax declaration, notification, account services, healthcare and social status and company registry inquiries, etc.) and it is also possible to fix an appointment for the physical Government Windows as well, and to launch the administration of many type of procedures (Buics, 2019).

Company Gate is also an important service created for business organizations. It is similar to the Client Gate service, however, in the case of Company Gate, the business entity itself can register after the central identification. Previously in Client Gate all businesses were

registered under the name of the owner citizen so one of the main intension of the creation of Company Gate was to separate citizens from business entities. Company Gate operates on a similar principle as Client Gate, but the scope of services provided to citizens and businesses is being also separated. In addition, from 2018 business entities are required to register at the Company Gate, because this electronic administration was made mandatory by the government. Based on Act CCXXII of 2015 on the General Rules of Electronic Administration and Trust Services (E-Administration Act) business organizations, particularly companies, must communicate electronically with the state from 2018 (Buics, 2019).

2.3.3.3. Hungarian public services digitalization according to DESI

Due to the complexity of digitalization and the specificities of public administration, these types of developments pose a huge and complex challenge for countries. At the same time, the ever-changing needs of citizens are forcing their administrations to constantly innovate. The Digital Economy and Society Index (DESI) is an online tool to measure the achievements of the EU Member States in building a digital economy and society. With DESI, European Union member states have the opportunity to identify the areas where further development needed to achieve the main objectives of the Union.

DESI is a so-called composite index, which has been in use since 2014 and which brings together 30 relevant indicators on the digital performance of EU countries and tracks the development of EU Member States in five main dimensions:

- Connectivity: how widespread, fast and affordable broadband is,
- Human Capital/Digital Skills: the digital skills of the population and workforce,
- Use of Internet: the use of online activities from news to banking or shopping,
- Integration of Digital Technology: how businesses integrate key digital technologies, such as e-invoices, cloud services, e-commerce, etc. and
- Digital Public Services: such as e-government and e-health.

To calculate a country's overall score, each set and subset of indicators were given a specific weighting by European Commission experts. Connectivity and digital skills ('human capital'), considered as foundations of the digital economy and society, each contribute 25% to the total score (maximum digital performance score is 1). Integration of digital technology

accounts for 20%, since the use of ICT by the business sector is one of the most important drivers of growth. Finally, online activities ('use of Internet') and digital public services each contribute 15%.

The DESI online tool is flexible and allows users to experiment with different weightings for each indicator and see how this impacts overall rankings. The DESI aims to help EU countries identify areas requiring priority investments and action, in order to create a truly Digital Single Market – one of the top priorities of the Commission.

The Commission compares the digital performance of EU countries with 17 non-EU countries as well. The International DESI (I-DESI) evaluates the performance of both the individual EU countries and the EU as a whole in comparison to Australia, Brazil, Canada, Chile, China, Iceland, Israel, Japan, South Korea, Mexico, New Zealand, Norway, Russia, Serbia, Switzerland, Turkey and the United States.

The top four EU countries (Finland, Sweden, the Netherlands and Denmark) are among the global leaders. They are just behind Korea and have higher scores than the United States and Japan. At the same time, however, the comparison shows that the EU's average in digital performance is significantly lower than the aforementioned.

I-DESI includes the same five dimensions as the DESI, but it is built on a slightly different set of indicators due to some of the DESI indicators not being available in non-EU countries. As a result, the I-DESI rankings and scores are slightly different to those of the DESI.

The majority of DESI indicators come from the surveys of Eurostat, the statistical office of the European Union. Some broadband indicators are collected by the Commission services from the Member States through the Communications Committee. Other indicators are derived from studies prepared for the Commission (e.g. some e-government, e-health and broadband indicators).

The full list of DESI Sub-dimensions can be find in Appendix 6.8.

Based on the data of the 2019 Digital Economy and Social Index, as we can see on Figure 8, Hungary still lags significantly behind. Within the European Union, Hungary is the 23rd (out of 27) in the case of the composite index, and the most challenging area remains digital public service development.
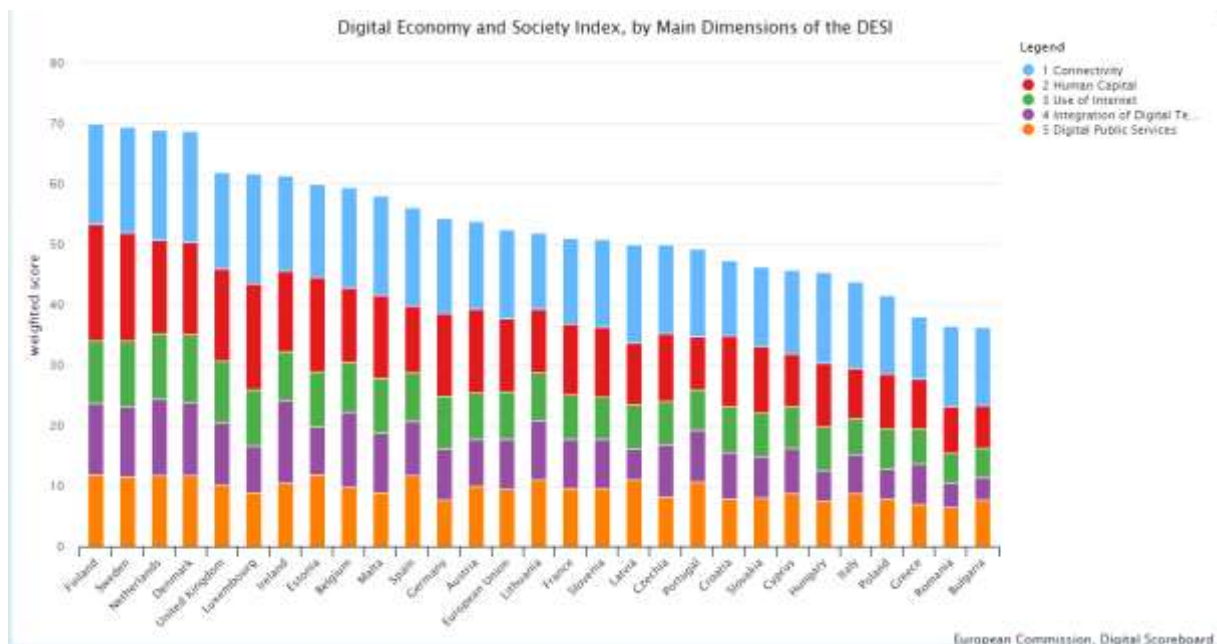
Figure 8: DESI 2019
Source: https://ec.europa.eu/digital-single-market/en/desi

Further analysis shows in Table 2 that after the comparison of the DESI from 2014 Hungary's position became worst by one level because since 2017 we are the 23th in the European Union.

Year	Position	Number of Countries
2014	22	27
2015	22	27
2016	22	27
2017	23	27
2018	23	27
2019	23	27

Table 2: Hungary's position according to DESI 2014-2018
Source: Author's creation based on https://ec.europa.eu/digital-single-market/en/desi

In the Digital Public Services dimension, the index is calculated from the weighted average of two sub-dimensions, E-Government (80%) and E-Health (20%), i.e. administrative general public services and electronic public services related to health. According to the index calculations, Hungary ranked 26th in 2019 in the dimension of public services, which is particularly important for the present study.

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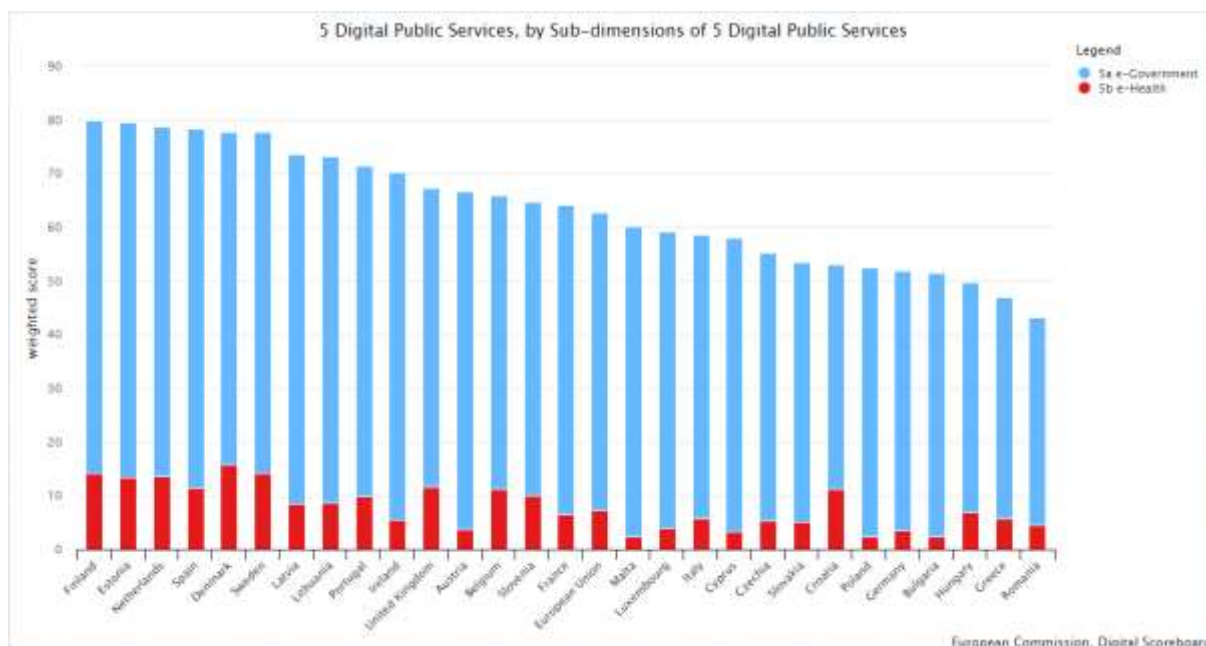
Figure 9: Sub dimensions of DESI regarding public services
Source: https://ec.europa.eu/digital-single-market/en/desi

Year	Position	Number of Countries
2014	22	27
2015	26	27
2016	27	27
2017	27	27
2018	26	27
2019	26	27

Table 3: Hungary's position regarding public service sub dimensions
Source: Author's creation based on https://ec.europa.eu/digital-single-market/en/desi

As we can see on Figure 9 and in Table 3, the situation of Hungary has deteriorated in the dimension of digital public services since the introduction of DESI. Compared to 2014 when Hungary was on the 22nd place, in 2019 Hungary is at the 26th place in the list of countries. Within this subdimension, as we can see on Figure 10, the index can be further divided into subdimensions. Its value is calculated as a weighted average of the following five values: E-Government users (20%), completed forms (20%), completion of online services (20%), digital services available to businesses (20%) and public access to data of public interest (20%).
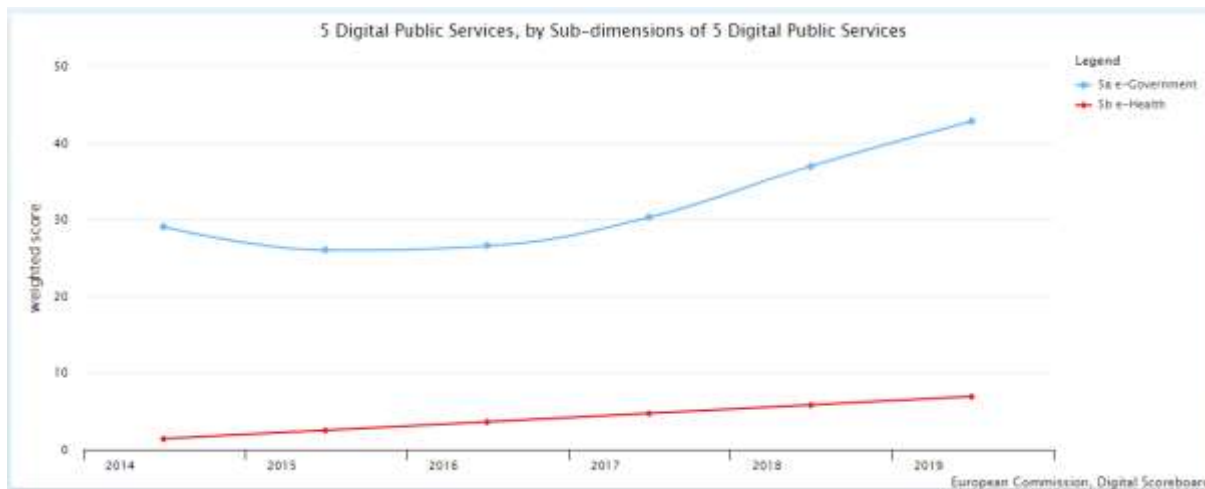
Figure 10: Digital Public Services according to DESI
Source: Author's creation based on https://ec.europa.eu/digital-single-market/en/desi

As shown, Hungary shows an improvement in the digital public services dimension between 2014 and 2019 for both general public services and health-related electronic services, but as the data in show, overall it is gradually lagging behind in the extent of the development of digital public services compared to other Member States of the Union (Buics, 2019).

Governments face growing expectations and demands from citizens regarding the availability and quality of public services. These new expectations encourage the modernization of the public sector, which in turn requires comprehensive efforts on the part of the state, especially in the case of greater public sector services.

Electronic administration is simpler and faster than traditional administration. E-Government services indirectly strengthen the IT skills of businesses, as the use of these services also requires the IT infrastructure and knowledge needed to access the services, thereby also strengthening competitiveness.

The introduction of these services reduces the time spent on administrative tasks, and during the freed up time, administrators can perform tasks that had better facilitate the profitable operation of the business. The use of E-Government services also reduces the burden of paper-based administration and files stored electronically can be easily downloaded.

As can be clearly seen from the data, Hungary is at a disadvantage in the field of electronic public services compared to most countries of the European Union according to the DESI indicator. In the case of the composite index, the position worsened from 23rd to 24th since

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2014, while in the case of the digital public services subdimension, it is currently 26th compared to the initial 22nd place, but the trend also shows a very slow improvement.

According to the author's opinion, adopting the concept of One-Stop Shop was one of the most important changes during the development of administrative public service delivery. Making all kind of services available under a single roof was a major step in creating a more efficient service delivery and accessibility for the citizens. However as seen according to the DESI indicator Hungary still lags behind most of the EU member countries because the next level of service development, the digitalization of public services still needs to be achieved. While now many services are available at one place, many of them have the same kind of process as before the OSS creation, meaning that the services themselves did not change too much. Of course there are several efforts to enhance digitalization levels of selected services, but as the international comparison shows, Hungary has still a long road ahead compared for example to Estonia, which is considered one of the most developed EU countries regarding digital public service availability, as it developed a digital OSS for its public services during the last decade. However, we must not forget that development of digital services also requires the population to be able to access these services on a large enough scale in order to become economically viable the development itself.

2.4. Methodology of Service Process Analysis

This subchapter is connected to research question one (RQ-3).

This chapter of the thesis presents the methods used to model, analyze and evaluate public service processes. Service Blueprinting (Shostack, 1981a, 1981b, 1984, 1987; Kingman-Brundage 1989, 1991, 1993; Bitner et al., 2008; Kazemzadeh et al., 2015; Zeithaml et al., 2009; Fließ and Kleinaltenkamp, 2004). Service Blueprinting is based on the customer view and can be used to map and visualize the interactions between the service providers and service users to get a whole picture about a given service from the start to the end.

Business Process Modeling (Ko, Lee&Lee, 2009; Recker, 2010, 2011) categorizes activities in a way to represent organizational responsibilities and communications between participant entities (especially customer and provider), organizational departments, systems, and roles, and has a higher capability than PCN to add additional information about concepts when it is needed.

Process-Chain Network (Sampson 2011, 2012a, 2012b; Kazemzadeh et al., 2015) is another process visualizing method, which helps to identify and link actors of a given process in a systematic way. It has several similarities with service blueprinting but it differs from blueprinting in terms of line of visibility for example and has advantages in terms of representing the internal complexities of the processes. PCN differentiates between process steps based on their nature of interaction to understand how the provider can reconfigure process steps across each process region and improve the performance of service processes. The purpose of discrete event simulation is to analyze the behavior of a given system as it allows us to apply changes during experiments to see how the system reacts without affecting the real system (Banks et al., 2013; Zeigler et al., 2000; Bohács, 2012; Mes, 2017; Prateek, 2015; Vuksic et al., 2017).

2.4.1. Service Blueprinting

Services can be seen as processes (Gronroos, 2000) and service blueprinting is an effective method, which can be used to model complex business processes. It was developed with the purpose to be used for service design and innovation (Kingman-Brundage, 1989, 1991, 1993; Shostack, 1981a, 1984, 1987). This method is based on the customer view and can be used to map the interactions between the service providers and service users in order to visualize a service from the start to the finish (Bitner et al., 2008; Kazamzadeh et al., 2015a).

The service blueprint has two dimensions: "the horizontal axis represents the chronology of actions conducted by the service customer and service provider. The vertical axis distinguishes between different areas of actions. These areas of actions are separated by different lines" (Fließ & Kleinaltenkamp, 2004). It is the overall picture of all relevant actors, resources and activities, which are connected and needed to a service (Ojalalo, 2012), so this method offers a well-suited approach on the field of service planning and delivery.

According to Bitner et al. (2008), Zeithaml et al. (2009) and Kazemzadeh et al. (2015a) as we can see in Table 1 the blueprinting method consists of six steps:

1.	clear identification of service process
2.	identification of specific customers targeted by this service
3.	map and design interactions between customer(s) and service provider
4.	map and design onstage and backstage employee and technology actions regarding the customer
5.	linking customer and employee with each other and with the supporting actions
6.	adding physical evidence for customer actions

Table 4: Steps of Service Blueprinting method
Source: Author's illustration based on Bitner et al. (2008)

According to Bittner et al. (2008), the service blueprinting method can be used in a wide variation of circumstances because it is highly flexible and resilient, as we will see it regarding our case as well.

2.4.2. Business Process Modeling

Business Process Modeling is a widely used modeling approach to analyze and improve business processes (Kazemzadeh et al., 2015a, 2015b, 2015c, 2015d; Milton & Johnson, 2012; Muehlen & Recker, 2008; Vuksic et al., 2011, 2013, 2017) and for public service processes as well (Chinosi & Trombetta, 2012).

According to Ko et al. (2009) and Recker (2011), it has a core set of constructs, which can be used for modeling processes and activities, and it has an extended set of constructs, which can be used to add further details and design and depth and complexity.

According to Kazemzadeh et al. (2015a), the basic construct of BPM consists of four categories: flow objects (event, activity, gateway), connecting objects (sequence flow, message flow, association), swimlanes (pools, lanes) and artefacts (data object, group, text annotation) In Business Process Modeling an event (which is shown by a circle) can be triggered three different ways: when the process begins (start event), in the middle of the process (intermediate event) and when the process ends (end event) (Kazemzadeh et al., 2015b). In BPM, activities are shown with rounded rectangles. These activities can be specific which cannot be broken down to further individual steps, or they can be complex activities as well (Kazemzadeh et al., 2015b).

In the process, diamonds shows gateways and they allow the divergence or convergence of process flows. Depending on their type, they are differentiated by their markings inside of the diamond (Kazemzadeh et al., 2015b).

Activities can be organized by sequence flows, which orders them by a solid line with an arrow showing sequence of activities. Message flows can be used to show messages flowing between activities where dashed line with a solid arrow indicates the direction of communication and labels indicate the type of communication. A sequence flow orders activities and is shown by a solid line with an arrow showing sequence of activities. A message flow, with the attached label, shows a message flow between activities and is denoted by a dashed line with a solid arrow, which indicates the direction of communication, the label showing the type of communication (Kazemzadeh et al., 2015c).

Pools and lanes can be used for grouping, where a pool can represent a group of participants (customers, administrators, etc.), lanes are used to categorize activities within a pool (departmental tasks, internal systems, etc.) but their usage is not strictly tied in BPM, it depends on the designers and their definitions, however, they must be clear in order to be understandable (Kazemzadeh et al., 2015d). Associations are used to connect artefacts with flow objects and dotted lined arrows, indicating their direction, represent them. Groups can link activities, which are related logically, and they are represented by dash-dotted boxes around the activities. A text annotation allows comments to be included for readers (Kazemzadeh et al., 2015b).

2.4.3. Process Chain Network

Process-Chain Network (PCN), which was introduced by Sampson (2011, 2012a, 2012b), is another process visualizing method which helps to identify and link actors of a given process in a systematic way. According to Sampson (2012a) "PCN diagrams build on the strengths of other flowcharting techniques, while emphasizing the unique conditions and design opportunities for interactive service processes" (Sampson, 2012a, p.17).

According to this statement this service visualization technique it has several similarities with service blueprinting as it was analyzed by Kazemzadeh et al. (2015) in terms of action and communication flow supporting as well as highlighting different actor categories and the interactions between them during the service process, but it differs from blueprinting in terms of line of visibility for example. On the other hand, it has advantages in terms of representing the internal complexities of the processes regarding direct interactions, surrogate interactions, and independent interactions, which are the three main process domains of the whole process chain according to Sampson (2012a).

According to Sampson (2011), the PCN method consists of the following steps:

1.	Define the target service process
2.	Define the process units within the process
3.	Define the first and last steps in the service
4.	Define the steps in the process and their position relative to the other steps
5.	Identify the steps in the process that have no financial cost or benefit
6.	Identify financial compensation options and reduce financial costs
7.	Identify the steps in the process that affect customer service perceptions

Table 5: Steps of Process-Chain Network method
Source: Author's illustration based on Sampson (2011)

As Frei (2006) states the complexity increases as customers are getting involved into a given service process thus visualization of the whole process is a key step, which helps to understand, analyze, manage and improve any given processes.

Sampson (2011, 2012b) makes a difference between entities of the processes based on that they are in control (operant resources) of certain resources and processes or they are controlled (operand resources), and it is also possible to switch between roles as we are moving forward in the process. Another important aspect of the PCN model is that it makes a difference between specific beneficiaries (customers) and generic beneficiaries (service providers) and separates them into two groups based on this.

2.4.4. Discrete Event Simulation

The purpose of discrete event simulation is to analyze the behavior of a given system as it allows us to apply changes during experiments to see how the system reacts without affecting the real system (Vuksic et al., 2017).

A discrete-event simulation model is defined as one in which the state variables change only at those discrete points in time at which events occur. Discrete-event system simulation is the modeling of systems in which the state variable changes only at a discrete set of points in time. Events can schedule other events such as an object entering a machine, which schedules an event for the same object to leave the machine. Discrete-event simulation only shows the state changes of the model components at certain points in time, not continually over time. When certain events take place, certain model components change their state and thus control the simulation (Zeigler et al., 2000; Bohács, 2012).

2.4.4.1. Background of Simulation

To understand the basic operation of a simulation software, we need to be aware of four important concepts. The first one is simulation itself, which is an imitation of the operation of a real process or system over time. This includes the creation of an artificial history of the system and the observation of this artificial history in order for the creator to draw conclusions about the operational characteristics of the real system depicted (Zeigler et al., 2000; Bohács, 2012).

A simulation is a test in which a system or the expected or actual behavior of the system is studied in a physical or computer model of the process. Accordingly, simulations are simplifications of reality that focus more on the system as a whole and less on its details. The purpose of the simulation is to create the same or very similar conditions for users in the virtual environment at the model level as the simulated phenomenon. This allows us to use a virtual environment that mimics the operation of the original system to accomplish a specific task, which greatly facilitates, for example, various efficiency and optimization efforts (Zeigler et al., 2000; Garrido, 2011).

The purpose of simulation is to understand the features and essence of processes, and it allows us to answer the question to "What would happen if…?" without any financial or safety risks. We can change parameters and try different setups in order to find the optimal solution during design or a review phase. The model not only describes the relations and the steps of the processes, but features of the steps are also described. These features involve parameters such as processing times, input rate and so on. In case of modeling an existing process, such parameters must be measured or estimated as distributions in order to simulate significantly more cases than measured. The way the model is described is based on the framework that is used. Usually simulation frameworks provide ways and tools to describe the models, while also allowing "operating" or "running" these models (Zeigler et al., 2000; Bohács, 2012; Mes, 2017; Prateek, 2015).

Within the concept of simulation, we distinguish between machine-human and human-human simulation. In human-to-human simulation, a group of individuals embodies the simulated reality. In doing so, real social life situations can be simulated in a model environment, which is suitable, for example, for teaching and understanding the processes that take place (Banks et al., 2013; Zeigler et al., 2000; Bohács, 2012; Mes, 2017; Prateek, 2015).

In machine-to-human simulation, the simulated reality is transmitted to the users by the computer and they interact with it. For example, simulators for the operation of a production line or a complex service process can understand and understand these processes, but the simulation run on a computer can also feed real measured data of a given situation, which can be used to explore the causes of existing problems and possible solutions (Zeigler et al., 2000; Bohács, 2012; Mes, 2017; Prateek, 2015).

The second concept is the model. Simulation requires a model that properly describes the steps, relations and features of the process. The level of detail and what "properly" means is always a valid question. These models are simplified descriptions of reality and as a thumb rule, the model should be simple but also detailed enough to grasp the general and studied behaviors of the real process (Bohács, 2012; Banks et al., 2013; Prateek, 2015; Martijn., 2017).

There are three theoretical methods for creating a basic mathematical model for a given system, the white-box method, the black-box method, and the gray-box method (Pokorádi, 2008).

In the case of the white-box procedure, we have preliminary information about the system for setting up the model, so the modeling is based on physical considerations and laws. The great advantage of the white-box method is that the physical parameters of the model have a real content and meaning, but the disadvantage is that the structure of the model is usually extremely complicated, as obtaining accurate information for creation can be time consuming and cumbersome. This method is most often used in engineering practice (Pokorádi, 2008).

The black-box procedure, on the other hand, represents the other extreme, in which case information can only be obtained through experiments and measurements to set up and create the model. One of the great advantages of the black-box method over the white-box method is that it is relatively easy to create the model. However, it also has a disadvantage, since in this case the parameters, in some cases, have no real physical meaning. However, in some cases, precisely because of their simplicity, these models are also very well applicable. Black-box models are also commonly referred to as input / output models, as such models are usually created based on the input and output characteristics of the system under study (Pokorádi, 2008).

The third modeling method is the so-called gray-box method. This kind of approach is essentially the result of a combination of the previous two methods, i.e. the white-box procedure and the black-box procedure. In reality, when creating simulation models, in most cases this type of procedure is used to simulate the processes of both the technical and social sciences. Since we usually have a certain amount of data and information available when solving a given technical problem, we do not have to grope completely in the dark, there are always handrails, but there are also unknown black spots (Pokorádi, 2008).

Regardless of the method of construction, a simulation model can be created to achieve many goals, whether it is to study the possible operation of systems under design, further optimize existing systems, identify, eliminate and eliminate the causes of failures in a given system, efficiency testing, diagnostics or planned condition assessment (Pokorádi, 2008).

An event is a momentum that changes the current state of the system. Within the simulation software, we distinguish between so-called discrete event simulation and continuous event simulation, and accordingly we can talk about so-called continuous-parameter and discrete-parameter simulation models. In models with continuous parameters, variables can take on any value within a given range or range. For models with discrete parameters, however, variables can only take discrete values (Bohács, 2012; Banks et al., 2013; Prateek, 2015; Martijn., 2017).

2.4.4.2. Characteristics, Advantages and Disadvantages

A simulation models allow us to evaluate different variations of processes under different circumstances and their effectiveness. In addition, the simulation allows to use new strategies and procedures, locate bottlenecks, and increase productivity while reducing inventory and reduce the cost of the implemented changes (Kikolski, 2016).

Studying processes is the aim of many research programmes. This involves the application of various methods, beginning with practical activities in the form of observations, and ending with theoretical analyses. Such procedures require a mathematical apparatus. Nowadays thanks to the various ICT tools, a computer simulation becomes an exceptionally significant and effective research method. It reflects the studied phenomenon or a process in the form of a computer program, also called a computer model, which is created with the use of a mathematical model (Siderska, 2016).

Simulation is an approximate imitation of a studied phenomenon or behaviour of a given system in the virtual space with the use of its so-called simulation model. Simulation models

are used to reduce the risk of failure while implementing significant changes into the existing manufacturing systems or processes. Upon generating the model, a simulation analysis is performed to determine particular elements of the process. The model of a studied system presents its properties, features and limitations as well as the manner in which the process in specific conditions takes place. Simulation, by means of adequate tools, allows for a respectively simple and cheap way of verifying different variants connected with the functioning of the processes (Law, 2008).

With a view to the objective of the simulation, it can be divided into three types (Kikolski, 2016):

- a simulation aimed at understanding the principles of the functioning of the system and its properties that are difficult to distinguish based on a formal analysis;

- a simulation aimed at facilitating decision-making within the functioning of the system;

- a simulation, whose aim is to train decision makers concerning the functioning of the system.

The simulation of production processes is a technique used for solving problems occurring during the manufacturing process. Modelling a process involves the creation of a virtual manufacturing process that allows conducting a simulation and collecting statistics. Statistics facilitate conducting reports and comparing selected settings of the parameters that characterise workstations. Computer models can be freely improved, and further simulations can be applied to various variants and settings anticipated by the user.

Simulation models are typically used when it is impossible or very difficult to devise an analytical solution of a studied problem. This takes place in the case of analysing a dynamic behaviour of production systems and processes. An adequate selection of strategies and skilful management of chosen tools, including methods of computer simulation, allow and facilitate solving of problems that occur (Law, 2008).

Computer simulations are identified as the most popular tools for the analysis of the possibilities that optimize processes in production engineering. Conducting of computer simulations allows assessing whether the undertaking was properly designed and is conducted in an adequate manner. A simulation ensures a total, complex view of the studied process or product, facilitates a multi-criterion analysis and testing various scenarios (Siderska, 2016). Modelling and digital simulations are used when it is too complicated or

impossible to obtain a solution with analytical methods and experimenting with the real process within a production hall is too labour- or cost-intensive due to the enforced standstills in operation (Kikolski, 2016).

The use of computer simulation tool like Plant Simulation allows predicting the work of the production line and providing some of the behaviour of systems. A wider scope research can provide an answer to the questions concerning the suitability of such solutions in the analysis of complex processes. Using simulation tools does not exclude a traditional form of design. However, it may become a source of confirming the adequacy of a designed object. The application of a computer simulation for solving research problems relies on the proper creation of the model and adequate execution of a simulation experiment. The choice of the relevant tool for conducting a simulation is extremely essential. It is important that a given program have an adequate functionality in the sense of the simulation′s objective.

It should be noted that the conducted analysis is only an example of using simulation models for the identification of bottlenecks and that it was focused on the part of the production process. Expanding research to encompass other elements of the process can affect the statistics of the efficiency of specific stations.

Advantages of simulation (Gray, 2002; Moorthy et al., 2005; Brooks et al., 2010)

- Simulation allows to explore 'what if' questions and scenarios without having to experiment on the system itself.
- It helps to identify bottlenecks in material, information and product flows.
- It helps to gain insight into which variables are most important to system performance.
- It can avoid danger and loss of life.
- Conditions can be varied and outcomes investigated.
- Critical situations can be investigated without risk.
- It is cost effective, can be safer and cheaper than the real world
- Simulations can be sped up so behaviour can be studied easily over a long period of time.
- Simulations can be slowed down to study behaviour more closely.
- Study the behavior of a system without building it.

- Can use it to find unexpected problems.

Disadvantages of simulation (Gray, 2002; Moorthy et al., 2005; Brooks et al., 2010)

- Simulation is not precise. It is not an optimization process and does not yield an answer but merely provides a set of the system's responses to different operating conditions. In many cases this lack of precision is difficult to measure.
- A good simulation model may be very expensive. Often it takes years to develop a useable corporate planning model.
- Not all situations can be evaluated using simulation. Only situations involving uncertainty are candidates, and without a random component, all simulated experiments would produce the same answer.
- The quality of the analysis depends on the quality of the model and the skills of the modeler, who requires specialized training.
- It's a time-consuming and expensive process, so should not be used if an analytical method can provide quicker results.
- It can be expensive to measure how one thing affects another, to take the initial measurements and to create the model itself (such as aerodynamic wind tunnels).
- To simulate something, a thorough understanding is needed and an awareness of all the factors involved. Without this, a simulation cannot be created.
- Mistakes may be made in the programming or rules of the simulation or model.
- The cost of a simulation model can be high.
- The cost of running several different simulations may be high.
- Time may be needed to make sense of the results.
- People's reactions to the model or simulation might not be realistic or reliable.

2.4.4.3. Simulation in Public Service Context

The thesis aims to contribute to literature by applying discrete event simulation in public service context to further analyze the selected public service processes and to provide additional details regarding key performance measures. According to literature, there are a few examples in the Eastern-European literature of applying discrete event simulation to public services (Devjak, Peček, 2012; Kovačič, Peček, 2007; Comas et al., 2008), however

this thesis is the first, which applies this approach in a Hungarian context in case of the selected and discussed public service processes.

As technology evolves and public administration management is undergoing a series of reforms, including digitalization, these changes influence the management methods and techniques. With the intention to gain a more transparent overview of the administrative processes and to make them more transparent and manageable, the implementing simulation methods can be useful. By using simulation, we can expose the weak points and bottlenecks of the organizations and processes.

According to Clifford and Bon (2008) and Luellig and Fraizer (2013) systems related to the management IT system could be utilized such as ITIL (Information Technology Infrastructure Library) or COBIT (Control Objectives for Information and Related Technologies). ITIL is a set of detailed practices for IT service management, focusing on aligning IT services with the needs of businesses. ITIL describes processes, procedures, tasks, and checklists, which are neither organization-specific nor technology-specific, but can be applied by an organization toward strategy, delivering value, and maintaining a minimum level of competency. It allows the organization to establish a baseline from which it can plan, implement, and measure. It is used to demonstrate compliance and to measure improvement. COBIT is a framework created by ISACA for information technology (IT) management and IT governance. The framework defines a set of generic processes for the management of IT, with each process defined together with process inputs and outputs, key process-activities, process objectives, performance measures and an elementary maturity model.

According to the international literature there are several research papers discussing the application of different process mapping solutions (Bittner et al., 2008; Kazemzadeh et al., 2015; Zeithaml et al., 2009; Fließ and Kleinaltenkamp, 2004). However only few of them combine these approaches with a simulation program for further analysis, especially in the Eastern- European literature (Kovačič, Peček, 2007; Devjak, Peček, 2012).

Providers of public services should provide the users with some of the essential information regarding the processing of their matters, such as the time required to solve their case, possible complications, additional obligations, and the current state of the application.

As we will see in the next chapter, while in case of the Gowernment Window operations these informations are relatively well available for the customers, in case of the Contact

Affair procedure of Guardianship Offices the situations is quite different. There have been some improvements in the phase of activities' analysis, but there have practically been no solutions to the problems regarding the prediction of the time required for a certain application. Due to the nature of the problem, it is indeed very hard to make any prediction about the duration of a public procedure. Moreover, this involves a high level of risk.

The article of Devjak and Peček (2012) describes the problems of collecting the data on elementary operations. The documentation databases have been analyzed with the aim to define the elapsed time for a single administrative operation and the probability of transformation of a transaction from one process state to another.

Hence, this problem demands a special methodology, which will allow simulations of various situations and methods of their solving. The solving of problems, which arise during the provision of services to citizens, has to aim at finding the optimum solutions. The services have to be provided optimally both as far as citizens' needs are concerned, taking into account all applicable norms, as well as far as the provider's financial and economic possibilities are concerned.

As the authors state in the public sector, there are many processes that could be dealt with simulation models. They involve particularly those, which are executed by the state or local self-government bodies for citizens. Mathematical models, written by complicated equations, would be too demanding and too hard for an ordinary citizen to understand. Due to the nature of the problem, e.g.returning to the previous state, repeating of the activities, simulations are the only way of fulfilling information demands in the management. That is why simulation techniques are becoming increasingly popular as a decision tool in everyday management.

When certain events take place, certain components of the models change their state and thus control the simulation. The simulation software discussed in the work takes these events into account discreetly, step by step. The simulation model of discrete events is defined as the state variables change only at the discrete points where the events occur. Discrete event simulation is the modeling of systems in which the state variable changes only in a discrete series of time points. The main advantage of this approach is that the software skips the time between events, so we can track the changes in the elements of a given system at time points of a predetermined density. In addition, a fully object-oriented environment and

programming allows us to model large, complex systems in an organized and transparent way.

The simulation software we discuss contains basic objects that have features that allow us to use them directly in a simulation model. Thus, the software can be used to apply discrete event simulation and statistical analysis capabilities to Government Windows and to specific public services, for example, to simulate their processes and to understand these processes, increase efficiency, and optimize work force requirements. This allows us to quickly check bottlenecks, lead times, and from time to time view resource utilization and utilization rates for each item.

However during simulation exceptions in the service processes must be also addressed during the design and analysis. In case of Government Window front office operations exceptions can be unpatient customers, who abandon the queue before being processed, or submit multiple requests simultaneously addressing different issues at the same time. In case of the Contact Affair Procedure of Guardianship Offices exceptions can be submissions which do not pass the initial evaluation or or will be withdrawn by the parents before being processes. These special situations must be also considered during the mapping and evaluation of the service processes in order to create a simulation, which represent the studied system lifelike.

According to the author's opinion service visualization and mapping are very important parts of service process analysis, it helps to understand the connections between the service steps and helps to unravel aspects of key importance. The discussed methodologies help to examine service processes from different angles, allowing to study them from both the point of view of the facilitators and the customers. Once we understand a process, we can better measure its characteristics and performance, which ultimately helps to achieve better development opportunities. Simulation on the other hand can help in the analysis and in the development process as well, offering various possibilities to predict process behavior and to test different kind of development possibilities in order to find the best solution, without affecting the real process.

3. Results

This part of the dissertation is connected to research question four (RQ-4). The first subchapter (3.1.) discusses the application of selected process mapping methodologies on Government Window front office operations, the statistical analysis of the collected data, and an example of the application of discrete event simulation based on the analyzed data by using the ProcessSim program.

The second subchapter (3.2.) discusses the application of selected process mapping methodologies on the Contact Affair Procedure of Guardianship Offices, the statistical analysis of the collected data regarding a complex case with multiple sub-cases, and an example of the application of discrete event simulation based on the analyzed data by using the Plant Simulation program.

Providing quality service is considered essential (Reichheld & Sasser, 1990; Zeithaml et al., 1990), and public service providers are under continuous pressure to improve service quality, efficiency and effectiveness (Ramseook-Munhurrun et al., 2010; Robinson, 2003).

The topic of the thesis is the service process analysis and development of public services with a special focus on selected public service processes. The units of analysis are within the Hungarian public administration system, more closely the front office operations of the Government Window system and a complex service process of Guardianship Offices called contact affair procedure. The thesis aims to use these selected service processes as examples to demonstrate the usefulness of the combined analytical methods and approaches.

In this chapter, the thesis first discusses the service process mapping, statistical analysis and discrete event simulation regarding the front office operations of a Government Window. In the second part of the chapter, the thesis discusses the service process mapping, statistical analysis and discrete event simulation regarding the operation of a contact affair procedure of Guardianship Offices.
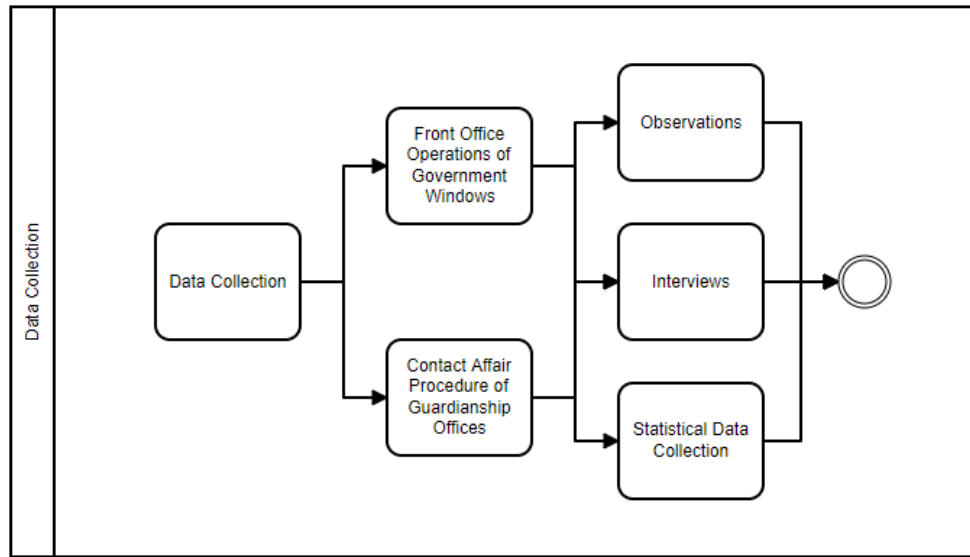
Figure 11: Data collection
Source: Author's own creation

Government Windows, as part of the Hungarian administrative reforms, were established almost a decade ago and serve as the main access point between the citizens and the state ever since (Buics, Süle, 2020).

Guardianship Offices handle mostly social and family related issues. They are service centers themselves in connection with the Government Windows, as Government Windows provide information and help with documentation in case of these type of submissions. Than because they cannot be handled directly there, instead they transfer the case and direct the citizens towards the Guardianship Offices. (Buics, Eisingerné, 2020)

As we can see on Figure 11, in case of Government Window, operations during the data collection observations and interviews were made in Government Windows located in the capital city. Then raw data was provided by the Government Windows which contained the arrival times, waiting for times and processing times of citizens and their cases during the front office operations based on the ticked machines where cases can be selected after arriving to a Government Window.

In case of the contact affair procedure of Guardianship Offices during the data collection, first interviews were made with administrators in the Guardianship Office of Győr and the legal background were studied. After that, the administrators provided anonym data regarding the process cases and participant. As there was no detailed raw data like in case of the front office operations of Government Windows, statistical data was generated based on

the case numbers, sub-numbers and their filing dates with the help of the administrators to ensure the anonymity of the participants of the process.

As we can see on Figure 12, in the following chapters the thesis first map and visualize the service processes of both selected services with the help of Service Blueprinting (SBP) (Bitner et al., 2008; Kazemzadeh et al., 2015a; Zeithaml et al., 2009), Business Process Modeling (BPM) (Ko et al., 2009; Recker, 2010, 2011; Vuksic et al., 2017) and Process-Chain Network (Sampson 2011, 2012a, 2012b; Kazemzadeh et al., 2015) to demonstrate the advantages of these approaches.
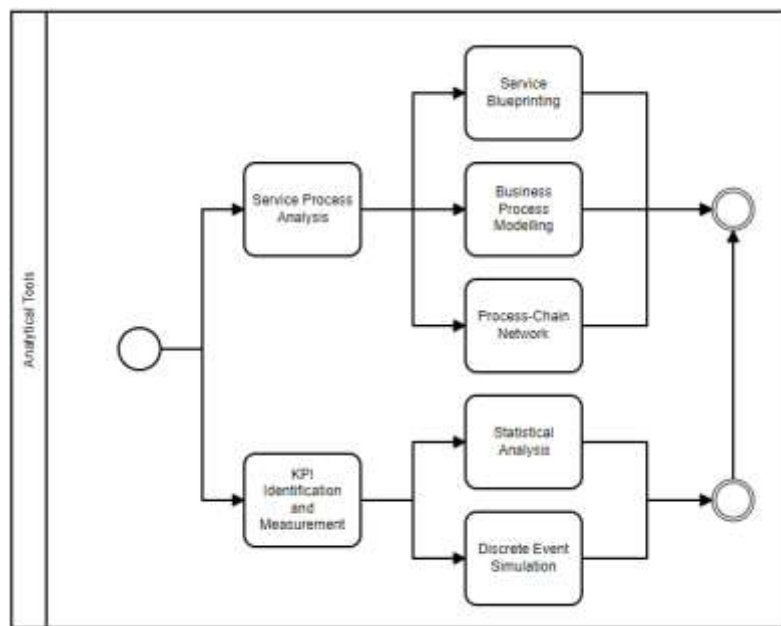
Figure 12: Analytical Tools
Source: Author's own creation

After that in case of the Government Windows, the thesis statistically analyses collected data (45234 records) from a selected Government Window. The analyzed data contains the arrival times, waiting for times and processing times of citizens and their cases during the front office operations between 1st December 2016 and 31st November 2017. In case of the contact affair procedure of Guardianship Offices the thesis statistically analyses a selected case in details. After the statistical analysis Discrete Event Simulation (DES) (Banks et al., 2013; Garrido, 2011; Mes, 2017; Vuksic et al., 2017) is applied to analyze the elements of the processes further. Therefore, we are able to give recommendation to improve the process both for the administrators and for the legislators.

3.1. Analyzing Government Window front office operations

In 2010 within the framework of the Zoltán Magyary Public Administration Development Program (Magyary Program) in Hungary, a wave of structural reforms was launched. In the Magyary Program, the legislators set the goal of simplifying procedures, reducing customer burdens and creating uniformly high-quality services accessible to all citizens. One of the main results of these reforms was the establishment of the Government Window system (Buics, 2019; Jenei, 2019).

The image of the Government Windows is uniform, their services are the same everywhere. The available services of the Government Windows have been constantly expanding since their establishment, as of 2020 the Government Windows can provide help for citizens in over 2000 different kind of available cases, which can be classified into several categories from cases which can be dealt with immediately to cases where only information can be provided by administrators.

The goal of the thesis is to examine Government Windows front office operations from the point of view of supply and demand with the help of queuing models (Cachon, Terwiesch, 2013), and to visualize the front office operations by using the Service Blueprinting (SBP) (Bitner et al., 2008; Kazemzadeh et al., 2015), the Business Process Modeling (BPM) (Ko et al., 2009; Recker, 2010, 2011) and the Process-Chain Network (PCN) (Sampson 2011, 2012a, 2012b; Kazemzadeh et al., 2015) methodologies.

They aim of the research, regarding research question four, is to show how the management approach can be used in case of public services and what are their advantages of the discussed visualization methodologies. The processed data is not open source, it was provided by higher authorities and government window officials upon request during the KÖFOP project.

Through Government Windows citizens can access a wide variety of public services. Amongst the more than two thousand individual services, there are four main types of public service categories, which can be clearly distinguished from the others. Services related to personal identification documents (passport renewal, ID cards, etc.), services related to social issues (family support, social security card issuing, application for child support, etc.), services related to taxation and services related to car issues.

According to the literature, the personal identification document related services are the most frequently used while the social issue related services are the second biggest group of frequently used services.

3.1.1. General description and background

The research used the Service Blueprinting, Business Process Modeling and Process-Chain Network methodologies to map and visualize Government Window front office operations. Service Blueprinting is based on the customer view and can be used to map and visualize the interactions between the service providers and service users to get a whole picture about a given service from the start to the end. Business Process Modeling categorizes the activities of the service participants based on their responsibilities and based on the communication between these participants.

According to Milton and Johnson (2012), the two methodologies have different perspectives but Milton and Johnson (2012) showed how Service Blueprinting and Business Process Modeling can support each other. We can use blueprinting to understand the customer perspective and reveal what drives their satisfaction while process modeling can be used to diagram the organizational perspective, thus these two methodologies can be used effectively together to map and understand a service process which can help further to improve the efficiency and effectiveness. As discussed before Process-Chain Network has several similarities with Service Blueprinting according to Kazemzadeh et al. (2015) but it differs from blueprinting in terms of line of visibility for example and demonstrates an advantage regarding the representation of internal complexities.

In case of our example, the flowing units of the process are the citizen themselves. On Figure 13 we can see the main steps of the Government Window front office operations. As we can see the process itself seems rather similar, the customers come into the Government Window, than chose the case type they want to address by using a ticket machine. In a Government Window there are multiple administrators but not all of them are necessarily skilled to handle all types of cases. After receiving the ticket, the customers become part of the queuing line and have to wait until one of the administrators who is capable of handling the chosen issue, becomes available. The administrator than calls the customer, processes the case and the customer leaves the Government Window, finishing the process. As we can see in case of the Government Window front office operations, we can speak about a parallel

system where there is one single queue, which leads to several identical workstations. While in our example we are examining a Government Window the service process in which customers are coming to handle different issues or request information is quite common in other sectors as well.
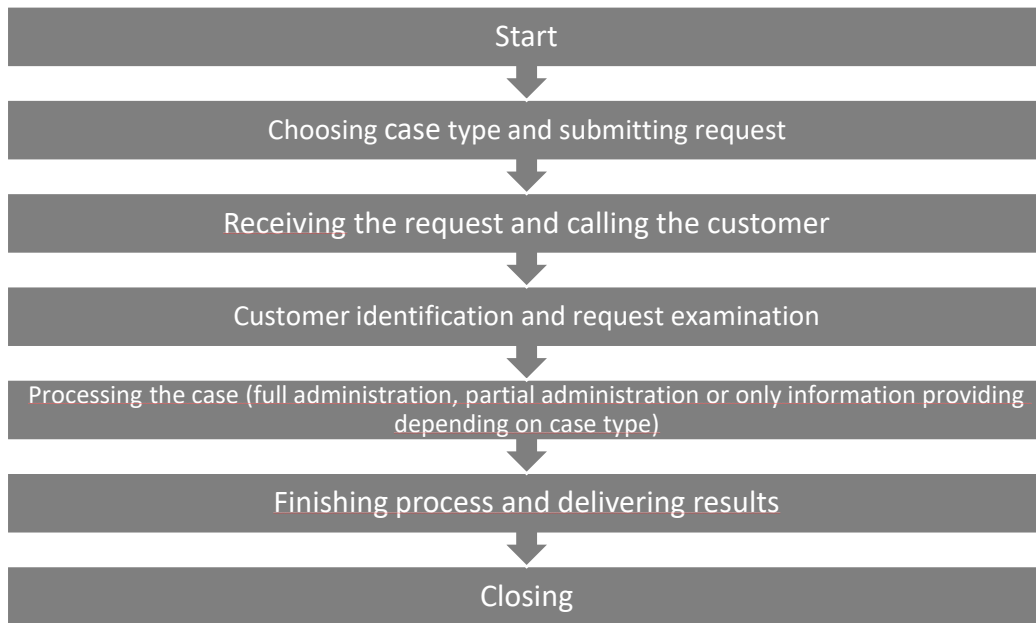
Figure 13: Main steps of Government Window front office operation
Source: Author's own creation

Government Windows operate like service centers where multiple issues can be solved or information can be provided in case of more complex issues about where to go and what to do. The interior design is similar in case of each Government Window and cases can be handled in any window so citizens can assess their issues in any of them, they are not tied to the place of living as in case of the previous system. Because of this Government Windows which are in central locations like county capitals or the capital city are usually handle a larger number of cases on average as people usually tend to their administrative issues before or after work.

3.1.2. Service Blueprinting

First, we will use the Service Blueprinting to map the process and create the visual representation of the service steps. This method puts the main focus on customer experience and interprets services from three perspectives: from a process point of view, from a

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customer experience point of view and from the point of view of development and design. Table 6 shows the components of the front office operations and Figure 14 shows the developed blueprint representation of the service process.

In this case, we can make a difference between customer actions, visible and invisible employee actions (from the point of view of the customer), supporting processes which are used by employees to provide the service process, and physical evidence which is the category of physical necessities to provide the service.

Physical Evidence	Government Window office
Customer Actions	Choosing case type and submitting request Receiving ticket, Waiting for call, Personal appearance in the office, personal appearance at the specific window Receiving results
Onstage/Visible Contact Employee Actions	Customer identification and request examination Processing the case Delivering results
Backstage/invisible Contact Employee Actions	Waiting for a request Receiving request Calling customer
Support Processes	Official digital system of administrators

Table 6: The components of Service Blueprinting
Source: Author's own creation based on Bitner et al. (2008)

After the identification of the main elements of each category, we continue with the interpretation of the process. When interpreting the service process, we focus on the relationships between the activities that create the service. We examine how much each activity is related, how well they are able to unite and build an efficient service.
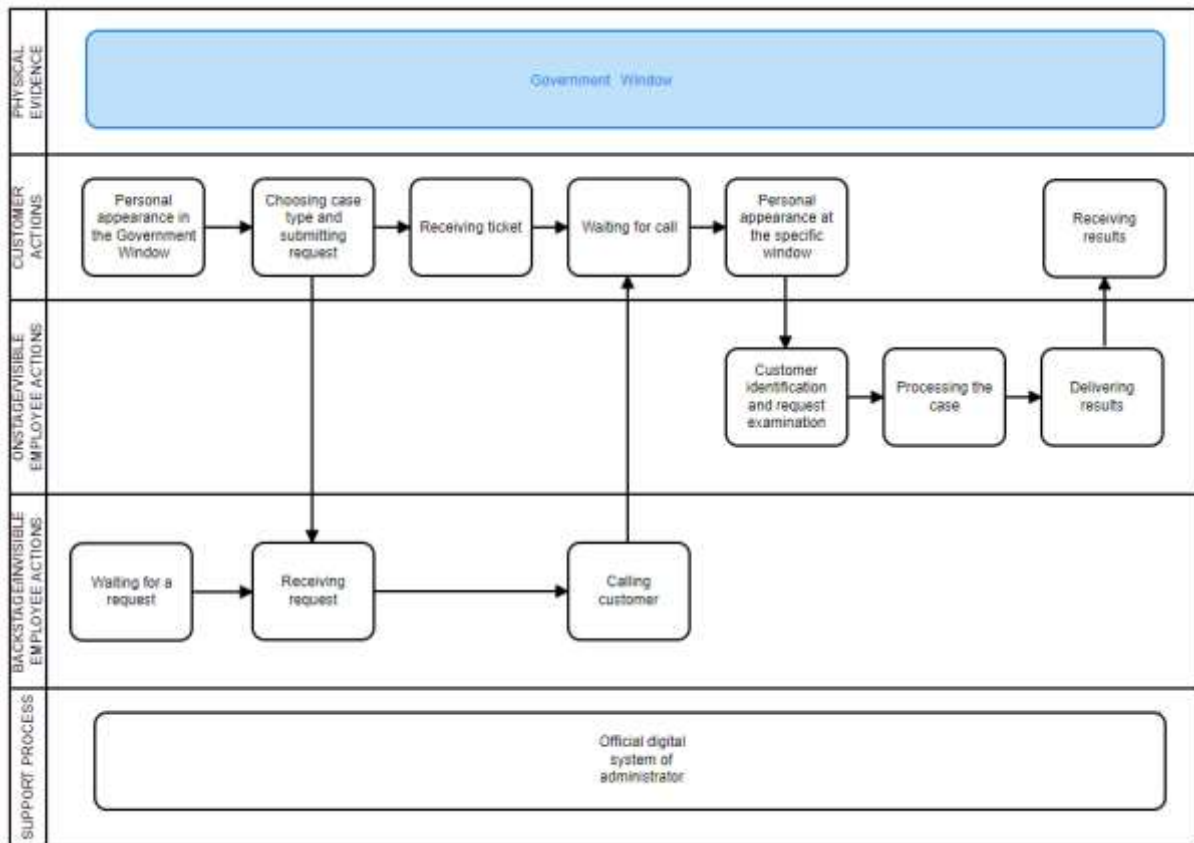
Figure 14: Blueprint representation of the Government Window front office procedure
Source: Author's creation

As shown in Figure 14 after the citizens arrive in a Government Window they have to choose what the reason of their coming is. There is a ticket machine next to the entrance of each Government Window, where they can choose from different categories. Some categories are specific like passport issues and some categories are general like issues related to vehicles. After that, they get a ticket with their number and they enter the queue until they are served. (Of course, they can also leave before being served if for example the queue is too long.) Several windows are working simultaneously where issues can be processed. When a new customer arrives and submit a request the system notifies the administrators. Not every administrator is tasked to handle every upcoming issue thus customers have to wait until one of the windows, where the issue can be handled, becomes free. When the administrator calls the customer, the system notifies the customer then the administrator processes the case provided by the customer. In case of Service Blueprinting, receiving a request and calling the customer are invisible employee actions because until the customers are called they are waiting in the queue not knowing exactly when and to which window they have to go later.

During the processing of the case, several outcomes can happen. Either the issue can be handled directly by the administrator (for example in case of a driving license renewal) or the case can be only partially handled there and the administrator sends it to another department (for example a birth certificate issue). It is also possible that the administrator can provide only information about where the customer should go to handle the issue (for example in case of taxation issues). However, in each case, there is a processing time, which depends on the type and complexity of the issue.

3.1.3. Business Process Modeling

On Figure 15 we can see the Business Process Modeling representation of the service process. This method offers deeper insights into the organizational perspective of the service process. As we can see the electronic system which handles the requests and notifications can be also represented as a key part of the process, but other layers can also be added in case of a more complex process. In this case, we can see more details regarding the steps of the employee. Either they are processing a case when a new request arrives or not, and depending on this waiting times of the customers (how long they have to wait to be served) can change.
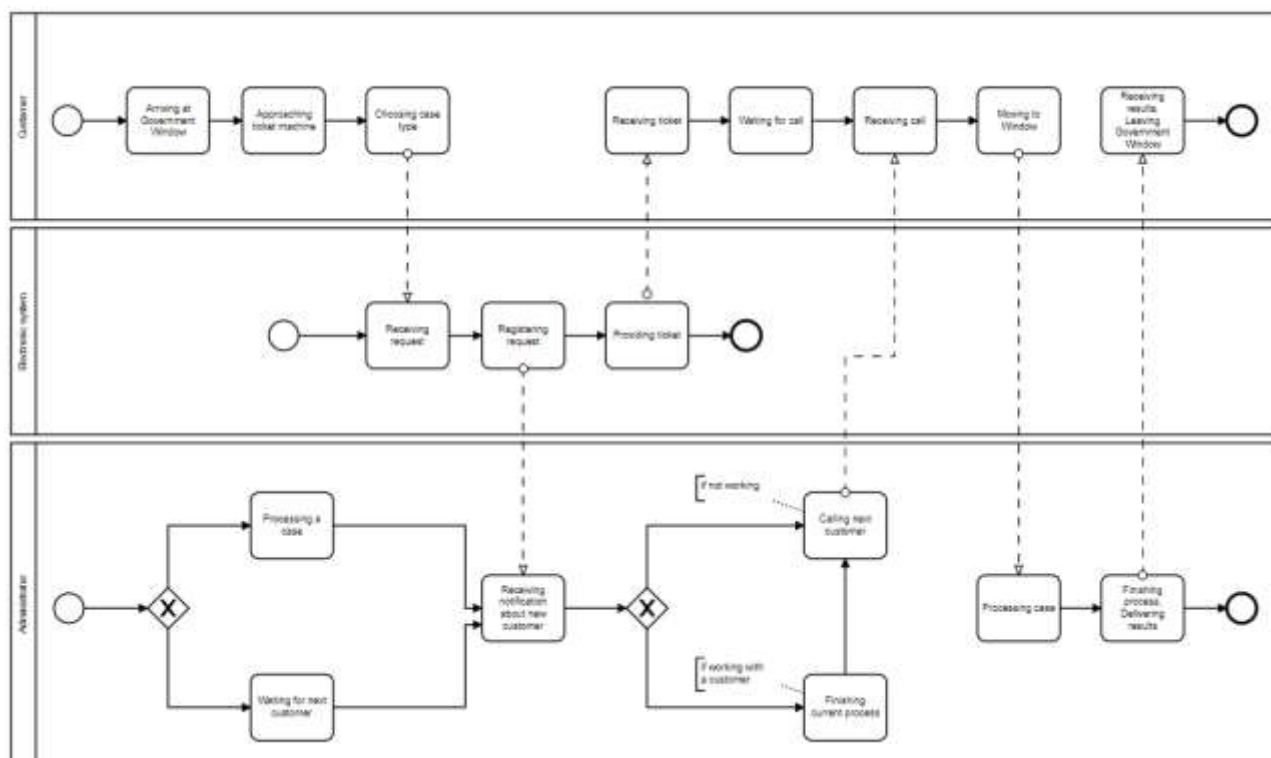
Figure 15: Business Process Modeling representation of the Government Window front
office procedure
Source: Author's own creation

The main advantage of Business Process Modeling that it offers more flexibility thus deeper insights into the different layers of the process from the organizational perspective while Service Blueprinting offers the point of view of the customers on a more detailed level. The Electronical Administrative Supervision of Hungary also highlights the advantages of BPM in their proposal and marks it as a potentially useful tool (https://euf.gov.hu/). There are several modeling software as well, like e.g. Bizagi Modeler (www.bizagi.com) and Cawemo (www.cawemo.com), which offer free and easy usage of this method.

3.1.4. Process-Chain Network

The Process-Chain Network (PCN) method is designed to present process elements involved in the service process based on needs and satisfaction. In this method, we divide the canvas vertically into two main parts: the customer and the provider. Customers are the citizens who are arriving and the provider is the Government Window and its employees as before.

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However, in this case, we make a difference between direct and surrogate interactions and independent processing actions.

The direct interaction region includes process steps that involve the Government Window employee interacting with another entity, such as the customer. The surrogate interaction region includes process steps in which the Government Window employee is acting on the resources coming from another entity without direct interaction. For example, the citizen provides necessary documents for identification and case processing and the employee examines them. The independent processing region includes process steps that the Government Window employee performs without interacting with other entities, such as waiting for a request or receiving a new request.
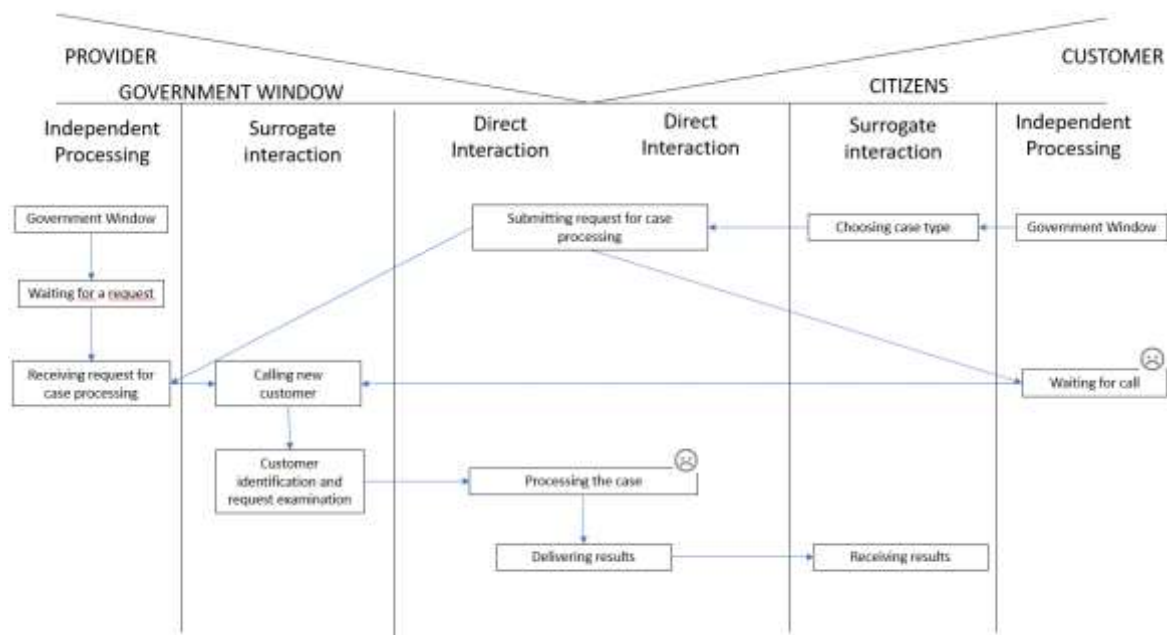
Figure 16: Process-Chain Network of the Government Window front office procedure
Source: Author's own creation

As we can see on Figure 16 the Process-Chain Network model includes customer satisfaction or dissatisfaction at different points of the service. Not surprisingly, our model shows that customers are dissatisfied mainly at the point where they have to wait too much for the processing of their case and dissatisfaction can be also seen in case of the processing of the cases. According to Government Window administrators, customers who had to wait longer to be processed are generally seem to be more impatient regarding the processing time of the case, which is understandable. The main advantage of this method is that it makes a

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difference between the process steps based on the level of interaction between the actors however, it is less flexible and detailed.

3.1.5. Statistical Analysis

In our current study, as an example, we choose to process the collected data of a Government Window located in a capital city district. In this process, the flow unit is the demand or transaction represented by the citizens. These transactions are automatically recorded after the service is requested at the ticket machine. Namely: the time of requesting the service ("Date": year, month, day), the number and name of the requested service ("Service", "Service Name"), the window ("Window"), the time the ticket was issued ("Ticket Time": hours, minutes, seconds), the time of the call ("Call Time") : hours, minutes, seconds) and the end time of the service ("End of Service": hours, minutes, seconds). However because the system is not uniform depending on the Government Window the dataset can be different in terms of details making the data extraction harder if we want to compare different service centers with each other.

The thesis uses the dataset of Government Window located in the capital city district. The thesis examined the processed cases from 2016 December to 2017 November. During this period, the Government Window administrators processed 45234 individual cases. Each record contains the date of the case, the time of arrival, the number of the window where the customer was directed, the time when the customer was called and the time when the record was closed.

While this case number is generally larger than a case numbers of other Government Windows located in smaller cities, this Government Window is located in one of the outer districts of the capital. Preliminary examination of other datasets revealed that Government Windows located in the inner districts processed two or three times more cases during the same period of time. According to the administrators, many people prefer to use these windows during working days even if they are not living in the capital city, given their central location, easy accessibility and the uniform design of Government Windows.

During data cleaning and sorting according to Vastag (2019), we have excluded records with extreme values where the processing times were shorter than 30 seconds did or longer than three hours (3543 records), which left 41691 records after data cleaning. According to the administrators, after calling a new customer they usually have to wait sometime because the

customer has to realize that his/her case number was called, then they have to find the right window and go there to start the actual process. However, there are examples when the customer does not show up. In this case, the administrators wait usually 20-30 seconds after the call before calling a new customer. Table 7 and Figure 17 shows the overall distribution of records based on processing time before exclusion.

Processing time	Number of records	Percentage
Below 30 seconds	3462	7.65%
Between 30 seconds and 3 hours	41691	92.17%
Over 3 hours	81	0.18%
Total	45234	100.00%

Table 7: Distribution of records according to the processing time (1)
Source: Author's own creation
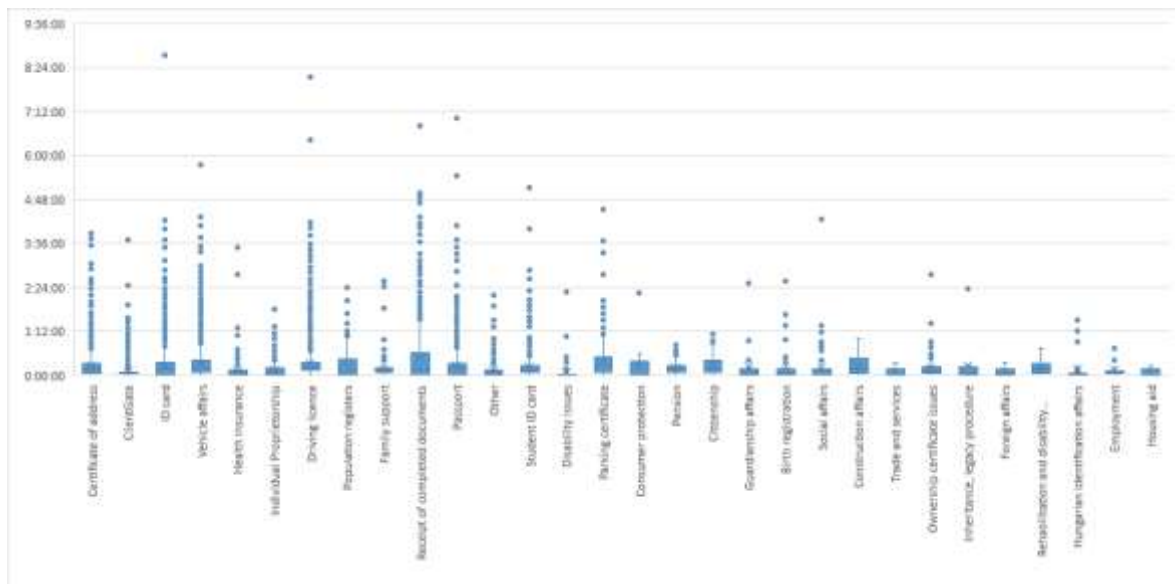
Figure 17: Distribution of records according to the processing time (2)
Source: Author's own creation

There are numerous reasons of why the customers do not show up, but the most common reason is that that they booked the time previously but for some reasons they cannot come or forget to come for their appointment when the administrators call their number. The other main reason is that they do not want to wait if the line is too long. From the 3543 excluded records 835 (23.56%) was a previously booked appointment. Besides, 78% of the records represent cases, which were not booked before, while 22% of the case was booked during the examined period.

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Distribution of cases

As seen in Figure 18 and 19 the average distribution of cases was 166 cases per day with a maximum of 312 cases, which happened on 30th August 2017. Besides, with a minimum of 26 cases which happened on 20th November 2017 and the analysis of distribution shows a 54 case standard deviation in the records during the examined period. The analysis also shows that during the 75% of the examined days the number of daily cases was below 205 (upper quartile).
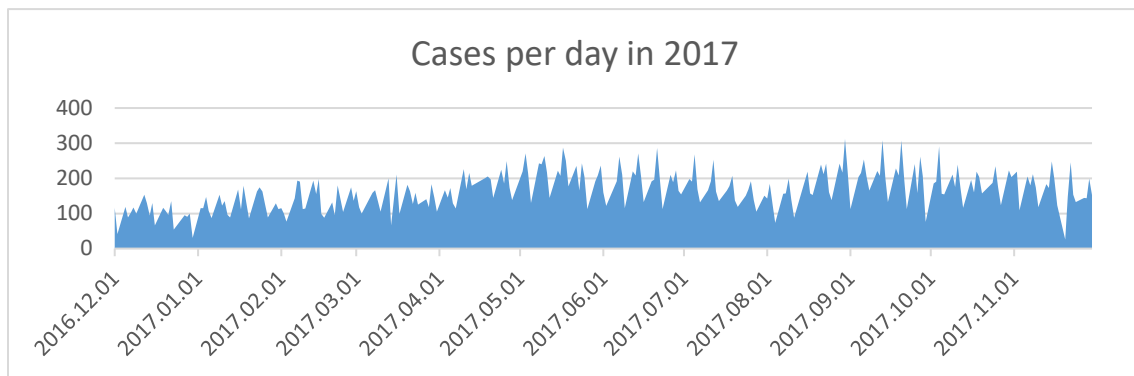
Figure 18: Time series of cases (between 2016. December and 2017. November) on a daily basis
Source: Author's own creation
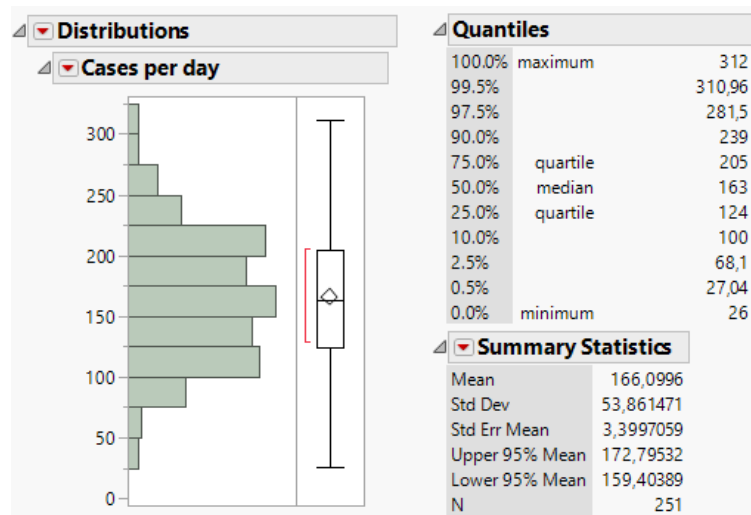
Figure 19: Distribution of the number of daily cases
Source: Author's own creation

Figure 20 and 21 shows the distribution of the examined records on a monthly basis. In this case, as we can see the number of monthly cases ranges from a minimum of 2080 (2016

December) to a maximum of 4681 (2017 May) with a mean 3474 and a standard deviation of 726 cases per month.
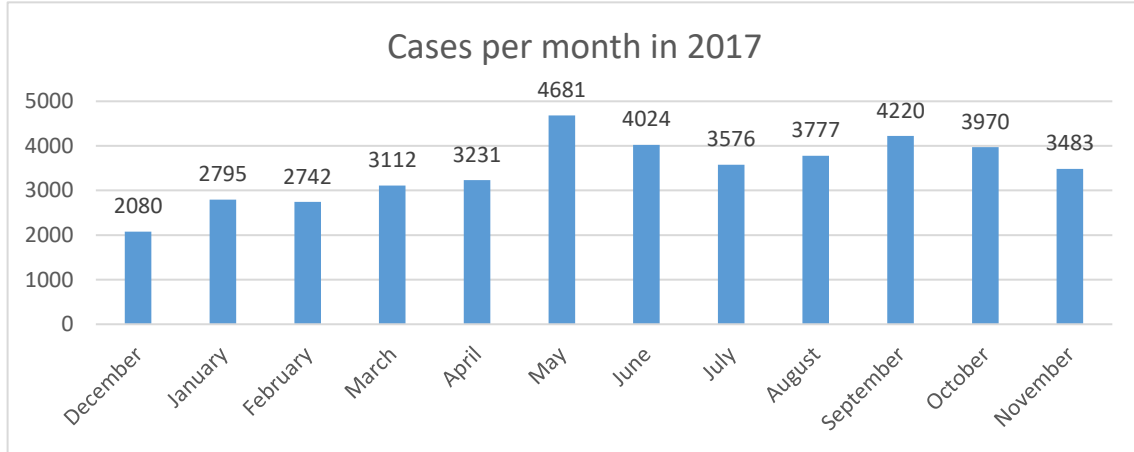
Figure 20: Distribution of records (between 2016. December and 2017. November) on a monthly basis (1)
Source: Author's own creation
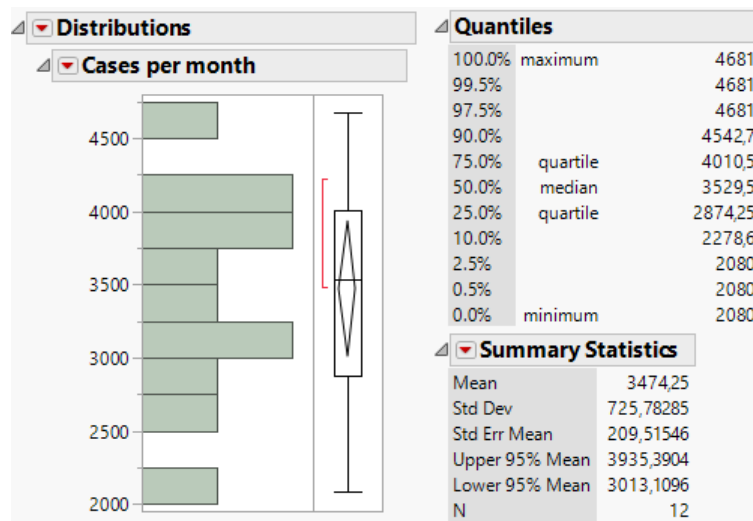
Figure 21: Distribution of records on a monthly basis (2)
Source: Author's own creation

Figure 22 also shows us the throughput of cases per hour based on daily processed cases. As we can see calculated with eight hour-long working days, during the 251 workdays when the Government Window was open the average throughput per hour was 21 cases with a minimum of three and a maximum of 39 cases based on the dataset. According to the upper quartile during 75% of the working days, the throughput was below twenty-six cases per hour in the examined Government Window.

For a further and more deeper analysis the statistical stability of the distributions could also be investigated, seasonality, daily or weekly cycles could also be identified and examined, but these are not part of the current analysis.
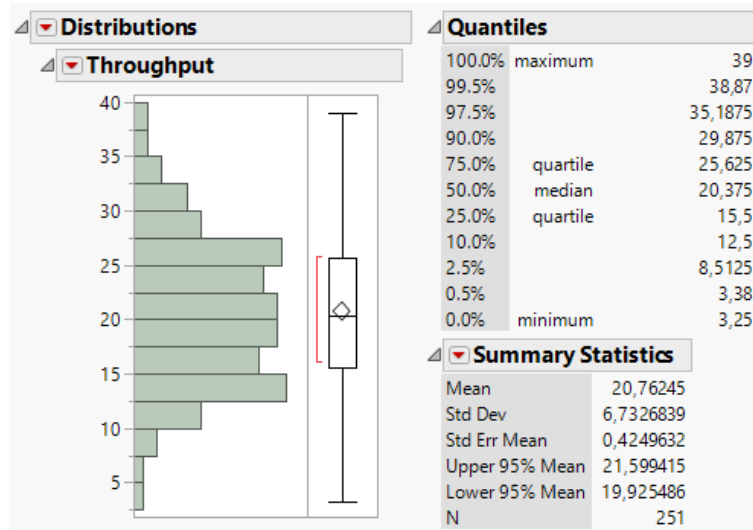
Figure 22: Throughput of cases per hour
Source: Author's own creation

Frequency of cases

Table 8 shows the distribution of each case types. In this table, we can see that there are 30 different case categories from which the citizens can choose when they arrive at the Government Window. Some of them are general categories like Vehicle affairs, which can mean several case types like license plate issues or car registration. There are also specific categories Student ID card, Passport or ClientGate and we can find the specific category of driving license here as well which means that this is an emphasized category of vehicle-related affairs.

As we can see there are case types which are rare like Disability-related issues in which case there were only 30 cases during the examined period of time while Vehicle Affairs and Driving license cases together generated 33,51% of the whole dataset.

According to the analyzed data, we can also that in case of this particular Government Window there were only twenty cases related directly to guardianship affairs in which cases the administrators of the Government Window can provide information, and they can help with documentation regarding the specific issue, then they transfer the case to the Guardianship Offices.

Case types	Number of cases	Frequency
Vehicle affairs	8267	19,83%
ID card	6915	16,59%
Driving license	5703	13,68%
Certificate of address	5049	12,11%
ClientGate	4447	10,67%
Passport	4381	10,51%
Student ID card	1528	3,67%
Health insurance	1425	3,42%
Receipt of completed documents	934	2,24%
Family support	745	1,79%
Individual Proprietorship	487	1,17%
Parking certificate	303	0,73%
Other	296	0,71%
Pension	272	0,65%
Ownership certificate issues	212	0,51%
Birth registration	148	0,35%
Citizenship	141	0,34%
Social affairs	120	0,29%
Population registers	105	0,25%
Construction affairs	47	0,11%
Disability issues	30	0,07%
Hungarian identification affairs	30	0,07%
Rehabilitation and disability benefits	29	0,07%
Guardianship affairs	20	0,05%
Employment	18	0,04%
Consumer protection	10	0,02%
Inheritance, legacy procedure	10	0,02%
Housing aid	8	0,02%
Trade and services	6	0,01%
Foreign affairs	5	0,01%

Table 8: Frequency of all cases according to the case type (1)
Source: Author's own creation

Most common cases

Figure 23 and Table 8 shows that the six most common case types together generated 83.38% of all cases during the examined time period. As we can see, the distribution follows the Pareto rule. The seventh most common cause was the Student ID card related issues with 1528 cases in total but this number is only one-third of the sixth most common case type which were the Passport related issues.
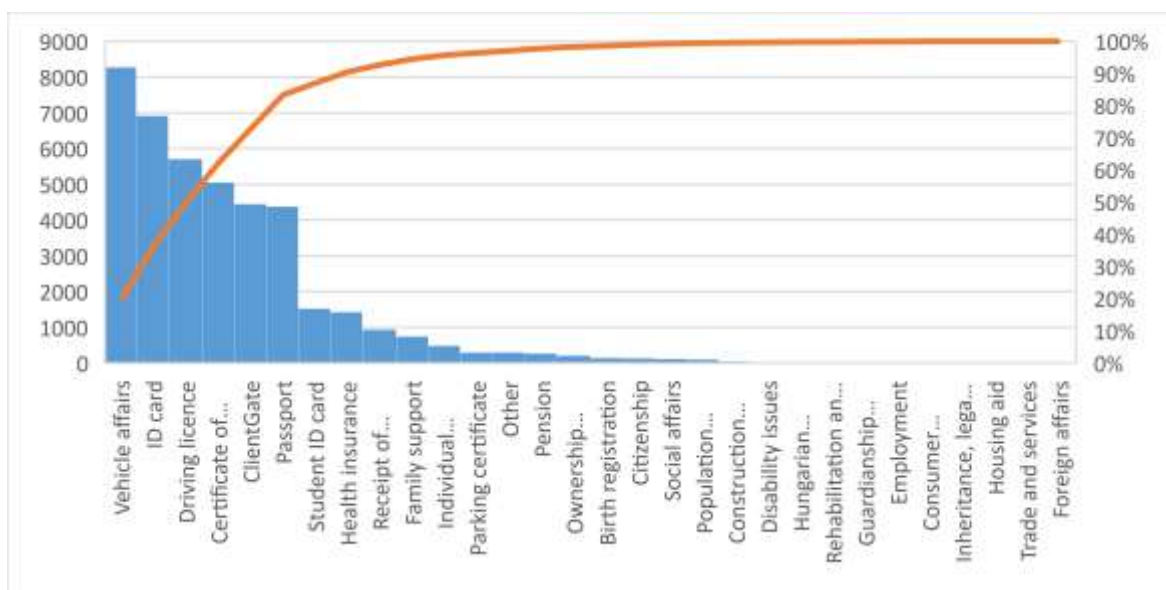
Figure 23: Frequency of all cases according to the case type (2)
Source: Author's own creation

As discussed before Vehicle affairs is a general category, which includes several case types like license plate issues or car registration. ID card related cases are when a customer wants to renew the personal identification card or apply for a new one if lost, but customers have to choose this category as well if they want to report the theft of their identification documents for example.

Certificate of address is another identification document, which contains information regarding the valid address of citizens. If someone moves to a new location, a new city and the address changes, they have to apply for a new card by choosing this case category.

ClientGate related issues are also very common. ClientGate functions as a valid digital identification method for citizens and it is commonly used for example during the process of digital taxation or by students to identify themselves digitally when they are applying for university online. It is also widely used by companies as identification and contact channel with different state authorities. Nowadays for companies, the state created the CompanyGate system, which is similar to ClientGate in order to separate individual citizens from companies, but during the examined period only ClientGate existed.

Waiting time statistics

Waiting times are calculated with the help of arrival times and calling times. Arrival time is the time of the moment when the customer uses the ticket machine and chooses the type of

the issue. Calling time is the momentum when the administrator calls the issued ticket number and the customer can go to the window to start the service process. Waiting time is calculated as the difference between the calling time and the arrival time.

In Appendix 6.2. we can see the statistical analysis of the calculated waiting times in case of each case category. On Figure 24 we can see the average waiting times in case of all case types. On average citizens who came to the Government Window with trade and services related issues had to wait the less (01:01 minutes) while citizens who arrived with housing aid related issues had to wait the most however these service types together represent only the 0,03% of all cases during the examined period of time. As we can see according to the upper quartile nevertheless the type of the service, 75% of the citizens usually waited less than 23 minutes.

As we can see both in case of the parking certificate and housing aid related issues citizens had to wait considerably more than in case of other issues. According to the previously calculated distributions these two case types together generated only the 0,75% of all cases during the examined period of time, from which parking certificates generated 0,73%. As we will see later in Table 13 while parking certificate issues were assigned to only half of the windows, housing aid related issues were only assigned to two windows, which were also handling other rarer issues as well next to the more common ones. Probably citizens with these issues had to wait more because of there were less capable windows they could be assigned to, which windows were also handling the common cases.

Figure 24: Average waiting times of all case types
Source: Author's own creation

In Table 9 we can see the statistical details of the six most common case types regarding the waiting times. According to the data from the six different case types, the issues regarding the certificate of address had the longest average waiting time while costumers had to wait only 5 minutes on an average if they came to the Government Window with ClientGate issues like registration or renewal.

As we can see in case of each case categories the average waiting time was between five and eleven minutes and according to the upper quartiles, 75% of the arrived customers had to wait for less than fifteen minutes before the process of their issues started.

Case types	Mean	Std. Deviation	Median	Lower quartile	Upper quartile
Vehicle affairs	0:08:27	0:11:43	0:04:15	0:01:11	0:11:10
ID card	0:08:54	0:10:22	0:05:12	0:01:50	0:12:05
Driving license	0:09:21	0:10:38	0:05:38	0:01:55	0:12:43
Certificate of address	0:11:14	0:12:13	0:07:10	0:02:31	0:15:53
ClientGate	0:04:58	0:07:08	0:01:56	0:00:26	0:06:45
Passport	0:08:15	0:12:05	0:04:49	0:01:43	0:10:48

Table 9: Waiting time statistics of most common case types
Source: Author's own creation

Processing time statistics

Processing times are calculated with the help of calling times and closing times. Calling time is the moment when the customer is called by the administrator and goes to the window to start the process. Closing time is the moment when the process is finished and the administrator uses the system to close the record. Processing time is calculated as the difference between the closing time and the calling time.

In Appendix 6.3. we can see the statistical analysis of the calculated processing times in case of each case category. On Figure 25 we can see the average processing times in case of all case types.

As we can see Trading and services related issues had the shortest processing time (05:43 minutes) while citizens who came to receive already completed documents had an average waiting time of 33:44 minutes. As we can see according to the upper quartile nevertheless the type of the service 75% of the citizens were processed in less than 45 minutes.

As we can see on Figure 25, the processing time of "Receipt of completed documents" were the longer amongst the service types. The reason behind this unknown, however rather strange because during this service citizens come to the Government Window to take their already completed documents, which would indicate that this process should be much shorter as it is according to the examined dataset.
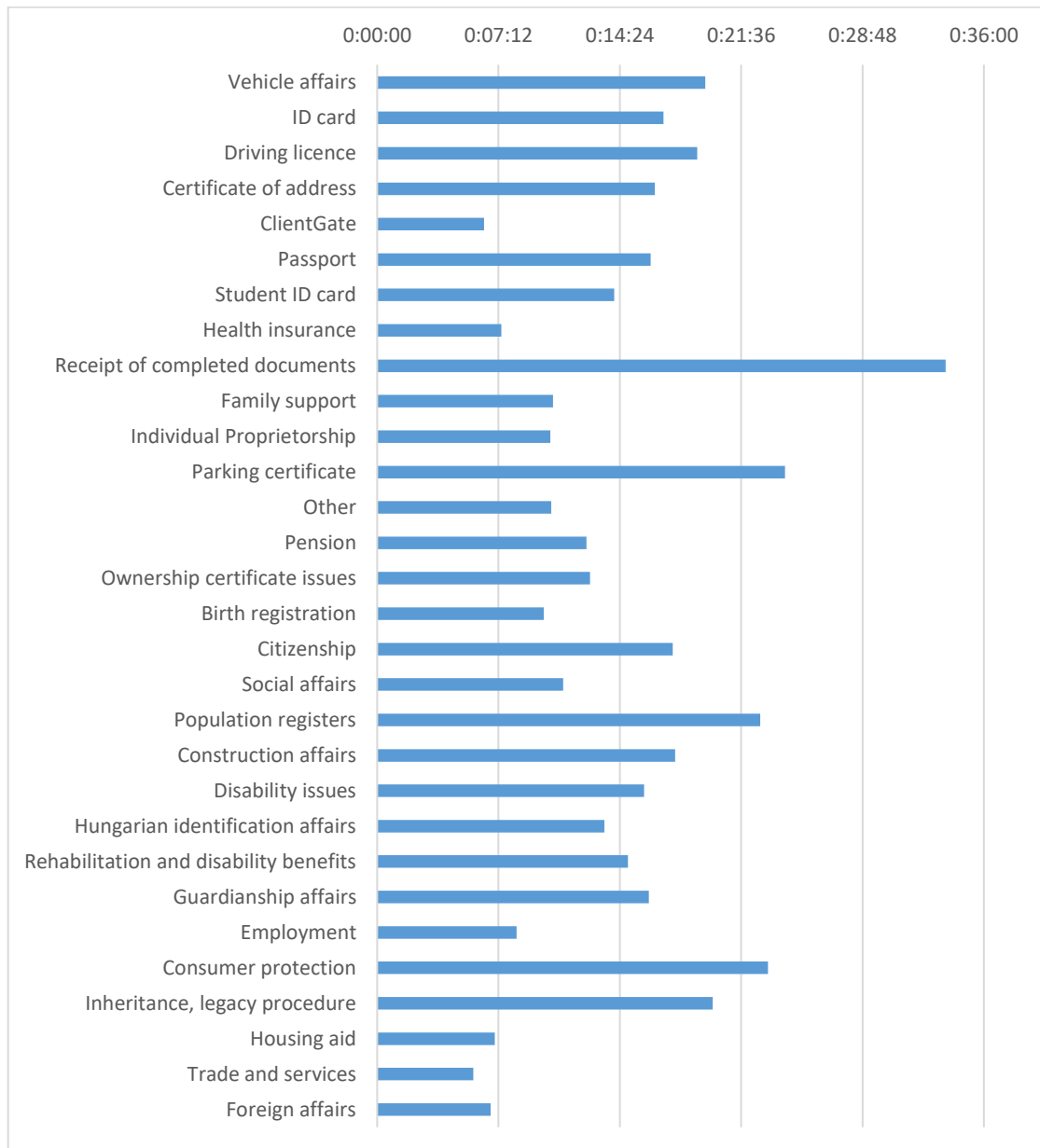
Figure 25: Average processing times of all case types
Source: Author's own creation

As we can also see on Figure 25 parking certificate related issues after the long waiting time also had a long average processing time which resulted in the second longest lead time as we can see on Figure 26.

In Table 10, we can see the statistical details of the six most common case types regarding the processing times.

Case types	Mean	Std. Deviation	Median	Lower quartile	Upper quartile
Vehicle affairs	0:19:28	0:21:49	0:12:23	0:05:35	0:25:12
ID card	0:17:00	0:18:47	0:12:26	0:04:02	0:21:35
Driving license	0:18:59	0:19:59	0:12:56	0:08:46	0:22:00
Certificate of address	0:16:28	0:18:49	0:11:03	0:05:14	0:20:37
ClientGate	0:06:20	0:09:36	0:03:56	0:02:52	0:05:59
Passport	0:16:13	0:17:44	0:11:38	0:04:42	0:20:28

Table 10: Processing time statistics of most common case types
Source: Author's own creation

In this case, ClientGate related cases had the lowest processing time on average. Generally, most of these cases were new registrations in either the system or renewal of outdated previous registrations. The vehicle-related affair had the longest average processing times and the processing times of identification-related issues (ID card, driving license, passport, address certificate) were between sixteen and ninety minutes. According to the upper quartiles, 75% of the customers' cases were processed under 20-25 minutes in general, in case of ClientGate under six minutes in particular.

Lead time statistics

Lead times are calculated with the help of arrival times and closing times. Arrival time is the moment when the customer arrives and uses the ticket machine to choose the goal of the arrival. Closing time is the moment when the process is finished and the administrator uses the system to close the record. Lead time is calculated as the difference between the closing time and the arrival time.

In Appendix 6.4. we can see the statistical analysis of the calculated lead times in case of each case category. In Appendix 6.5. we can see the waiting times, processing times and lead times of all cases together. On Figure 26 we can see the average lead times in case of all case types.

On average citizens who came to the Government Window with trade and services related issues had the shortest lead time (06:44 minutes) while citizens who arrived to receive completed documents had the longest lead time however these seríce types together represent only the 2,24% of all cases during the examined period of time. As we can see

according to the upper quartile nevertheless the type of the service 75% of the citizens usually had less than 57 minutes lead time in the Government Window.
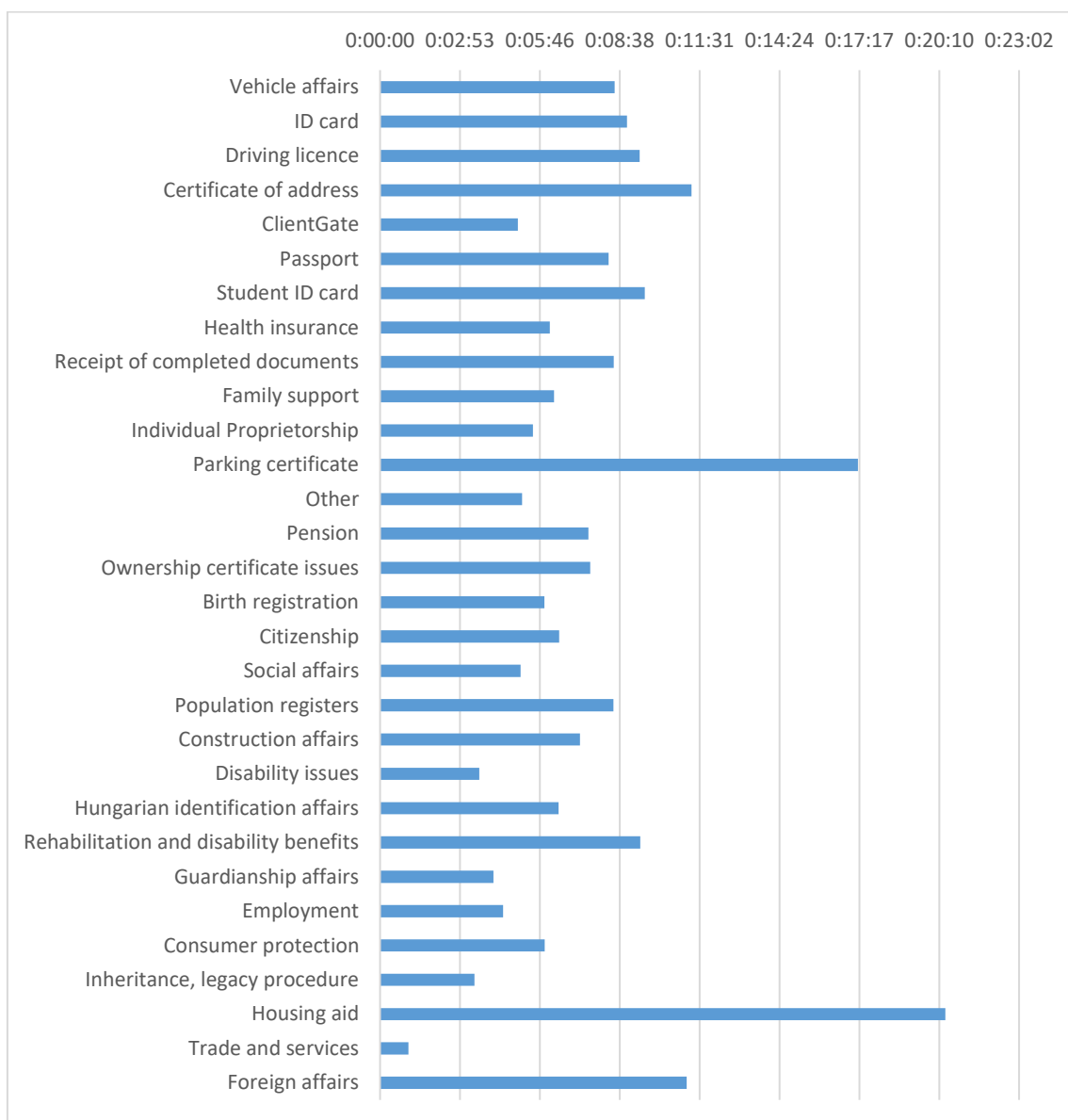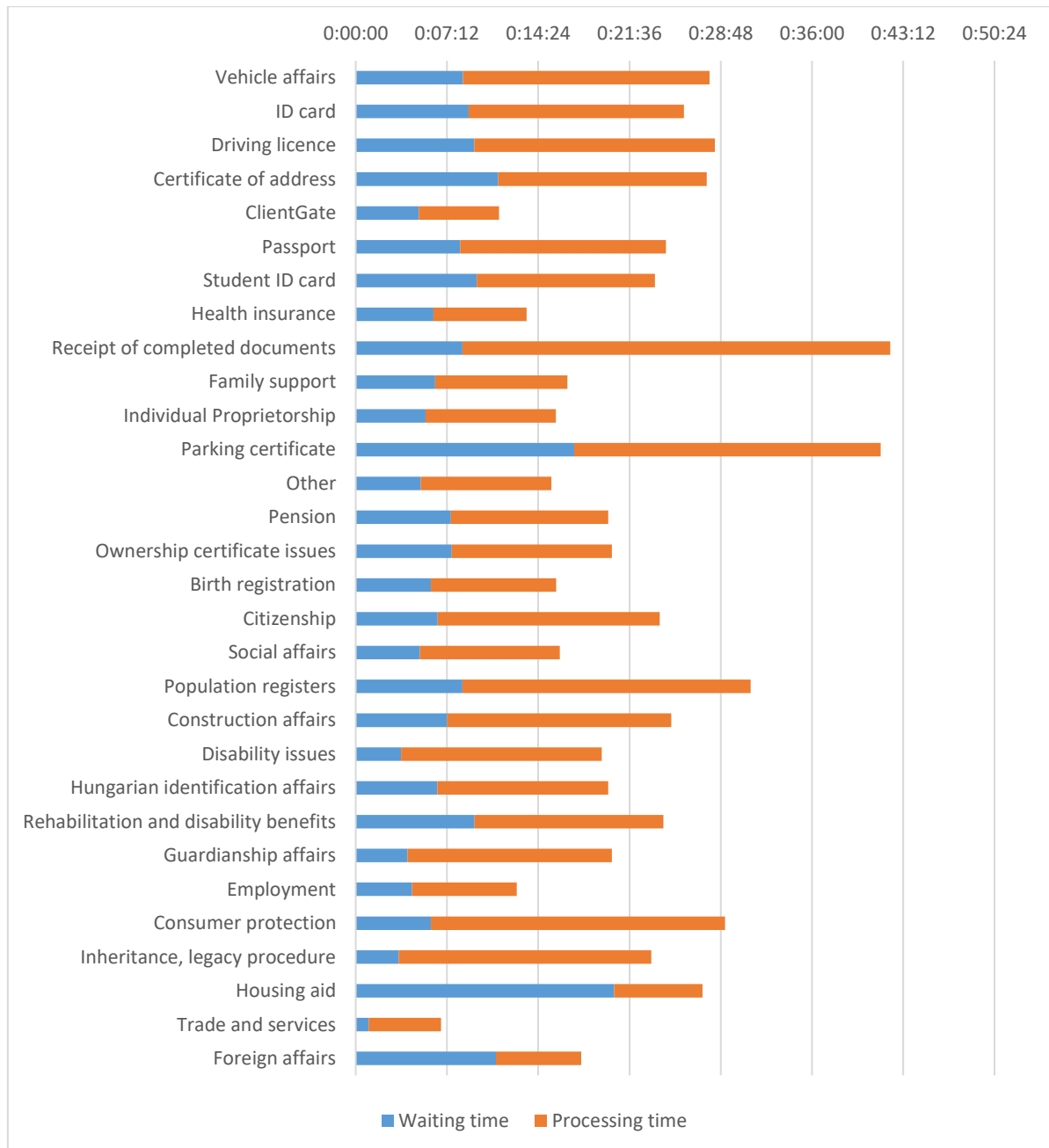

Figure 26: Lead time statistics of all case types (2)
Source: Author's own creation

In Table 11, we can see the statistical details of the six most common case types regarding the lead times. As we can see the average lead time of the six most common case categories were between 24-29 minutes except for ClientGate cases which hade the average lead time

of eleven-minute in total. Upper quartiles show that 75% of the customers were finished after 31-36 minutes after their arrival thus they had to spend half an hour in general in a Government Window to handle their issues.

Case types	Mean	Std. Deviation	Median	Lower quartile	Upper quartile
Vehicle affairs	0:27:55	0:24:19	0:21:10	0:11:35	0:36:05
ID card	0:25:54	0:20:39	0:20:57	0:12:31	0:33:45
Driving license	0:28:20	0:21:47	0:22:15	0:14:29	0:35:47
Certificate of address	0:27:42	0:21:13	0:22:34	0:13:53	0:35:30
ClientGate	0:11:18	0:11:59	0:07:34	0:04:25	0:13:52
Passport	0:24:28	0:20:33	0:19:26	0:11:58	0:31:28

Table 11: Lead time statistics of the most common case type
Source: Author's own creation

With further and more detailed analysis based on the dataset, we could determine whether there is a seasonality among the cases and data patterns could be identified as well, but that would require an even more detailed analysis. In addition, analysis and comparison of more datasets from different Government Windows could also lead to the more detailed calculation of the discussed measures. As average waiting times and processing times will be probably different, we could analyze further, what are the reasons behind these differences. During a much larger study with longer examined time periods and with more examined datasets from different Government Windows not just from the capital city but also from other cities of the country while we could also measure temporal and spatial distributions in order to discover patterns regarding specific case types. Public service managers, provider and legalizators could use the results to better use the available resources and to better plan the service delivery of Government Windows in the future.

3.1.6. Discrete Event Simulation

During the simulation analysis of the front offices operation the thesis uses the environment of ProcessSim simulation software (Buics, Kovács, 2019), which was created to simulate service processes, especially Government Window front office operations. During the creation of the simulation exceptions in the service processes should be also considered. In case of Government Window front office operations exceptions can be unpatient customers, who abandon the queue before being processed, or submit multiple requests simultaneously addressing different issues at the same time. The ProcessSim program has the ability to

handle customers who abandon the waiting line, hovewer in this particular simulation exceptions are not added, because we have no exact data about the number of unserved citizens.

The purpose of the simulation is to simulate an average day setting with regular opening hours. Based on the research the average number of daily cases were 166 per day with a standard deviation of 54 cases as we can see on Figure 18.

As the result of the simulation during the simulated day 115 cases were handled by the administrators which is in the lower quartile of the average daily case numbers according to the dataset. As discussed before while the example Government Window is located in the capital city because it is located in one of the outer districts it operates with less average daily case numbers than other windows in a more central position. As we can see the results of the simulation can be used to determine the utilization levels of the administrators which can help public service managers and providers to better plan the service delivery and to determine how the case types should be assigned to the windows to create more equal utilization levels for example.

After further analysis of the dataset of the selected Government Window, first the research determined which of the operating windows served which service. The results of the research can be seen in the following table where X marks when a service was served by the given window. As we can see in Table 12, the seventh and eighth windows were assigned to serve almost all the selectable case types while the other windows were tasked to serve the services which are among the most common service types according to the research, with a few additional service types in case of each windows.

Case types	Window numbers							
	1	2	3	4	5	6	7	8
Disability issues		X			X		X	X
Citizenship				X			X	X
Birth registration							X	X
Family support							X	X
Student ID card	X	X	X	X	X	X	X	X
Health insurance				X			X	X
Other		X	X		X	X	X	X
Individual Proprietorship				X			X	X
Receipt of completed documents	X	X	X	X	X	X	X	X
Construction affairs							X	X
Employment							X	X
Consumer protection							X	X
Vehicle affairs	X	X	X	X	X	X		X
Guardianship affairs							X	X
Foreign affairs							X	X
Driving license	X	X	X	X	X	X	X	X
Trade and services							X	X
Housing aid							X	X
Certificate of address	X	X	X	X	X	X	X	X
Hungarian identification affairs			X				X	X
Population registers			X		X	X	X	X
Pension							X	X
Inheritance, legacy procedure							X	X
Parking certificate		X	X	X	X	X		X
Rehabilitation and disability benefits							X	
ID card	X	X	X	X	X	X	X	X
Social affairs							X	X
Ownership certificate issues							X	X
Passport	X	X	X	X	X	X		X
ClientGate	X	X	X	X	X	X	X	X

Table 12: Assigned services of the windows
Source: Author's own creation

After the determination of the service assignments, first, the basis of the model was built in the simulation environment (Figure 27), and then the data of the previous statistical analysis was used to define the distributions of the services. After that based on the window assignment table each window was tasked with the given service types and the distributions were also assigned to them.
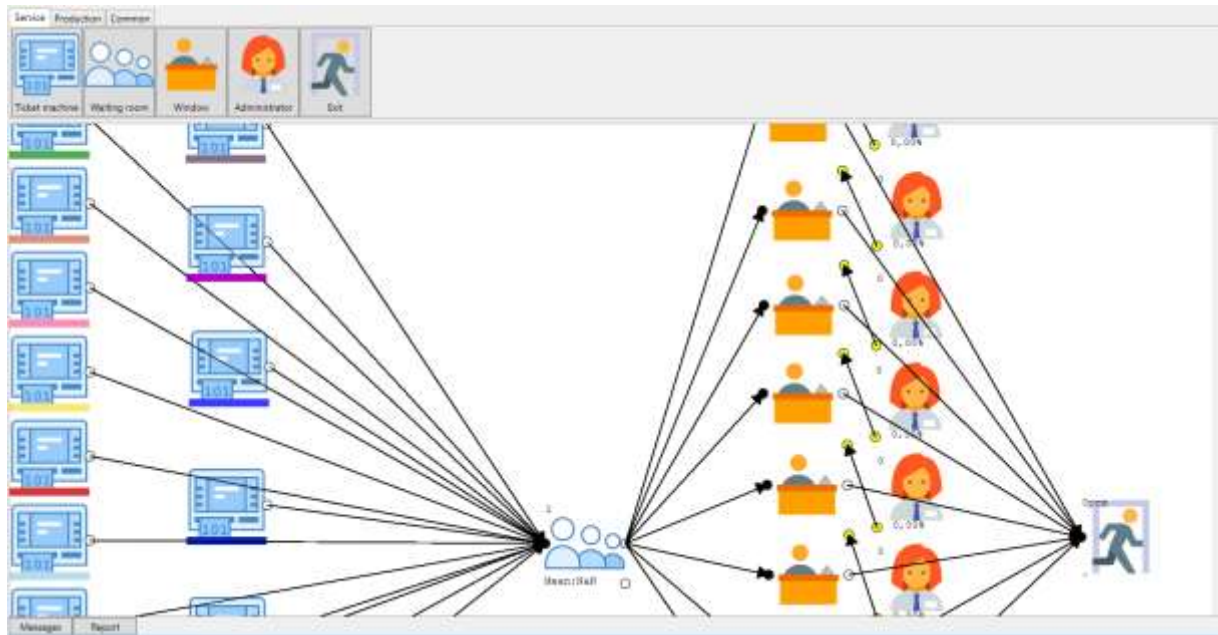
Figure 27: Government Window simulation model
Source: Author's own creation

After the running of the simulation, the utilization of each administrator can be seen in Table 13. We can see that the average utilization of the administrators is between 18%-24% with the exception of the third administrator who had a utilization of 40,77%, which is higher than the other utilization levels, while the number of served citizens are between 14-19.

Name	Served	Utilization
Window-1	14	17,54%
Window-2	14	19,07%
Window-3	14	40,77%
Window-4	14	20,18%
Window-5	13	22,62%
Window-6	12	20,68%
Window-7	15	22,65%
Window-8	19	23,08%

Table 13: Utilization of windows
Source: Author's own creation

Further analysis of the generated report revealed, as it can be seen in Table 14, that while the distribution of the cases was generally equal between the administrators in most cases, however the administrator with a higher utilization was assigned with one third of the ID card cases alone while the rest of this case type was shared between the others. Because this

case type has a longer processing time according to the results of the research, this administrator had to work more during the opening hours than the others while they all served almost the same number of citizens.

Case types	Windows								SUM
	1	2	3	4	5	6	7	8	
Disability issues									0
Citizenship									0
Birth registration									0
Family support							3	2	5
Student ID card								2	2
Health insurance							3	1	4
Other		1	1		1				3
Individual Proprietorship							1		1
Receipt of completed documents					2			1	3
Construction affairs									0
Employment									0
Consumer protection									0
Vehicle affairs	4	3	3	4	4	6		1	25
Guardianship affairs									0
Foreign affairs									0
Driving license	2	2	1	3	2	2	1	1	14
Trade and services									0
Housing aid									0
Certificate of address	2	3	2	1	3	1	5	1	18
Hungarian identification affairs									0
Population registers						1	1	1	3
Pension								3	3
Inheritance, legacy procedure									0
Parking certificate									0
Rehabilitation and disability benefits									0
ID card	3	2	5	1	1	1		2	15
Social affairs								1	1
Ownership certificate issues									0
Passport	2	1	2	3				3	11
ClientGate	1	2		2		1	1		7
SUM	14	14	14	14	13	12	15	19	115

Table 14: Served case types per window
Source: Author's own creation

Several more iterations of the simulation provided the same results, one administrator with higher utilization while the other utilization levels were are around 25%. This could mean that maybe the assignment of the case types should be reconsidered to share the burdens more effectively between the administrators. Because the used simulations software has its limitations for a further and more deep analysis another software should be used in the future.

3.1.7. Results and Discussion

The thesis uses the front office operations of Government Windows and the contact affair procedure of the Guardianship Offices as an example of public service processes to show the usefulness of the three analytical methods within the domain of the public services. The intentions were to find methods, which are well suited to access the complexity and provide useful insights without the fear of losing valuable information as we unwrap the layers of the service and create its clear and understandable model. With the process management approach, we showed that they could be applied not just in case of private service operations but in case of public service processes as well.

As we can see both the Service Blueprinting, Business Process Modeling and Process-Chain Network methods can be used effectively to map the process steps of a complicated public service to clearly identify and analyze every step in order to highlight weaknesses and offer improvement options.

We can use the Service Blueprinting to understand the customer perspective and reveal what drives their satisfaction while Business Process Modeling can be used to diagram the organizational perspective, thus these two methodologies can be used effectively together to map and understand a service process which can help further to improve the efficiency and effectiveness. In addition, while the Process-Chain Network method offers less flexibility compared to the Business Process Modeling, it provides additional insights regarding the level of interaction between the actors involved in the process. With Process-Chain Network, we are able to visualize the internal complexities of the processes as we make a difference between direct interactions, surrogate interactions, and independent interactions on both sides.
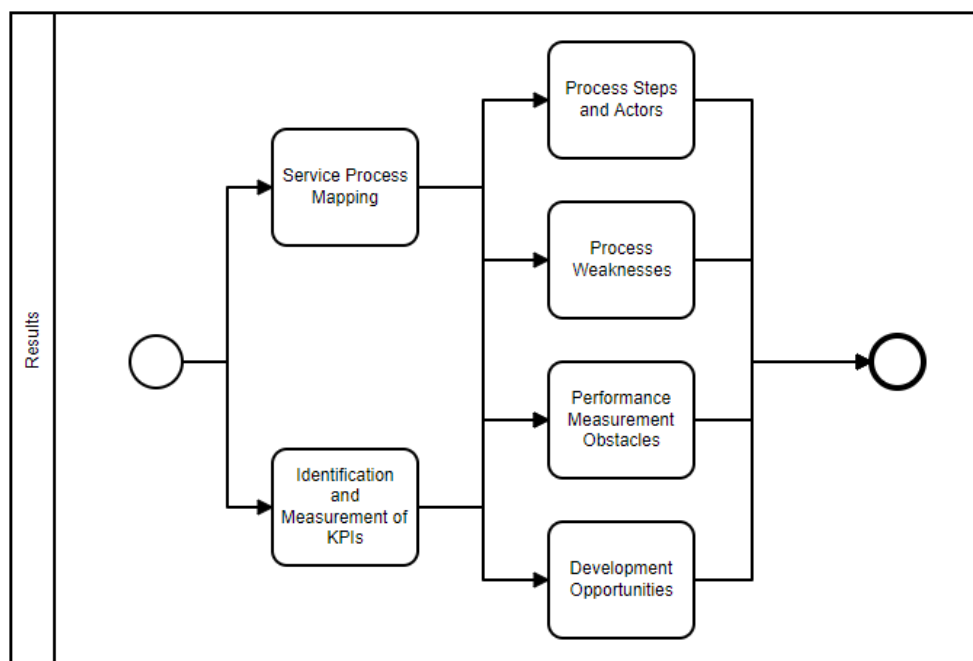
Figure 28: Results of the Analysis
Source: Author's own creation

As we can see, the Hungarian public administration system has undergone significant transformations, all of which aimed to increase efficiency. In 2013, the district system, which is the backbone of the new administrative system, was established, and its restructuring was already much more transparent and centralized than that of its predecessor. Previously established government offices regulated administrative systems at the county level, and lawmakers as territorially competent subunits of government offices defined district offices. The organizational system of the district office includes administrative systems operating under previously different management but in the same area of competence, thus creating a unified and more transparent organizational structure, where the previously typical overlaps and differences of competencies are no longer present.

From the citizens' point of view, the noticeable effect of the transformation of the public administration was the development of the system of Government Windows and thus the actual implementation of one-stop shop, thus becoming a very important institution of through, which their effectiveness is perceived. Consequently, it is extremely important to create a modern, clean and customer-oriented organizational structure such as Government Windows.

Numerous articles and books discussed the details and effectiveness of the different levels of the newly reformed Hungarian administration system but this research provides new deep-

level insight into the daily operations of a Government Window. The thesis aims to contribute to the literature by analyzing the front office operations of a Government Window from this point of view, creating a comprehensive picture of the service process structure of a typical Hungarian Government Window, which functions as a one-stop shop service center for administrative public services.

In case of the front office operations of Government Windows the distribution and composition of the offered administrative public services is as follows. According to the examined dataset, the Government Window system operates with 30 main case categories. Some of them are rather specific case types like driving license related issues while others are collected categories like vehicle affairs, which can include many types of subcategories. Based on the dataset we can make difference between thirty categories of cases from which we can highlight six different categories (vehicle affairs, driving license, ID card, certificate of address, passport, ClientGate) which are the most common ones. Together these categories covered 83.38% of all records in the examined timeframe.

According to the literature of service quality and excellence based on several authors, the research identified the most frequently used time-related key performance indicators frequently used by scholars in their research. These measures include waiting time, process duration time and lead time, which can be used as performance metrics in case of the Government Windows based on the available dataset.

Based on the results of analysis the research used the available dataset to calculate the values of the identified performance indicators in case of the thirty case types of the examined Government Window. We statistically analyzed the dataset by using Microsoft Excel and SAS JMP software. As seen in Table 15, we calculated that on average in case of the six most common cases the waiting time ranges from four to twelve minutes, the processing time ranges from 6 to 20 minutes and the lead time ranges from 11 to 29 minutes in total. However, if we exclude ClientGate issues as seen in Table 9, the value ranges change. In this case, the waiting time ranges from 8 to 12 minutes, the processing time ranges from 16 to 20 minutes and the lead time ranges from 24 to 29 minutes in total.

	The most common case types	**The most common case types, excluding ClientGate**
Waiting time	4-12 minutes	8-12 minutes
Processing time	6-20 minutes	16-20 minutes
Lead time	11-29 minutes	24-29 minutes

Table 15: KPI values of the most common case types

As a limitation, our research only used the dataset of one singe Government Window as a unit of analysis but our research showed how performance metrics could be extracted from the available data. The future plan of the research is to acquire and analyze several more datasets from other Government Windows in order to collect and use more quantitative data regarding the key performance indicators. The aim of the future research is to use the extracted data to create a more detailed simulation, which can represent the daily operations of the Government Windows and use it to simulate the front office operations on a complex and more detailed level. The future goal is to be able to identify improvement possibilities and based on that give a general recommendation for the legislators on how to improve these processes in the public sector.

3.2. Analyzing contact affair procedure of Guardianship Offices

In this chapter, we examine the complicated process of contact affair procedure of Hungarian Guardianship Offices as an example. The processed data is not open source, it was provided by higher authorities and guardianship office administrators upon request during the KÖFOP project. First, the thesis will present the regulation and legal background of the contact affair procedures in order to uncover and clear the reasons of involvement of the participants and their legal capabilities. After that, we discuss the burdens and problems of the Guardianship Office administrators during a contact affair procedure highlighting the importance and difficulty of their work. Finally yet importantly, we discuss the ways of communication between the participants with a special focus on electronic communication methods as a promising way to shorten the process.

The process of contact affair procedure has a more complex design compared to other public service types. The thesis is interested in finding new ways to examine these intricate public service processes, which were not analyzed before with process modeling approaches. By applying these methods on complex public services, we will be able to capture insights based on subjective perception and weaknesses in the process can be clearly identified.

The second part of the chapter discusses the steps of this complex service, demonstrates the specifics of the guardianship's procedure and uses the discussed modeling approaches to visualize and analyze the service process. Because this service is mostly used by patchwork families to settle their issues in order to help understand better the nature and complexity of the service we are also discussing the nature of patchwork families as they are the main customers of this service process thus they can benefit the most from the improvements of the service process.

The data was collected in the Guardianship Office in Győr (Hungary), during the data collection process deep interviews were conducted, and administrators were asked to provide statistical information about contact affair cases. Based on the legal background (Appendix 6.7.) and the deep interviews we created the process model of the contact affair procedure. Based on the model we applied discrete even simulation to identify the process elements where potential improvement can be made.

With our new model, we created a simulation about the procedure, to examine the connection and relation between the Governmental Regulation and the practice. Discrete even simulation showed the insufficiency of the Governmental Decree of the whole process, the

weaknesses of the contact affair procedures in field of quality and success. We found the basic causes why the participant of the procedures (administrators, customers) are dissatisfied. In the discrete event simulation we used a specific case (with patchwork family), because based on our theory it is impossible for the administrators to conduct the whole procedure on time with appropriate quality (involving in the procedure – if it is required-, doctors, police officers', teacher, kindergarten teacher, psychologist etc.).

As a result of the research, the simulation highlights the time related deficiencies of the service process as it shows how much longer it takes to finish the process in reality than as it is defined by the regulations, and how this situation affects the administrators who have to pay penalty if the service delivery takes too long. On time delivery is also important for the head of the Guardianship Office too, because the effectiveness and judgement after the government of the office is based on that.

3.2.1. General description and background

The time is a relevant factor in the public services. For the consumers it is important to get the results of the public service as quickly as possible in as high a quality as possible. Services can be divided into different categories based on their complexity (Benedettini, Neely, 2015). There are services, which are less time consuming, and can be easily standardized and digitalized, for example applying for a passport or renewing an ID card. In many countries, these public services are available from home, if the costumers do not want to go personally to the office, they can arrange everything by online. However, there are also more complicated public services, which are much more time consuming and their digitalization, and optimization could be very difficult.

The administrators of these public services play a crucial role in these service processes because the customer satisfaction is greatly based on their skills, personality and attitude as well. The measure of the successfulness of services is the customers' satisfaction or dissatisfaction. The successfulness of good governance and the pertaining offices is shown by how satisfied the clients are after they have administered their cases. Satisfaction is a complex issue. Nobody likes administering office affairs therefore such services must be fast, sensitive and definitely successful. It is important for clients that they could administer cases preferably in one place or at least with little physical work. Different conducts of business take place in district offices. Among these, there are so-called typical cases, which

affect the majority of the clients and such ones, which affect only a narrow target group. Among such narrow target groups, we can find patchwork families, which are the government offices' specific groups that are affected in many cases.

The term "contact" in this case refers to the regulation of the relationship between a parent and child. The supervision and regulation of these procedures is within the competence of the Guardianship Offices of the given city (Government Decree 331/2006. (XII. 23.)).

Relationship issues are issues that arise after the divorce of parents or the termination of cohabitation. Usually a parent stays with the child (children) and lives his or her daily life there. It is up to the court to decide. A parent with whom the child (children) does not live in a household is entitled to maintain contact with the child (children). The manner, form and regularity of contacts are also regulated by the court, but Guardianship Offices are also entitled to make such decisions or to regulate contacts (Boér, 2000). The issue of contact has become important nowadays due to the emergence of new types of family models and the increase in divorces. Half of the marriages end in divorce, but children and parents has the right to meet with each other and keep in touch.

The basics for the research are provided by the model below, which is the basic model of the contact affair procedure of Guardianship Offices (Figure 29). This model illustrates the above-mentioned procedure's process for which the law ensures 60 days for the administrator. We currently see the procedure as a 'production process', and as a continuation of the research we wonder whether this model in its current form is applicable in case of patchwork families, so if the 60 days are enough in case of a procedure in which patchwork families are the participants
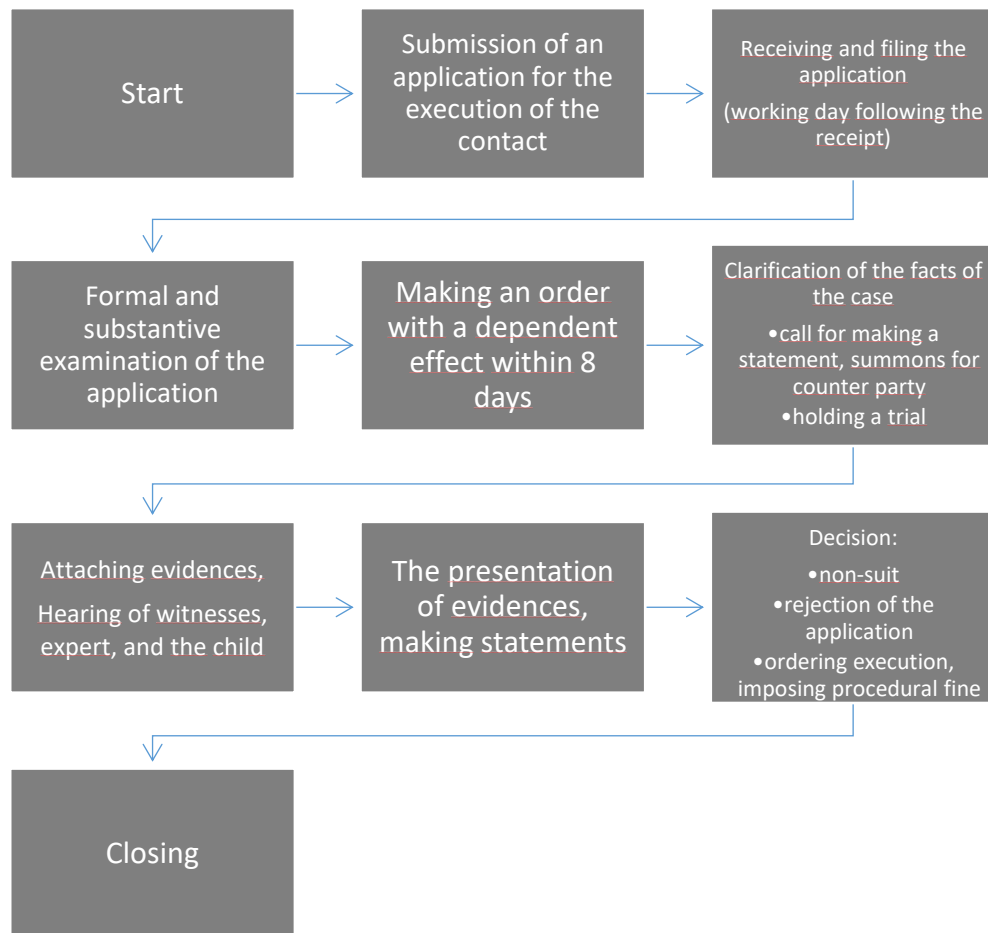
Figure 29: Process steps of the contact affair procedure
Source: Author's own creation

The procedure commences with the filling out of an application by one of the parents (or both of them simultaneously against each other), which goes through a review. After a thorough, formal review, the administrator issues an interlocutory decree and official letters are mailed to all parties involved to inform them officially about the next steps. This step can take significant time depending on the circumstances, the cooperation and willingness of the opposing parties. Following that, several further steps take place in the process, e.g., the parties are summoned to make statements, provide evidence and finally participate in the negotiation process. During the negotiation, a decision is made to resolve the issue based on the collected and verified evidence as well as end the statements of parents, experts and the child (children).

In case of these types of public service, the employee's experience can contribute to enhancing the service due its complex nature and the customers involved. The sensitive nature of the cases and representing the best interests of the children place a heavy burden

on the administrators involved who deal with personal relationships. Each decision can fundamentally change an individual's or the whole family's life. These types of decisions require highly qualified, professional, knowledgeable administrators in a greater number on a daily basis.

However, there is a variety of factors that impede the efficient, accurate, and fast execution and delivery of guardianship tasks, among others, high number of cases, high client contacts, time-consuming communication with individual clients due to the specific nature of the cases, oral and written communication with clients (telephone communication with clients and with other authorities, emails, faxes, mails), file submissions, inspection of requests, making interlocutory decrees with immediate effect, and reporting to the superior authorities. Several things can slowdown the administrative procedures, e.g., out-of-court measures, multiple meetings with the Child Welfare Service regarding the cases, holding mandatory negotiations, attending court trials, managing and maintaining multiple filing systems, and carrying out financial duties.

Such problems also include working occasionally as legal assistants, ad-hoc work at district office level, frequent meetings due to the uniqueness of the cases with the police, with the prosecutor's office, with the court, with the child protection services, and with other professionals. These special administrators also need psychological knowledge.

3.2.2. Service Blueprinting

The aim of our study is to describe a slice of the public service sector using the blueprinting practice, and to explore its potential. The service-blueprinting method is the first (compared to other methods aiming to increase service efficiency), which is based on the consideration of the customer's opinion, it is able to visualize the service process from the customer's point of view, and examines the physical characteristics of the service regarding this aspect. In Bitner et al. (2008), the authors describe many examples of using the blueprint method in the business sector. In this paper, the method described above is interpreted in the field of public services, including the contact affairs of Guardianship Offices

In the Service Blueprinting method, the focus is on customer opinions and experiences, and interpersonal relationships. Services are interpreted from three perspectives in terms of blueprinting: (1) Service as a Process (2) Service as a Customer Expérience (3) Service Development and Design. Table 16 shows the components of the guardianship contact affair

procedure and Figure 30 shows the developed blueprint representation of the contact affair procedure.

Physical Evidence	Guardianship Offices, home of clients, experts' office
Customer Actions	Application submission to initiate procedure Receiving official letters, Attaching evidence. Personal appearance in the office, personal appearance at the experts, making statements
Onstage/Visible Contact Employee Actions	Making an interlocutory decree within 8 days Call for making a statement, summons for counter party, holding a negotiation Hearing of witnesses, experts, and the child Presentation of evidence, making statements, Decision
Backstage/invisible Contact Employee Actions	Receiving and filing the application Formal and substantive examination of the application Clarification of the facts of the case
Support Processes	Official digital system of administrators, Post

Table 16: The Service Blueprinting representation of the Contact Affair Procedure
Source: Author's own creation

When interpreting the service process, we focus on the relationships between the activities that create the service. We examine how much each activity is related, how well they are able to unite and build an efficient service. Considering the role of the customer within the service elements is a critical point in the process of services.

Figure 30 presents the blueprint of the Guardianship Office's contact affair procedure.
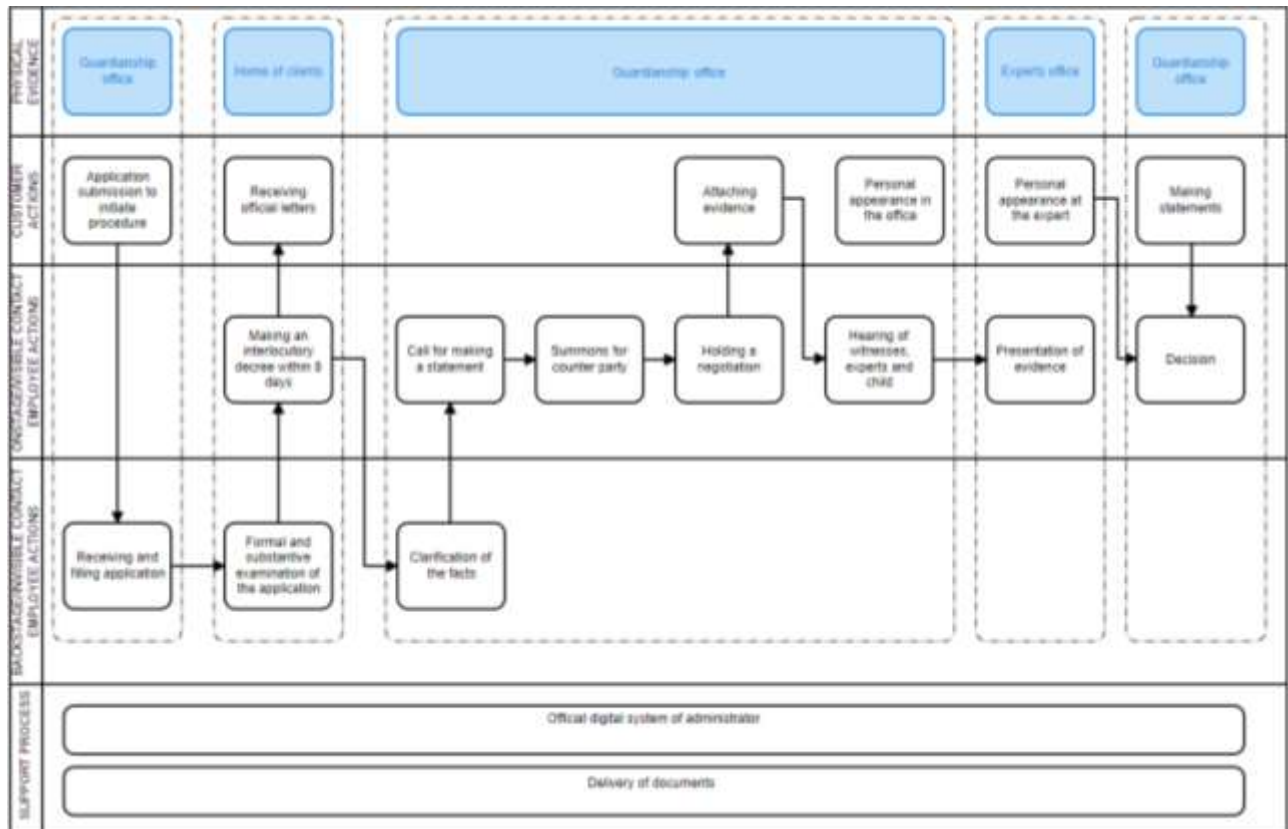
Figure 30: Blueprint representation of the Guardianship Office contact affair procedure
Source: Author's own creation

When examining and developing the service process, it is necessary to get to know the deeper understanding of the customers' perception and not only the interpersonal interaction. Taking into account customer experience goes beyond the scope of services. According to Pine and Gilmore, we live the time of experience economy (Pine, Gilmore, 1998). Customer experience means that customers contribute directly and indirectly to the development of companies, and they do so through their internal and subjective suggestions. The service blueprinting method is capable of visualizing the participants of a service operation, the entire process, highlighting critical points of contact with customers and physical service and other key functional and emotional elements.

As we can see after collecting and classifying the process steps, we can get a clear and understandable blueprint of the existing process in which we can identify easily the different roles and actions of each participant as well as shows the connections between them while also showing the order of the steps as they are coming after each other. This method can be used to describe and visualize any service process after the thorough mapping of the

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necessary process steps and by allowing to see the whole end-to-end process it helps the further analysis as well for example with discrete-event simulation.

3.2.3. Business Process Modeling

With the help of the Business Process Modeling approach, we aimed to visualize the contact affair procedure from the company's point of view as it focuses on the administrator's tasks during the process from the employee perspective. The BPM representation of the process can be seen on Figure 31.
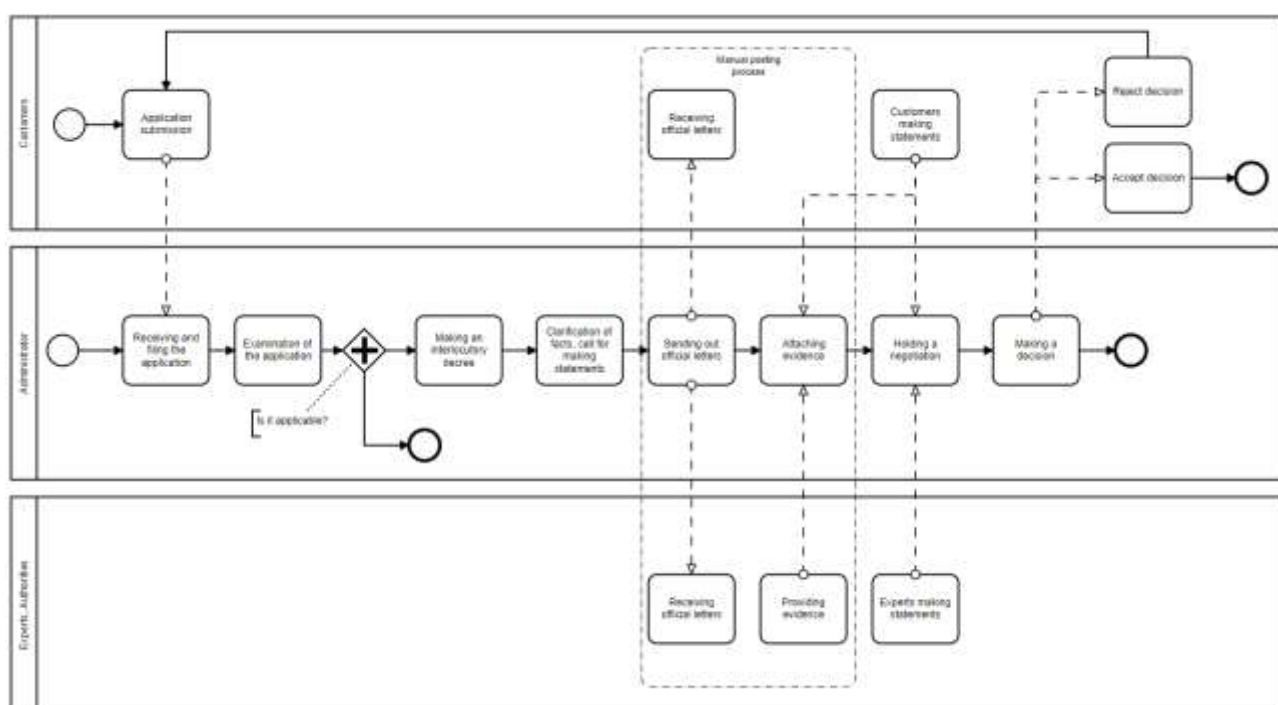
Figure 31: Business Process Modeling representation of the Guardianship Office contact affair procedure
Source: Author's own creation

In a contact affair procedure, separated parents are involved to settle their differences with the help of the Guardianship Office administrator. The procedure starts with a submitted application by one (or both) of the parents which goes through an examination. After formal and substantive checking an interlocutory decree is made by the administrator and official letters are sent out by regular post to all interested parties to inform them officially about the next steps. This step can take significant time depending on the circumstances and cooperation willingness of the opposing parties. After this several more steps occur, the

parties are summoned to make statements, provide evidence and finally participate on a negotiation. During the negotiation a decision is made to resolve the issue based on the collected and verified evidence and the statements of parents, experts and the child (children) (Buics & Eisingerné Balassa, 2020).

3.2.4. Process-Chain Network

The Process-Chain Network (PCN) method is designed to present process elements involved in the service process based on needs and satisfaction. In the process of applying the method, we analyze the steps of the service process in the case of the guardianship contact affairs, and we illustrate the different needs and goals of the service. The elements of the process have different needs. Based on the diversity of needs, Sampson (2012) distinguishes between "specific beneficiary" and "generic beneficiary". In this case, the guardian and the administrator are the generic beneficiary, and the clients are the special beneficiary. It is obvious that both have different needs and goals (Sampson, 2012a).

The PCN model includes customer satisfaction or dissatisfaction at different points of the service. Our model shows that customers are dissatisfied at many points. In the current stage of our research, these conclusions are our primary results (based on in-depth interviews with administrators and managers). In interactions where clients encounter with administrators, customer dissatisfaction is quite common. This may be due to lengthy waiting times (sending and receiving notifications, customers are deeply touched by the elements of the procedure emotionally, giving statements to experts, etc.).

Figure 32 shows the Process-Chain Network representation of the Guardianship Office contact affair procedure.
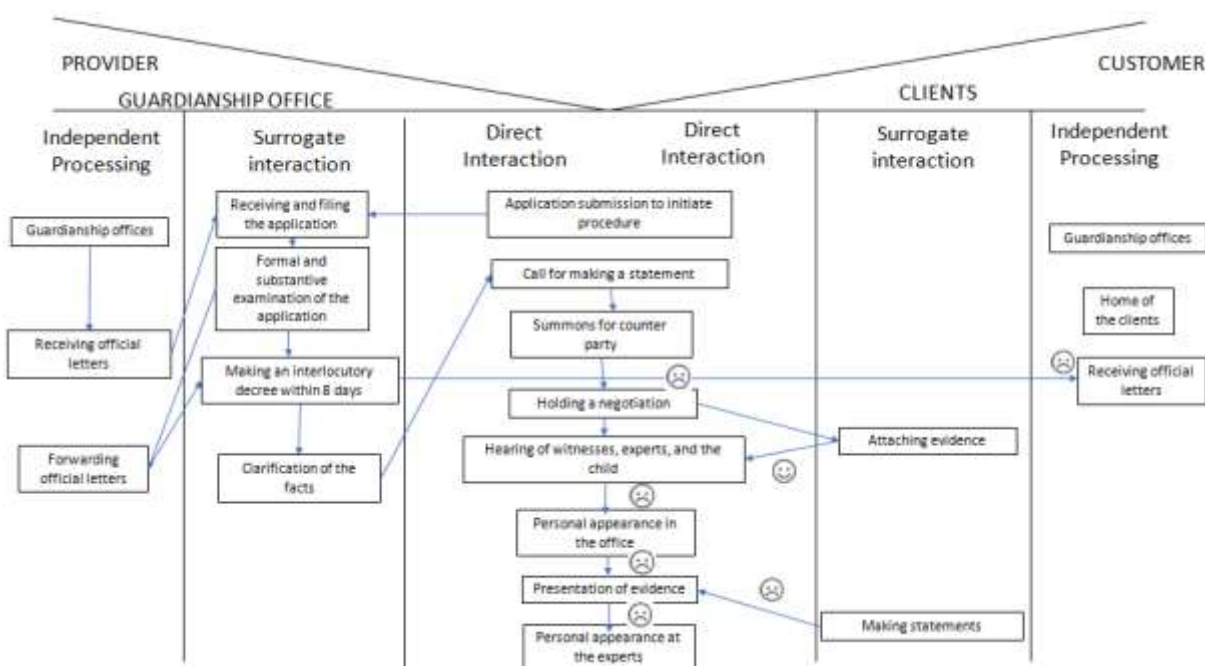
Figure 32: Process-Chain Network representation of guardianship contact affair procedures
Source: Author's own creation

Unfortunately, the independent elements slow down the process and overall they are not getting closer to the solution. It can be clearly seen that measures and solutions for these elements could greatly increase customer satisfaction. These can be new digital administration solutions or other efficiency enhancing methods. The office premises are only partly suitable for creating an intimate atmosphere, which could also have a positive impact on customer satisfaction. During customers' surrogate interactions often face the difficulty of not understanding the language of the office; they cannot represent their affairs correctly by themselves, which reduces their satisfaction. In such cases, they should seek the assistance of legal experts and lawyers. Overall, direct interactions are filling agents and clients with dissatisfaction. By making the process more flexible customer satisfaction would be much higher.

3.2.5. Statistical Analysis

The contact affair procedure of Guardianship Offices differ from the front office operations of Government Windows several ways. The first significant difference is the repeatability of this process during a single case, which is the main reason behind the complexity of this process. An individual case starts with the first submitted application but during the process

the parties can submit new applications continuously as well thus several iterations of the process can run simultaneously within a single case. The case will be only closed if there are no more submissions and the decision for the last submission was made. These characteristics can make the contact affair procedure significantly longer and more complex and the administrators have to handle multiple cases at the same time.

The other main difference is that while in case of the front office operations of Government Windows we had a large and structured dataset containing the necessary information regarding time in case of the contact affair procedure there is no structured dataset, which could be used for simple data extraction. In this case, only their case numbers and their sub-numbers can identify the individual cases. Each application submission has a time stamp but as there is no structured central dataset with the necessary details, in each case we had to as the administrators to extract and create the raw dataset by hand.

In the current phase of the research seven expert in-depth interviews with the head and the colleagues of the Guardianship Office of Győr District Office were conducted. By analyzing the above model, it immediately rises to view that the so important time factor of the procedure is not indicated at all, furthermore, those procedural elements, which may repeat or induce further delay in the procedure are also not indicated. For example, we do not see that the different parties have to be summoned during the procedure, which may take a long time due to the complexity of posting and notification. It may increase the duration of the procedure by two weeks.

The hearing of the experts (doctor, psychologist, teacher, and kindergarten-teacher) also takes a long time and slows the entire procedure by making the closing on time impossible. During the procedure it would be often necessary to apply mediator. Each affected party can ask for a mediator, but the administrator can also offer it. However, the administrators often do not use this option, as they are sure that the procedure cannot be closed within 60 days in case of applying a mediator.

What can the administrator do? Do they comply with the rules and make a decision on time? But in this case the quality is compromised, and we must admit that these procedures are about people and faiths. Alternatively, do they exceed the time frame and concentrate on the quality? However, in this case they surely do not meet the time limit (especially if it is about patchwork families), and they have to pay a fine of 10.000 HUF (30 Euros).

We can assure that none of the solutions is good. In this situation neither the administrator, nor the affected parties will be satisfied. The objective is obviously not this.

Distribution of the subnumber of cases

Table 17 and Figure 33 below illustrates the complexity of the contact affairs of the Győr-Moson-Sopron County Guardianship Office in 2017 (Table 17 and Figure 33). Each case is divided to sub-numbers, which means that the parties submitted newer and newer actions during the procedures. Obviously, the higher the sub-numbers are, the more complex the case is, and the more the case annoys the participants, what's more, it increases the duration as well as the complexity of the procedure.

Sub-Number 1-10	Sub-Number 11-30	Sub-Number 31-50	Sub-Number 51-100	Sub-Number Above 100	Total number of cases
112	27	8	4	2	153

Table 17: Contact affairs of Győr-Moson-Sopron County Guardianship Office in 2017 (1)
Source: Author's own creation
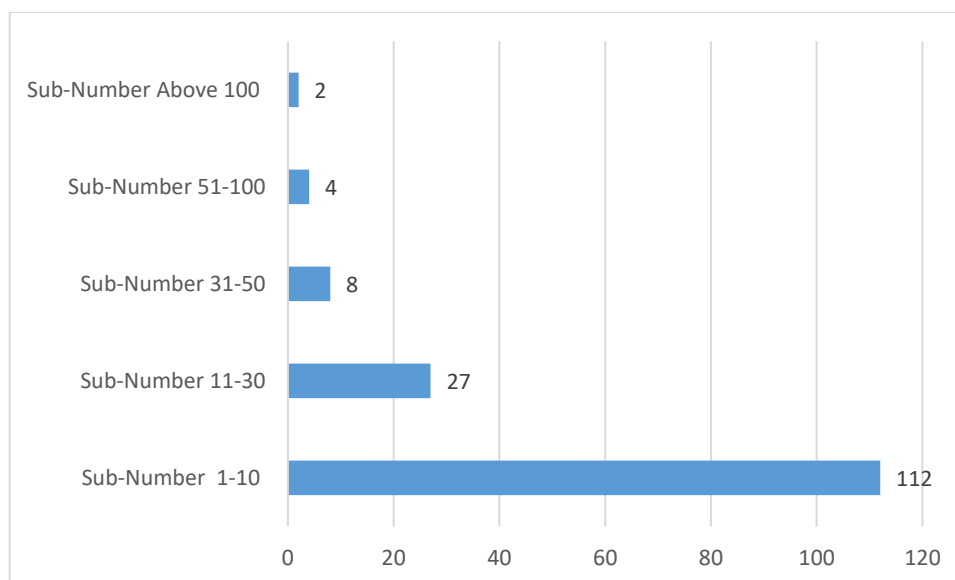
Figure 33: Contact affairs of Győr-Moson-Sopron County Guardianship Office in 2017 (2)
Source: Author's own creation

On Figure 34 we can see cases with sub-numbers in which patchwork families are/were the participants. By sorted in descending order, it clearly appears that cases of patchwork

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families are more difficult, there are more files, they use the administrator in a greater extent, and there is little chance to close the case on time.
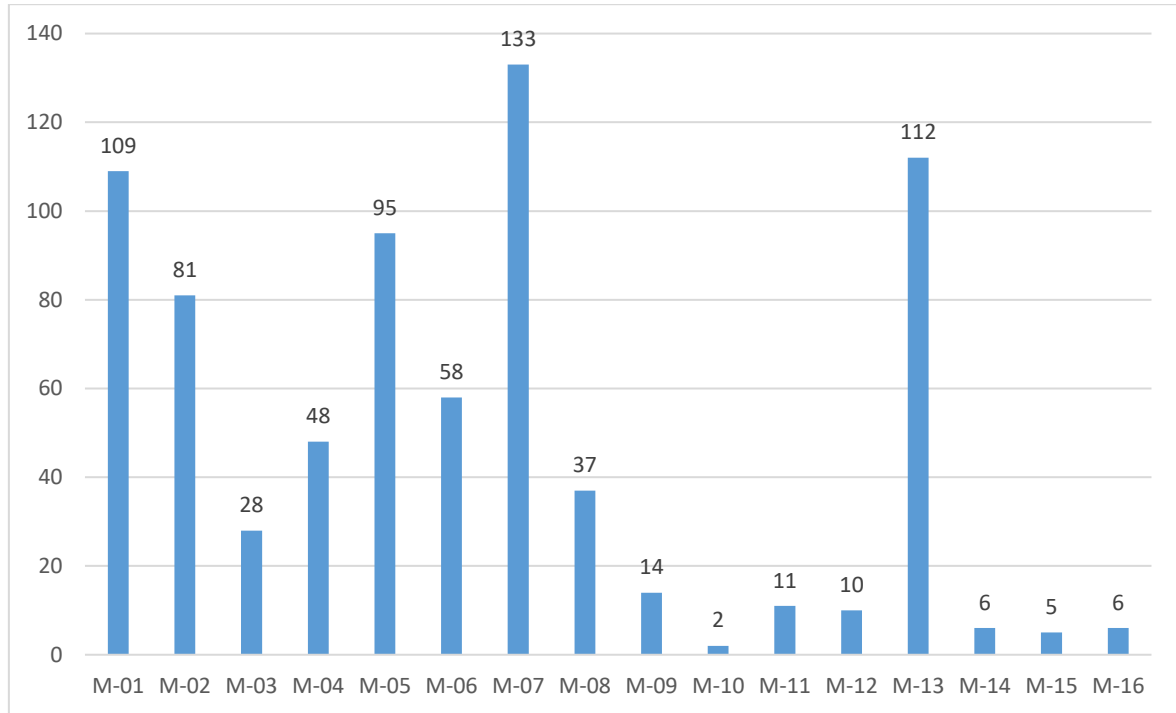
Figure 34: Sub-numbers of contact affairs in patchwork families in Győr-Moson-Sopron County Guardianship Office in 2017
Source: Author's own creation

Processing time statistics

Regarding complexity, the next step was to analyze an individual case in order to extract valuable data regarding the processing times of each step in order to see how long the individual iterations of this case were. The most complex case were chosen which had a sub-number of 133. There were 22 process iterations in this case and Figure 33 shows the length of each process iterations.

Appendix 6.6. shows the main steps of the process and the dates when the employee who handled this specific case administered these steps. The length of each process iterations are also shown on Figure 35.
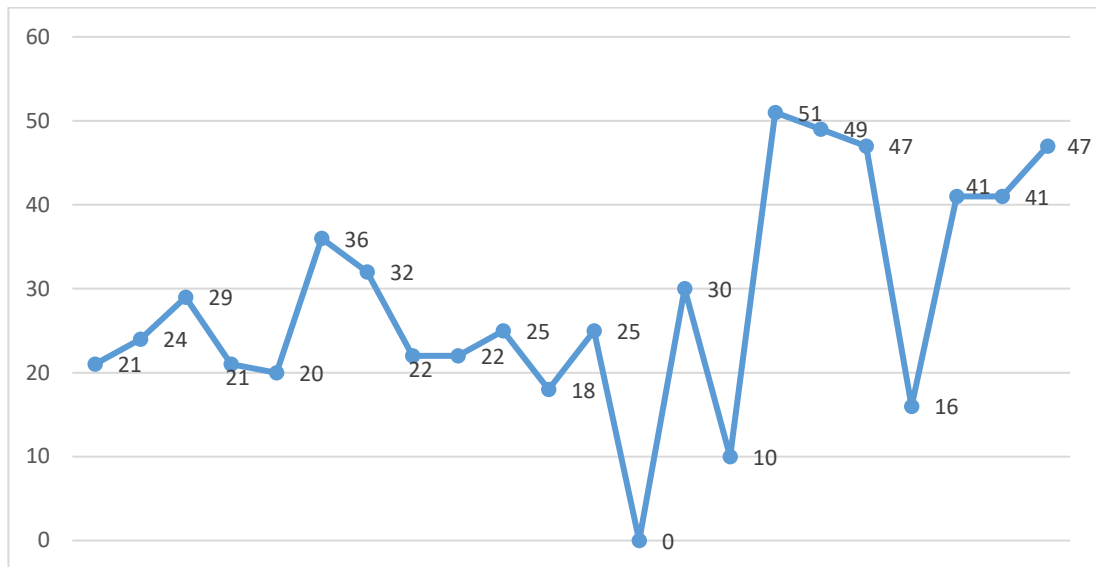
Figure 35: Length of process iterations
Source: Author's own creation

In case of this specific contact affair procedure case, several applications and appeals for previous decisions were submitted by the separated parents, which altogether triggered the process to start twenty-two times. From the beginning of the first application submission until the closing of the whole case it was almost a year long (from 2017.03.09 to 2017.11.13.). According to the time stamps, several applications were submitted simultaneously at the same day and among the applications there were several ones, which were submitted before previous iterations of the process ended, resulting in parallel processes connected to a single case. Moreover, this data is just from one single case while the administrators have to handle multiple active cases at the same time with at least one running process in each case at the time.

Lead time statistics

While in this case each iteration remains under sixty days length as required by the law, it is mostly because the administrators try to minimize the involvement of outside parties. Based on the in depth interviews made these involvements can lengthen the process significantly as they are waiting for responses from different authorities and experts. However according to administrators the exclusion of experts and mediators often leads to general dissatisfaction of the customers and usually as they are not accepting the decision the submit an appeal or a new application. In Table 18 we can see the start and end dates of the individual iterations

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and on Figure 36 we can see the Gantt chart of the whole process, which was overall 249 days long until the final submission was closed by a decision.

Iteration	Submission of an application	Decision	Length in days
1.	2017.03.09	2017.03.30	21
2.	2017.03.28	2017.04.21	24
3.	2017.03.28	2017.04.26	29
4.	2017.04.04	2017.04.25	21
5.	2017.05.02	2017.05.22	20
6.	2017.05.03	2017.06.08	36
7.	2017.05.19	2017.06.20	32
8.	2017.06.08	2017.06.30	22
9.	2017.06.08	2017.06.30	22
10.	2017.06.12	2017.07.07	25
11.	2017.06.12	2017.06.30	18
12.	2017.06.30	2017.07.25	25
13.	2017.07.27	2017.07.27	0
14.	2017.08.02	2017.09.01	30
15.	2017.08.07	2017.08.17	10
16.	2017.08.14	2017.10.04	51
17.	2017.08.16	2017.10.04	49
18.	2017.08.30	2017.10.16	47
19.	2017.08.31	2017.09.16	16
20.	2017.09.05	2017.10.16	41
21.	2017.09.05	2017.10.16	41
22.	2017.09.27	2017.11.13	47
Total Lead Time			249 days

Table 18: Start and End dates of individual process iterations during the case
Source: Author's own creation

On Figure 36 we can also see that during the whole lead time there were almost two or three iterations running simultaneously, while from September the complexity increased even more because of several new appeals submitted as reactions to previous decisions.

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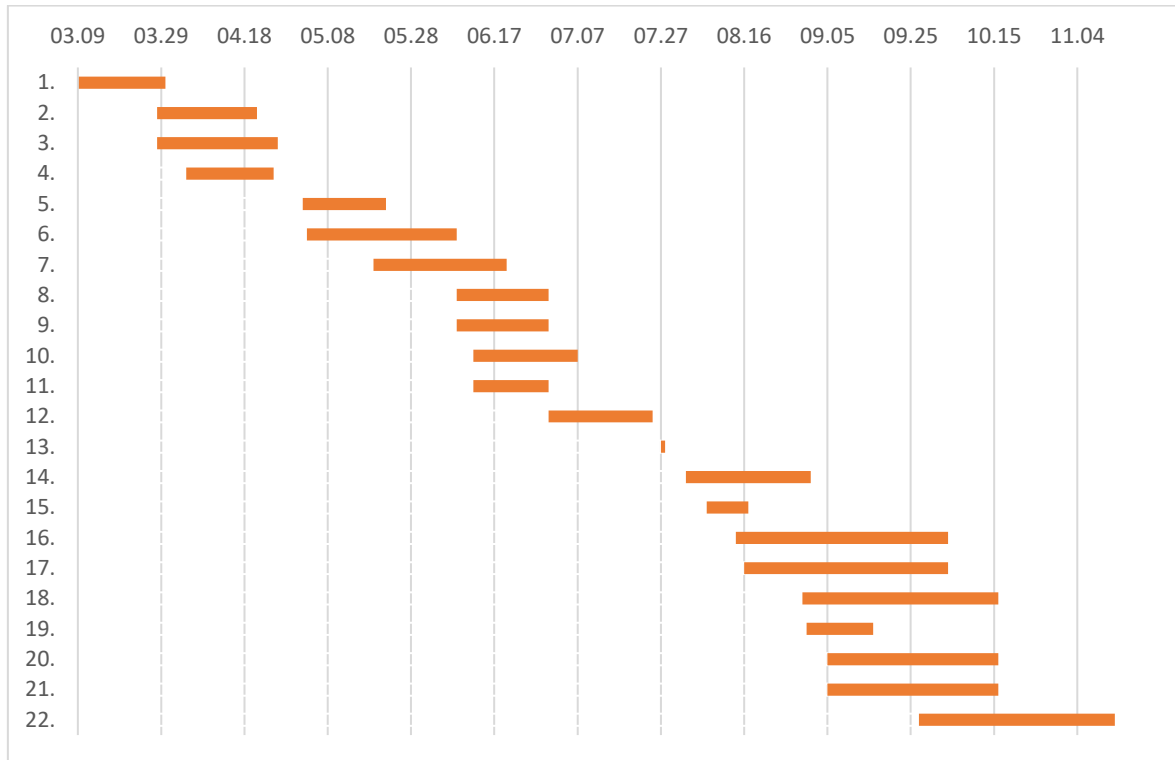
Figure 36: Gantt chart of the example case from the start of the first iteration until the end
of the last iteration
Source: Author's own creation

As we can see on Figure 35, in case of the examined example case more process iterations were running simultaneously. According to the administrator, they have to handle several individual cases simultaneously, which all bear this complexity, which means that they have to handle multiple cases with multiple iterations during their work.

3.2.6. Discrete Event Simulation

After the application of Service Blueprinting and Business Process Modeling, and the deep analysis of an individual case to show the complexity of contact affair procedure we can see the process from different perspectives and they all helped us to develop the first iteration of the discrete event representation of the process for further analysis.

The research used the Technomatix Plant Simulation software by Siemens, which offers a wide range of tools to build and operate process simulations, which can imitate the behavior of the real process. First, we built the process based on how it should look like according to the laws and regulations detailed before and used the collected data to define the processing time parameters of each step (Figure 37).
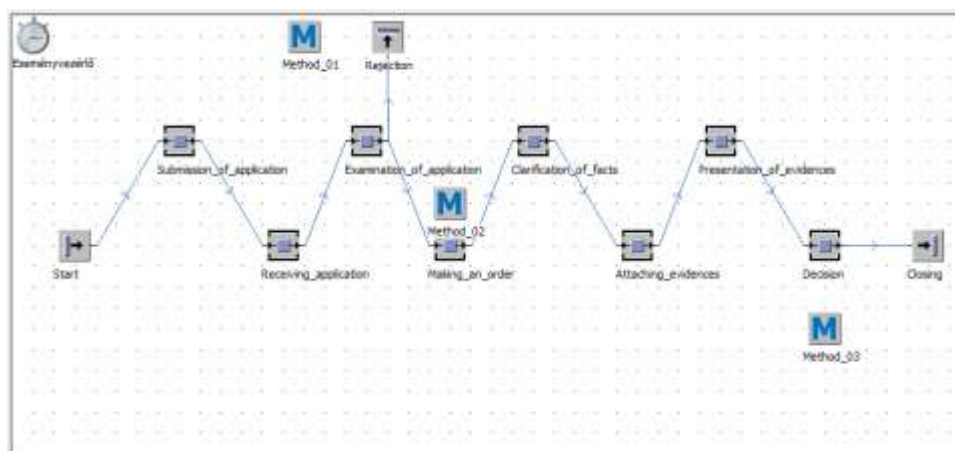
Figure 37: Simulation model of the contact affair procedure according to regulations
Source: Author's own creation

During the creation of the simulation exceptions in the service processes should be also considered. In case of the Contact Affair Procedure of Guardianship Offices exceptions can be submissions which do not pass the initial evaluation or or will be withdrawn by the parents before being processes. The Plant Simulation program and the built simulation has the ability to handle customers who abandon the waiting line, but in this particular simulation exceptions are not added specifically, because we have no exact data about the number of rejected submissions.

In our simulation, the moving objects, which are moving from the source to the sink, are the individual cases. Each station of the simulation represents a main step of the contact affair procedure such as the examination on an application, evidence attaching, decision-making, etc. Five categories of moving objects were defined according to the data (Figure 38).

	object 1	integer 2
string	MU	Case number
1	.MU.A	112
2	.MU.B	27
3	.MU.c	8
4	.MU.D	4
5	.MU.E	2

Figure 38: Case categories and numbers defined
Source: Author's own creation

By using methods to create simple programs the simulation becomes highly customizable which is a great benefit of this simulation software as many different and complex scenarios can be defined.

After the simulation of multiple cases with the built model, we concluded that the average time needed to finish a case was 49 days, which is within the 60-day timeframe. According to this simulation, an ordinary case really can be closed before the deadline, which is regulated by the law. However as previously discussed there are steps, which could take significantly longer time to finish according to the information, collected during the in-depth interviews. For example, the complexity of posting and notification could increase the duration of the procedure by several weeks according to the experience of the administrators, but these steps are not detailed in the original service process. Based on this we added the posting and notification process to the simulation model and defined its parameters according to the experience of the administrators (Figure 39).
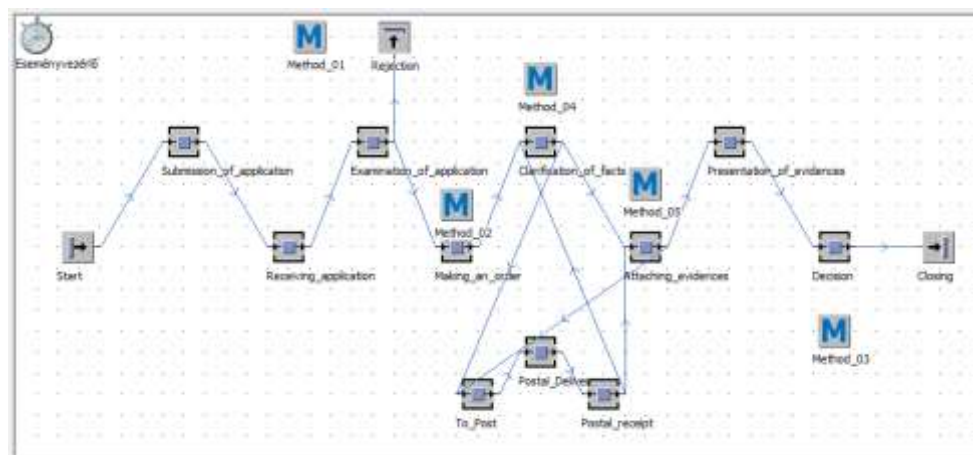
Figure 39: Simulation model of the contact affair procedure with detailed posting process
Source: Author's own creation

After running the simulation again, it turned out that the average time needed to finish a case is 81 days, which is above the current regulation by 21 days. Our simulation results correspond with the experience of the administrators who stated that cases could run for several months in some cases and there are examples for even longer processing times due to the nature and complexity of the given case. One way could be to improve the posting and notification process by servitizing it through the digitalization of it at least partially as currently this part of the process is completely manual using regular post and delivery

methods as discussed before. If administrators are dealing with a more complex case in which multiple outside actors should/could be involved all of them have to be notified trough regular post and replies are also received this way whether the actors are sending back requested data, asking for more detailed information or just confirming that they are ready to be participate.

While this difference is just one aspect of the depths of this complex public service process our research is the first which provided real proof in case of the contact affair procedure that reality defies regulations thus steps should be made to reevaluate the process regulation in details and find ways to improve efficiency and effectiveness.

3.2.7. Results and Discussion

Contact affair procedure is a public service process used by Hungarian Guardianship Offices to settle issues between separated parents regarding their child (children). According to the research and interviews made with administrators because the legal regulation prescribe sixty days to finish the procedure the administrators are often forced to finish it at the expense of quality by excluding third party experts and advisors. The thesis presented and analyzed an individual case to show the complexity of this procedure as customers can submit several applications and appeals against previous decisions, which altogether can trigger the process multiple times. In this specific case from the beginning of the first application submission until the closing of the whole case it was almost a year long. In addition, this was just a case of only one family, however administrators have to handle the issues of multiple families continuously keeping in mind the time frame regarding each individual process iteration of each case.

According to Co-Production theory customers and administrators are an inseparable part of the service process, and their feedback and experience can be used from the inside to map and analyze the process and find improvement possibilities. Our paper aims to contribute to the usage of Co-Production theory approach. Only a few studies were conducted so far in case of the Central European Countries by using this approach and our study is one of the firsts regarding complex Hungarian public service processes.

As we can see on the visualization of the process the procedure starts with a submitted application by one (or both) of the parents. The application goes through an examination in

order to determine its justness then the administrator creates a decree and official letters are sent out by regular post to all interested parties to inform them officially about the next steps. As we can see in case of the Service Blueprinting representation, there are two main support processes, the Official digital system of the administrators and the Post. Based on the interviews conducted with several administrators we can state that the backstage actions and especially the supporting processes can slow down the process as for example the official letter sending and receiving (the posting). It can take several days for the letters to arrive or even more depending on the circumstances and until then the next step of the process cannot start. Depending on the motivation level of participation and the understandability of the situation of the parties in many cases, the administrators have to repeat this step several times during the process.

On the Process-Chain Network representation of the contact affair procedure, we can see the direct actions of the process are greatly affected by the previously discussed conditions of the independent steps and surrogate interactions, so the direct interactions create dissatisfaction on both ends. Improving the background operations thus could greatly improve customer satisfaction and for example, new digital administrative solutions could greatly ease the circumstances of the administrators.

As we can see both the Service Blueprinting, Business Process Modeling and the Process-Chain Network methods can be used effectively to map the process steps of a complicated public service to clearly identify and analyze each step in order to highlight weaknesses and offer improvement options.

We could see that contact affairs are very complex and lengthy processes. The law gets the administrators of the guardian office to strictly keep the time frame for the administration, however, it does not take into consideration either the complexity of the cases or the different family types.

For the process analysis and simulation, the research used the Plant simulation software based on a case study, selecting the most complicated example. Plans for the future research are to analyze more situations in order to collect and use more quantitative data in order to add more layers of complexity to the simulation process. With comprehensive analyses, our aim is to be able to give a general recommendation for the legislators and for the administrators on how to improve the processes in public sector.

As we could see according to the simulation model of the service process it takes longer time to finish than the allowed timeframe that corresponds with the collected data and experience of the Guardianship Office administrators. As we saw by analyzing the model it is clear that the time factor of the procedure is not indicated at all, furthermore, those procedural elements, which may repeat or induce further delay in the procedure are also not indicated. For example, we do not see that the different parties have to be summoned during the procedure, which may take a long time due to the complexity of posting and notification. It may increase the duration of the procedure by up to two weeks.

This situation can deeply affect the quality, efficiency and effectiveness of these processes as administrators are forced to shorten the process in some cases to save time which overall affects customer satisfaction as well. Our research is the first which provided real proof in case of the contact affair procedure that reality defies regulations thus steps should be made to reevaluate the process regulation in details and find ways to improve efficiency and effectiveness.

According to Buics and Eisingerné Balassa (2020) due to legal restrictions, the administrators have 60 days to finish a process or they have to pay a fine. Partially because of this burden and because other service inefficiencies administrators are sometimes forced to exclude the involvement of outside parties from the process as waiting for their response could potentially lengthen the process beyond the deadline. Administrators generally consider this process very stressful as they have to manage multiple cases at the same time and especially because – as we will see in our example – due to the dissatisfaction of the customers regarding the result they often submit applications to trigger the start of the process again, which can lead to the distortion of a family case for several months, even a year in extreme cases. Thus burning out in this work is a possible risk as they accumulate dissatisfaction as we have seen in other employment relations (Cančer et al., 2017; Merkac Skok et al., 2013).

Based on the simulation we can realize, it is possible to end the process until the deadline. Despite of this, this procedure is very complex and there are hidden steps in it, which can take a long time. The administrator is under the pressure to end the process until the deadline, so many times the quality of the service becomes inappropriate.

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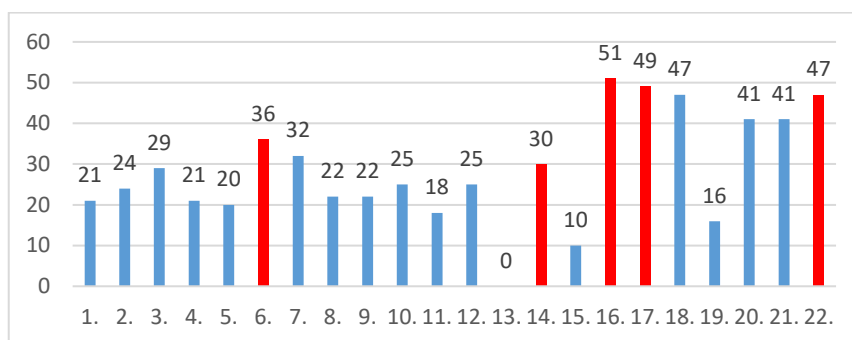
Figure 40: Length of process iterations (red indicates where third parties were involved)
Source: Author's own creation

Figure 39 represents, that within the process iterations where were third parties (experts, authorities) involved. If administrators use experts when conducting the process, they are risking running out of time. They do not want to pay a fine for exceeding the deadline of sixty days, therefore, in most cases administrators do not use other witnesses, nor experts (psychologist, teacher, kindergarten teacher, pediatrician, mediator) if it is not absolutely necessary, because administrators are afraid of the lengthening of the administration process. As we can see on Figure 6, there are iterations where the process was more than forty days long from start to finish even without the involvement of third parties.

Based on qualitative and quantitative researches (modeling and data collection), the research identified some elements, which could improve the customer satisfaction: shorten the process time factor, creating simpler procedures, focusing on common agreement and solutions.

Administrators do not have enough information, time and the right skillset to manage so complex and long-term procedures. On the top of that at the beginning of the process administrators do not know how long and how complex the process will be. People in charge can only rely on their previous experiences (if they have) which makes the process utterly stressful. Additionally, since the administrators do not get training to manage this complex situation, the fluctuation of the administrators is very high in this office.

According to the literature, there are many intentions to improve public service processes but very few of them discusses the more complex public services like the contact affair procedure, and there was no example so far in the Hungarian literature. The intentions of the thesis were to find methods, which are well suited to access the complexity and provide useful insights without the fear of losing valuable information as we unwrap the layers of the service and create its clear and understandable model.

According to the research that these methods are useful and can be applied on the more complex Hungarian public service processes and key points can be identified where improvements can be made to shorten lead times, increase flexibility and improve the general efficiency and effectiveness. In our further research we will put greater focus on the process of the contact affair procedure itself by collecting detailed data about the individual cases regarding processing times and complexity and by using analytical methods and simulations to analyze the collected data in order to point out the inefficiencies which worth further research and examination. Term goal of the research is to call the attention of the decision-makers to optimize the procedure deadline as this way the satisfaction of both the parties and the administrators will highly increase.

4. Conclusion

Nowadays there are significant changes in the public sector. Due to the fact that customers have higher expectations of more flexible and faster services, there is an increasing pressure on governments who want to improve public services, and on service administrators as well to perform on a higher level of efficiency and effectiveness every day.

The thesis aims to show how Hungarian public services can be examined comprehensively through two examples with a selected combination of analytical tools based on the international public service, and process management literature. The goal of the thesis is to recommend the application of these tools in public service development. The thesis present how these tools can be applied together to map and analyze public service processes, building on observations, interviews and available statistical data in order to identify and measure objective time-related key performance indicators. The results of the thesis can be useful for decision-makers and legalisators to evaluate service processes to gain deeper insights about the level of service quality and efficiency based on the analyzed data, using an industrial process management perspective.

The thesis analyzes selected service processes from the Hungarian public services to show the way of service delivery from the point of view of the service provider and to show what are the most important service phenomenon which can describe the service characteristics and performance based on the available data. The thesis does not aim to give a complete picture about the national public service system, it only analyzes the selected types of services to gain insights about service quality by emphasizing the importance of the used key performance indicators as they show how the customer perceives the examined services. The thesis aims to provide a cross-sectional picture of the actual service operation in case of the selected public services based on real data collected by observation, interviews and statistics. The thesis aims to show how these services are typically conducted, and to present how process mapping and analyzing can contribute to the better understanding of the selected processes, and thus result in the better delivery of public services.

The units of analysis are within the Hungarian public administration system, more closely the front office operations of the Government Window system and a complex service process of Guardianship Offices called contact affair procedure. The thesis aims to use these selected service processes as examples to demonstrate the usefulness of the combined analytical methods and approaches.

The answer to the first research question (RQ-1) regarding what are the relevant theories in public service management and how can it benefit from the industrial process management perspective is as follows.

The first research question (RQ-1) serves the goal to provide the theoretical framework for both the context of public service management and for the service process quality and performance measurement on a macro level. These both are serving as the background of the topic of the dissertation regarding the examined services and the applied methods.

The first (2.1.) and second (2.2.) subchapters of the Literature review chapter are connected to research question one (RQ-1). The first subchapter (2.1.) addresses the public service theories and approaches providing an overview of important definitions and theories. The second subchapter (2.2.) addresses service process management concepts providing an overview of the importance of service quality and key performance indicator measurement. The quality of service delivery is critical for both the government and the citizens. Because of this, most governments struggle to respond to present day needs driven by complex challenges.

Findings of RQ-1 show that the current Hungarian public service system is built on the Neo-Weberian State concept, which emphasizes efficiency and effectiveness and for the successful service development co-production with the customers is vital, but due to the special context cooperation does not necessarily work which makes performance improvement especially difficult. However, performance of service processes can be measured in this context as well by applying key performance indicators well known in the private sector.

According to the literature in the last decades three major theories emerged, the New Public Management, The Neo-Weberian State approach and the New Public Governance model.

The New Public Management model was based on the efficiency-oriented business model of the private sector, it emphasizes neoliberal values and puts the market, the creation of a competitive situation, the suppression of direct state intervention at the center of public service management. Among the guiding values are consumer focus, competition between public service providers, which enables consumers to make decisions, the need for performance management of public service organizations, and service and result focus based on consumer satisfaction. The approach of New Public Management was a quite popular

theory with numerous positive examples, however it proved to be ineffective, sometimes even contradictive especially in case of Eastern European as NPM was not able to provide practical solutions for the problem of assessing and improving public service processes.

In response to the failures of New Public Management a trend called the Neo-Weberian State (NWS) emerged against NPM at the beginning of the 21st century. While NPM supports the concept of "small/minimal state", NWS supports the concept of a strong state, emphasizes the renewal of traditional bureaucratic values and puts the state at the center. The NWS approach seeks to strengthen the state and administration through regulation and the restoration of moral values. The NWS model treats the principles of efficiency and the operation of a citizen- and customer-friendly administration as a key aspect in the use of financial resources for the performance of community tasks. Based on the above, the Hungarian public administration reform, the structural transformation of the institutional system, the highly centralized apparatus, and the concept of the service state, customer-centered public administration appearing in the Magyary Program and the Public Administration Development Strategy are most in line with the Neo-Weberian approach.

The governance models following the New Governance model approached public administration based on values and participation. Regarding these approaches besides the values of economy, effectiveness, efficiency, equity, and environment controllers, we usually talk about co-creation, co-design, co-production, collaboration in service delivery, and co –responsibility. In governance models, the service culture remains as a value, but the design, organization, production, and delivery of public services itself emerges as a result of cross-sectoral collaboration.

According to the literature, we can find the approach of Co-production in New Public Management as consumerism, it can be also found in the literature of New Public Governance as well as a system level approach to public service delivery methods. In case of the Neo-Weberian State as well as the focus on customer participation and efficiency regarding the use of resources.

Co-Production is defined as the voluntary or involuntary involvement of public service users in the design, management, delivery and/or evaluation of public services, thus co-production is an intrinsic process of interaction between service providers and users when the service delivery happens. Overall, the theory of Co-Production gives us a practical way to plan and deliver public services with focus on the process steps and its participants. According to

Nemec et al. (2019) while there are many research papers focused on co-production and co-creation in the international literature, few of these are coming from the Central and Eastern European region. Because of this, secondly, the thesis aims to contribute to literature by the application of Co-Production in the Hungarian public service context by the above mentioned way as the theoretical approach of Co-Production and Co-Creation were not applied before in Hungary during the close examination of public service processes and highlight the importance of customer and provider participation in the process. The thesis aims to help filling in this gap by focusing on selected public services, emphasizing how important is the role of public service employees in such service processes, as they are essential part of the service just as the customers themselves.

The customer satisfaction depends greatly on the level of the service and the quality of the product and the private companies do everything they can to acquire information about citizens needs in order to convert these expressed needs into new kind of products, shorter lead times, increased service levels. While the governments are trying to meet the growing expectations of the citizens, the relations between the citizen and the public institution become more and more complex and they have mutual influence on each other.

Servitization generally means developing innovative capabilities that could complement and enhance product offerings in the industrial context, however based on the literature this approach can be applied in the public service context as well by using Unified Services Theory as a bridge to generally define service processes and in order to connect servitization with the theory of Co-Production. These industrial and public service development and delivery methodologies share the similar approach, which emphasizes both the importance of customer participation and the fact that customer participation is actually an inseparable part of the production and consumption of services. According to the Unified Services Theory customer input is a necessary and sufficient condition for defining a production process as a service process. A very important part of the servitization concept is that it treats people (providers and customers) as essential parts of the service providing process because their needs and feedbacks shape the creation process in order to improve the performance and profitability of a company.

By using the theory of Co-Production to examine a public service process and its steps and participants and combining it with a servitization approach public services can be seen from a new angle. In case of complicated public services where administrators are an inseparable

part of the process, their feedback and experience can be used from the inside to map and analyze the process and find improvement possibilities.

In the private sector, companies are often use key performance indicators as a tool to measure the performance of individual processes or whole departments, with their help they can determine whether they meet with the expectations, perform above the expectations or they fail to meet with the expectations, which require intervention to deal with the consequences. As the demand for quality services is increasing from the citizens the performance measurement also becoming a hot debate in public sector as well, because a performance management system positively influences positively both the organizational behavior, the organizational efficiency and the organizational effectiveness.

KPIs are useful to measure the organization performance not only for private sector companies but also in the public sector. KPIs can ensure the effective and transparent service delivery by setting appropriate targets thus helping public institutions to meet with customer demands. With their help, we can measure efficiency in terms of how fast and accurate is the service provided and delivered to customers by using objective measures like waiting time, process duration time and lead time.

Each of the discussed public service theories and approaches, the New Public Management, the Neo-Weberian State and the theory of Co-Production and Co-Creation strengths and limitations, advantages and disadvantages. Depending on the development level, economic environment, community attitude and authorial arrangement not every country is suited for every approach. As we seen, the New Public Management was flourishing in developed western countries but other countries like Hungary were unable to adapt it to the local conditions right after the regime change. However nevertheless of the concept of the system level approach of a country as technology evolves and the customers' need is growing for better, faster, more efficient and more comfortable service delivery. In order to develop and provide these services governments have to address the need of citizens on a new, immediate level, which can only be achieved by applying the principles of Co-Production in service development.

In order to create more effective and efficient services, better tailored to the needs of citizens, the first step should be always to thoroughly examine the existing processes in order to be able to determine what should be changed to achieve the development goals. In this process measuring service characteristics with the help of key performance indicators are vital.

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Private businesses are well aware of the importance of performance measurement because fulfilling customer needs is the only way of survival on the market. While in case of public services in most cases there are no competitors, the way of service delivery is also should be important for governments, because a better-developed service process could also save costs, resources, work force and eliminate administrative burdens hindering the system. Because of this key performance indicator measurement is also very important in case of public service management as well.

The answer to the second research question (RQ-2) regarding how does the current Hungarian public service system look like and how does it perform compared to other European Union countries is as follows.

The second research question (RQ-2) serves the goal to provide the details of the Hungarian public service system with a focus on the context of the selected service processes (Government Window front office operations, Contact Affair Procedure of Guardianship Offices) to show the major characteristics and environment of these service processes.

The third subchapter (2.3.) of the Literature review chapter is connected to research question two (RQ-2). This subchapter provides an overview of the Hungarian public service system, its development compared to other EU countries and discusses the background of the selected public service processes, which are analyzed later.

Findings of RQ-2 show the current structure of the Hungarian public service system itself, presenting the details necessary to understand the background and context of the later analyzed selected services. It also shows the current development level of the Hungarian public service delivery system compared to other EU countries, emphasizing on the importance of digitalization, which is currently the major direction of service process development. Advantages and disadvantages of E-government are also discussed in details.

In 2010 and before, the middle level of the Hungarian public administration system was fragmented, in which the realization of organizational integration was hindered. One of the first steps of the public administration reform was organizational integration, in the framework of which the government offices of the capital and the counties were established, laying the foundations for the transformation of the public administration system.

Organizations with county-level competencies have been formed from the former regional state administration offices, into which the individual territorial administrative bodies have

been integrated. The county government offices thus established have become the highest-level organizational units of the central administration organized on a territorial basis.

The district offices were established as general, first-instance authorities and organizational units of the capital and county government offices. The aim of the state was to create districts of the modern age that would contribute to the creation of a system with a lower social cost than the previously existed administrative system. With the comprehensive transformation of the public administration, the modern districts were established as the lowest territorial level of the public administration, which can thus provide the vast majority of public administration activities and services in close proximity and high quality to all Hungarian citizens.

The government has also decided on the tasks to be transferred to the district offices. The most important task of the district offices is to perform administrative public administration tasks at a lower level than the county level. The district offices took over mainly document office tasks, child protection and guardianship matters, as well as the administration of certain social, environmental and nature conservation administrative matters from the municipalities. The majority of cases referred to the district office are document office tasks, such as personal data and address registration, passport administration and vehicle administration. These administrative services are provided by the Government Window System, which is a separate department of each district office, and operate as One-Stop Shop service centers. One-Stop Shops (OSS) were first established in the 1980s, typically in the Anglo-Saxon countries.

The aim of the wave of reforms launched within the framework of the Zoltán Magyary Public Administration Development Program (Magyary Program) was to establish a customer-centric service operation that takes into account the needs and interests of customers. In the Magyary Program, the legislators set the goal of simplifying procedures, reducing customer burdens and creating uniformly high-quality services accessible to all citizens. In order to raise the standard of public services, a multi-channel government customer service system was created through the establishment of one-stop shops, the so-called Government Windows.

The creation of Government Windows introduced the One-Stop Shop model into the Hungarian public administration, which already exists as a common administrative solution in several countries. The essence of the system is that customers can settle several cases at

the same time at one point of administration, in the case of a more complex procedure; they can initiate the procedure or receive information. Since then Government Windows are the customer service offices of the county government offices and district offices that form the backbone of the territorial administration, where citizens can handle, initiate and receive information on the progress of many administrative procedures.

However while there are a lot of available at a single place the digitalization and developing E-Governmental solutions are also becoming more and more important for customers. The concept of E-Government focuses on the use of information and communication technologies as a tool to achieve a better working government and it tries to optimize service delivery, constituency participation and governance by transforming internal and external relationships through technology. In electronic government systems, government operations are supported by web-based services. It involves the use of information technology, specifically the Internet, to facilitate the communication between the government and its citizens. The customer satisfaction depends greatly on the level of the service quality. Due to the complexity of digitalization and the specificities of public administration, these types of developments pose a huge and complex challenge for countries. At the same time, the ever-changing needs of citizens are forcing their administrations to constantly innovate.

In the European Union the Digital Economy and Society Index (DESI) is a practical online tool to measure the achievements of the EU Member States in building a digital economy and society. With DESI, European Union member states have the opportunity to identify the areas where further development needed to achieve the main objectives of the Union.

According to the conducted research in the thesis based on the data of the 2019 Digital Economy and Social Index, Hungary still lags significantly behind. Within the European Union, Hungary is the 23rd (out of 27) in the case of the composite index, and the most challenging area remains digital public service development. As it can be clearly seen from the data, Hungary is at a disadvantage in the field of electronic public services compared to most countries of the European Union according to the DESI indicator. In the case of the composite index, the position worsened from 23rd to 24th since 2014, while in the case of the digital public services subdimension it is currently 26th compared to the initial 22nd place, but the trend also shows a very slow improvement.

Adopting the concept of One-Stop Shop was one of the most important changes during the development of administrative public service delivery. Making all kind of services available

under a single roof was a major step in creating a more efficient service delivery and accessibility for the citizens. However as seen according to the DESI indicator Hungary still lags behind most of the EU member countries because the next level of service development, the digitalization of public services still needs to be achieved. While now many services are available at one place, many of them have the same kind of process as before the OSS creation, meaning that the services themselves did not change too much. Of course there are several efforts to enhance digitalization levels of selected services, but as the international comparison shows, Hungary has still a long road ahead compared for example to Estonia, which is considered one of the most developed EU countries regarding digital public service availability, as it developed a digital OSS for its public services during the last decade. However, we must not forget that development of digital services also requires the population to be able to access these services on a large enough scale in order to become economically viable the development itself.

The answer to the third research question (RQ-3) regarding what methods are suitable for the exploration and mapping of the structure and process of public services is as follows.

The third research question (RQ-3) serves the goal to provide the description of the methodologies, which are applied during the analysis of the selected service processes, and present how these methodologies can be connected and used in case of public services and why they are valuable in public service development.

The fourth subchapter (2.4.) of the Literature review chapter is connected to research question three (RQ-3). This subchapter provides an overview of the methods used to map, visualize and analyze the selected public services, providing details on process mapping methodologies and discrete event simulation, regarding advantages, disadvantages and applicability in public service context.

Findings of RQ-3 show how the used process mapping and simulation methods can be used together to uncover the important steps of service processes in order to find key points where development can be executed for example by the help of digitalization, building on the results and findings of research question two (RQ-2), in order to increase efficiency and effectiveness.

There is a sophisticated and extensive toolkit for designing, managing and measuring industrial processes, which is constantly expanding and striving to meet the new possibilities as a result of the almost limitless amount of data offered by the digitalizing industrial environment. Services, on the other hand, are managed under harsher conditions, both in terms of expectations and measurability, and in terms of the modeling techniques used for them.

In the second part, the thesis uses three service process mapping methodologies, Service Blueprinting, Business Process Modeling and Process-Chain Network to examine, map and visualize public service processes. These methods are commonly used in international literature and there are several examples of using them specifically in public service literature as well regarding Western European countries.

However, these methods, except the proposal of the Electronical Administrative Supervision of Hungary, which highlights the advantages of BPM and marks it as a suitable tool for potential public service development, there were not applied before in Hungary to map, visualize and analyze public service processes in order to increase efficiency and effectiveness. Hence, the thesis aims to contribute to literature by the application of these methodologies in a Hungarian context, both to reflect on the previous proposal of the Electronical Administrative Supervision of Hungary, and to provide detailed information about Hungarian public service processes, which could be used to create comparisons with other countries' public services, which bear similar purposes.

Service Blueprinting is based on the customer view and can be used to map and visualize the interactions between the service providers and service users to get a whole picture about a given service from the start to the end. Business Process Modeling categorizes activities in a way to represent organizational responsibilities and communications between participant entities (especially customer and provider), organizational departments, systems, and roles, and has a higher capability than PCN to add additional information about concepts when it is needed.

Process-Chain Network is another process visualizing method, which helps to identify and link actors of a given process in a systematic way. It has several similarities with service blueprinting but it differs from blueprinting in terms of line of visibility for example and has advantages in terms of representing the internal complexities of the processes. PCN differentiates between process steps based on their nature of interaction to understand how

the provider can reconfigure process steps across each process region and improve the performance of service processes.

The thesis also aims to contribute to literature by applying discrete event simulation in public service context to further analyze the selected public service processes and to provide additional details regarding key performance measures. According to literature, there are a few examples in the Eastern-European literature of applying discrete event simulation to public services, however this thesis is the first, which applies this approach in a Hungarian context in case of the selected, and discussed public service processes. The purpose of discrete event simulation is to analyze the behavior of a given system as it allows us to apply changes during experiments to see how the system reacts without affecting the real system. These methodologies offer insights regarding the service processes from the aspects of both the service provider and the user side. The aim of the research was to show what are the advantages regarding their most important characteristics and the method of usage of the discussed modeling methodologies. The goal of the thesis was to offer an analogy by presenting how the selected methods can be used generally to review processes whether we are speaking about an industrial, manufacturing or a public service if we use a holistical management approach.

Service visualization and mapping are very important parts of service process analysis, it helps to understand the connections between the service steps and helps to unravel aspects of key importance. The discussed methodologies help to examine service processes from different angles, allowing to study them from both the point of view of the facilitators and the customers. Once we understand a process, we can better measure its characteristics and performance, which ultimately helps to achieve better development opportunities. Simulation on the other hand can help in the analysis and in the development process as well, offering various possibilities to predict process behavior and to test different kind of development possibilities in order to find the best solution, without affecting the real process.

The answer to the fourth research question (RQ-4) regarding how can the public service performance be measured and what performance indicators could best be used to describe the quality and performance of public services is as follows.

The fourth research question (RQ-4) serves the goal to provide examples on the micro level by analyzing the selected public service processes, building on the topics of the previous

research questions and connecting the results to each other. Collected data is analyzed both in case of Government Window front office operations and Contact Affair Procedure of Guardianship Offices do measure key performance indicators identified previously.

The first (3.1.) and second (3.2.) subchapters of the Results chapter are connected to research question one (RQ-1). The first subchapter (3.1.) discusses the application of selected process mapping methodologies on Government Window front office operations, the statistical analysis of the collected data, and an example of the application of discrete event simulation based on the analyzed data by using the ProcessSim program. The processed data is not open source, it was provided by higher authorities and government window officials upon request during the KÖFOP project.

The second subchapter (3.2.) discusses the application of selected process mapping methodologies on the Contact Affair Procedure of Guardianship Offices, the statistical analysis of the collected data regarding a complex case with multiple sub-cases, and an example of the application of discrete event simulation based on the analyzed data by using the Plant Simulation program. The processed data is not open source, it was provided by higher authorities and guardianship office administrators upon request during the KÖFOP project.

Findings of RQ-4 show the application of the selected methodologies on the selected public service processes (Government Window front office operations and Contact Affair Procedure of Guardianship Offices) providing examples of how the collected data can be used to measure key performance indicators. The thesis presents results in case of simple and more complex service processes, building on the findings of both research question one (RQ-1), research question two (RQ-2) and research question three (RQ-3).

Building on the theoretical background and analytical methodologies the thesis aims to examine the front office operations of Government Windows more closely on an every-day level, create a comprehensive picture and identify key performance indicators regarding service quality and excellence based on the related literature. As part of the Hungarian administrative reforms, these service centers were established almost a decade ago and serve as the main access point between the citizens and the state ever since.

While numerous articles and books discuss the details and effectiveness of the different levels of the newly reformed Hungarian administration system, only a few of them offer an inside (statistical) look into the daily operations of a Government Windows, based on time-

related numerical data. Therefore, the thesis aims to contribute to the literature by analyzing the front office operations of Government Windows from this point of view and provide statistical details. Besides this, so far there was no detailed statistical and service process analysis in case of the contact affair procedure of Guardianship Offices, therefore the thesis also aims to contribute to the literature by analyzing this complicated public service in details.

In case of the front office operations of Government Windows the analyzed data contains the arrival times, waiting for times and processing times of citizens and their cases during the front office operations between 1st December 2016 and 31st November 2017. In case of the contact affair procedure of Guardianship Offices the data was collected in the Guardianship Office in Győr (Hungary), during the data collection process deep interviews were conducted, and administrators were asked to provide statistical information about contact affair cases.

The goal of the thesis was to identify objective key performance indicators and to demonstrate how these KPIs can be measured in a public service context nevertheless of the type and complexity of the given service. The thesis aims to contribute to the literature by applying these performance measurement indicators to public service processes, which bear different characteristics and complexity. The thesis presents how these commonly used KPIs can be measured in different conditions to provide valuable insights about these service processes, which can be used by legalisators to adjust the services in order to increase efficiency and effectiveness. The literature identifies several time performance indicators regarding business process models, which were frequently used by scholars in their research such as throughput, waiting time, process duration time and lead time.

Through Government Windows citizens can access a wide variety of public services. Amongst the more than two thousand individual services, there are four main types of public service categories, which can be clearly distinguished from the others. Services related to personal identification documents (passport renewal, ID cards, etc.), services related to social issues (social security card issuing, application for family support, etc.), services related to taxation and services related to car issues. According to the literature, the personal identification document related services are the most frequently used while the social issue related services are the second biggest group of frequently used services.

During the process of front office operations, the flow unit is the demand or transaction represented by the citizen. These transactions are automatically recorded after the service is requested at the ticket machine. However because the system is not uniform depending on the Government Window the dataset can be different in terms of details making the data extraction harder if we want to compare different service centers with each other.

From the dataset, the research identified thirty individual case categories, calculated the daily and monthly amount of records, the distribution of case categories, the average throughput per hour, and identified the most common case types. After that, by using the previously identified performance metrics, the values of key performance indicators like waiting times, processing times and lead times of each record were calculated in case of each case types.

The process of contact affair procedure has a more complex design compared to other public service types. The thesis is interested in finding new ways to examine these intricate public service processes, which were not analyzed before with process modeling approaches. By applying these methods on complex public services we are be able to capture insights based on subjective perception and weaknesses in the process can be clearly identified.

The contact affair procedure of Guardianship Offices differ from the front office operations of Government Windows several ways. The first significant difference is the repeatability of this process during a single case, which is the main reason behind the complexity of this process. An individual case starts with the first submitted application but during the process the parties can submit new applications continuously as well thus several iterations of the process can run simultaneously within a single case. The case will be only closed if there are no more submissions and the decision for the last submission was made. These characteristics can make the contact affair procedure significantly longer and more complex and the administrators have to handle multiple cases at the same time.

The other main difference is that while in case of the front office operations of Government Windows we had a large and structured dataset containing the necessary information regarding time in case of the contact affair procedure there is no structured dataset, which could be used for simple data extraction. In this case, only their case numbers and their sub-numbers can identify the individual cases. Each application submission has a time stamp but as there is no structured central dataset with the necessary details, in each case we had to as the administrators to extract and create the raw dataset by hand.

The thesis analyzed an individual case in order to extract valuable data regarding the processing times of each step in order to see how long the individual iterations of this case were. The most complex case were chosen which had a sub-number of 133. There were 22 process iterations in this case and the whole process took 249 days to end.

In case of these types of public service, the employee's experience can contribute to enhancing the service due its complex nature and the customers involved. The sensitive nature of the cases and representing the best interests of the children place a heavy burden on the administrators involved who deal with personal relationships. Each decision can fundamentally change an individual's or the whole family's life. These types of decisions require highly qualified, professional, knowledgeable administrators in a greater number on a daily basis.

We could see that contact affairs are very complex and lengthy processes. Due to legal restrictions, the administrators have 60 days to finish a process or they have to pay a fine. Partially because of this burden and because other service inefficiencies administrators are sometimes forced to exclude the involvement of outside parties from the process as waiting for their response could potentially lengthen the process beyond the deadline. Administrators generally consider this process very stressful as they have to manage multiple cases at the same time and especially because due to the dissatisfaction of the customers regarding the result they often submit applications to trigger the start of the process again, which can lead to the distortion of a family case for several months, even a year in extreme cases.

For the process analysis and simulation the research used the Plant simulation software based on a case study, selecting the most complicated example. As we could see according to the simulation model of the service process it takes longer time to finish than the allowed timeframe, which corresponds, with the collected data and experience of the Guardianship Office administrators. As we saw by analyzing the model it is clear that the time factor of the procedure is not indicated at all, furthermore, those procedural elements, which may repeat or induce further delay in the procedure are also not indicated. For example, we do not see that the different parties have to be summoned during the procedure, which may take a long time due to the complexity of posting and notification. It may increase the duration of the procedure by up to two weeks.

This situation can deeply affect the quality, efficiency and effectiveness of these processes as administrators are forced to shorten the process in some cases to save time which overall

affects customer satisfaction as well. Our research is the first which provided real proof in case of the contact affair procedure that reality defies regulations thus steps should be made to reevaluate the process regulation in details and find ways to improve efficiency and effectiveness.

The purpose of the thesis was to approach Hungarian public services from a managerial angle, focusing on service process management with the help industrial approaches, by offering a combination of practical tools for analysis of both simple and more complicated public services, in order to improve the efficiency and effectiveness of public service delivery, thus affecting customer satisfaction positively. The thesis showed how Hungarian public services can be examined comprehensively through two examples with the selected combination of analytical tools based on the international public service, and private service process management literature. The goal of the thesis is to recommend the application of these tools in public service development by presenting how these tools can be applied together to map and analyze public service processes, building on observations, interviews and available statistical data in order to identify and measure objective time-related key performance indicators. The results of the thesis can be useful for decision-makers and legalisators to evaluate service processes to gain deeper insights about the level of service quality and efficiency based on the analyzed data, using an industrial process management perspective.

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6. Appendixes

6.1. List of publications related to the dissertation

During the writing of the dissertation based on the conducted research several papers were submitted and published by the author regarding the discussed topics. The following table contains the summary of these articles.

Article	Status	Type	Methodology	Main contribution
The role of logistics management in public services	Published	Conference paper published in International Journal of Engineering and Management Sciences	Short literature review on New Public Management, Logistics and Unified Services Theory	Discusses the usefulness of a logistical approach in public service development
Improving "customer" satisfaction in public services with the help of information logistics	Published	Conference paper published in Kautz Gyula conference proceedings	Short literature review on public service and digitalization	Discusses the importance of digitalization in public service development
A szolgáltató állam szervezetének kialakulása	Published	Book chapter published in Szolgáltatás- és folyamatmenedzsment a közigazgatásban book	Literature review on the development of the current centralized Hungarian public service system	Gives an overview on Hungarian public service development goals and results regarding District offices and Government Windows
A járási gyámhivatalok fennhatósága alá tartozó Család-és Gyermekjóléti Központ működése	Published	Case study published in the case study collection of Szolgáltatás- és folyamatmenedzsment a	Case study based on interviews about the processes of Guardianship Offices and	Summarizes the legal background and main types of service processes

		közigazgatásban book	child protection services	provided by these service centers
Számítógépes, szimulációs esettanulmányok	Published	Monography which is related to the Szolgáltatás- és folyamatmenedzsment a közigazgatásban book	Description of a simulation software (ProcessSim) designed for service center process simulations with examples	Introduction of process simulation in public service environment regarding Government Window operations
The importance of digital public service development from the companies' point of view	Published	Conference paper published in Law 4.0. conference proceedings	Literature review on Hungarian and EU programs regarding the development of digital public services	Discusses the advantages of public services which are accessible not just manually but also at least partially digitally
Magyarország közszolgáltatásainak digitalizációja a DESI mutató tükrében	Accepted for publication	Article accepted for publication in an EFOP study book	Comparison of EU member countries based on the DESI indicators	Shows where is Hungary in terms of digital public service development compared to other countries in the EU
Applying new methods for analyzing public service processes	Published	Article published in Pro Publico Bono – Magyar közigazgatás	Literature review on public service theories like Public Service Dominant Logic and Co-Production. The article than analyses a complex Hungarian public service with Service	The article discusses the advantages of Co-production in public services and presents new ways to gain insights about the selected service which were

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			Blueprinting and Process-Chain Network	not used before in Hungarian context to analyze public service processes
Service Process Excellence in Public Services	Published (*Intelligent Systems in Management Best Paper Award*)	Proceedings of the ENTRENOVA - ENTerprise REsearch InNOVAtion Conference	Literature review on One-Stop-Shops, Government Windows and service quality indicators. Analysis of a selected Government Window using statistical data and Business Process Modelling.	The article uses Unified Services Theory as a background to connect public service processes with quality and efficiency indicators used in the private sector. Raw data from a selected Government Window is used to statistically analyze front-office operations, and Business Process Modelling is used to describe the service process.
Service Process Excellence in Public Services *(extended version)*	Accepted for publication	Article accepted for publication in Interdisciplinary Description of Complex Systems (INDECS)	Literature review on One-Stop-Shops, Government Windows and service	The article uses Unified Services Theory as a background to connect public service

			quality indicators. Analysis of a selected Government Window using statistical data and Business Process Modelling.	processes with quality and efficiency indicators used in the private sector. Raw data from a selected Government Window is used to statistically analyze front-office operations, and Business Process Modelling is used to describe the service process.
Servitization of public service processes with a simulation modelling approach	Published	Article accepted for publication in Engineering Management in Production and Services (EMPAS)	Literature review on Co-production, Servitization and Discrete Event simulation. Detailed analysis of a selected complex public service based on interviews using DES.	The article connects Co-production and Servitization and uses discrete event simulation (Plant simulation software) to demonstrate the discrepancies between process regulation and reality.
Analyzing Public Service Processes from Customer and Employee Perspectives by	Published	Article accepted for publication in Proceedings of the ENTRENOVA - ENTerprise	The article uses Service Blueprinting and Business Process	The article highlight how different aspects of the selected

Using Service Blueprinting and Business Process Modelling		REsearch InNOVAtion Conference	Modelling to map the selected public service process and uses an example to show the internal complexity of the service process	service could affect lead times and how satisfaction is affected by this on both the customer and provider side.
Analyzing Public Service Processes from Customer and Employee Perspectives by Using Service Blueprinting and Business Process Modelling *(extended version)*	Accepted for publication	Article accepted for publication in Journal of Theoretical and Applied Electronic Commerce Research	The article uses Service Blueprinting and Business Process Modelling to map the selected public service process and uses an example to show the internal complexity of the service process	The article highlight how different aspects of the selected service could affect lead times and how satisfaction is affected by this on both the customer and provider side.
Service modeling possibilities - process-based approach with a public service example	Published	Article published in Magyar Logisztikai Évkönyv (MLE)	The article demonstrates how queuing theory can be applied to public service processes and how Service Blueprinting, Business Process Modelling and Process-Chain Network methodologies can be used to map	The article describes the advantages of the selected methodologies, using the Government Window front operations as an example, presenting differents aspects can be used to gain additional information

			service processes.	about the customer and provider side of the service process.
Statistical analysis of public service processes for key performance indicator measurement	Published	Article published in Hungarian Statistical Review	The article uses Business Process Modelling to visualize Government Window front operations and the contact affair procedure of Guardianship Offices then uses a statistical analysis to measure key performance indicators in case of both services	The article highlights how commonly used KPIs in the public sector (waiting time, processing time, lead time) can me measured in the chosen simple and complex service processes based on the available dataset.

Source: Author's own creation

6.2. Waiting time statistics of all Government Window case types

Case types	Mean	Std. Deviation	Median	Lower quartile	Upper quartile
Vehicle affairs	0:08:27	0:11:43	0:04:15	0:01:11	0:11:10
ID card	0:08:54	0:10:22	0:05:12	0:01:50	0:12:05
Driving license	0:09:21	0:10:38	0:05:38	0:01:55	0:12:43
Certificate of address	0:11:14	0:12:13	0:07:10	0:02:31	0:15:53
ClientGate	0:04:58	0:07:08	0:01:56	0:00:26	0:06:45
Passport	0:08:15	0:12:05	0:04:49	0:01:43	0:10:48
Student ID card	0:09:33	0:10:32	0:06:10	0:02:01	0:13:09
Health insurance	0:06:07	0:08:59	0:02:26	0:00:36	0:07:56
Receipt of completed documents	0:08:26	0:11:12	0:05:32	0:02:23	0:10:34
Family support	0:06:17	0:09:06	0:02:18	0:00:38	0:00:38
Individual Proprietorship	0:05:31	0:08:05	0:01:55	0:00:42	0:06:45
Parking certificate	0:17:14	0:20:22	0:11:08	0:03:34	0:22:32
Other	0:05:07	0:07:44	0:01:57	0:00:29	0:05:58
Pension	0:07:31	0:10:14	0:03:08	0:00:51	0:10:12
Ownership certificate issues	0:07:35	0:10:30	0:04:34	0:00:59	0:10:01
Birth registration	0:05:55	0:09:40	0:01:54	0:00:30	0:07:28
Citizenship	0:06:27	0:09:34	0:02:17	0:00:40	0:07:56
Social affairs	0:05:04	0:07:37	0:01:46	0:00:33	0:05:38
Population registers	0:08:25	0:12:37	0:04:50	0:01:30	0:09:54
Construction affairs	0:07:13	0:08:41	0:02:28	0:01:03	0:11:10
Disability issues	0:03:35	0:04:41	0:01:47	0:00:19	0:05:09
Hungarian identification affairs	0:06:26	0:12:55	0:01:05	0:00:37	0:04:58
Rehabilitation and disability benefits	0:09:23	0:14:59	0:03:27	0:01:46	0:10:09
Guardianship affairs	0:04:05	0:09:08	0:00:40	0:00:23	0:04:41
Employment	0:04:26	0:07:21	0:00:52	0:00:17	0:06:38
Consumer protection	0:05:56	0:14:58	0:00:50	0:00:24	0:02:03
Inheritance, legacy procedure	0:03:24	0:07:34	0:00:39	0:00:30	0:02:08
Housing aid	0:20:23	0:41:37	0:02:54	0:00:55	0:11:30
Trade and services	0:01:01	0:00:52	0:00:44	0:00:26	0:01:25
Foreign affairs	0:11:04	0:06:16	0:13:39	0:11:05	0:14:05
MINIMUM	**0:01:01**	**0:00:52**	**0:00:39**	**0:00:17**	**0:00:38**
MAXIMUM	**0:20:23**	**0:41:37**	**0:13:39**	**0:11:05**	**0:22:32**

Source: Author's own creation

6.3. Processing time statistics of all Government Window case types

Case types	Mean	Deviation	Median	Lower quartile	Upper quartile
Vehicle affairs	0:19:28	0:21:49	0:12:23	0:05:35	0:25:12
ID card	0:17:00	0:18:47	0:12:26	0:04:02	0:21:35
Driving license	0:18:59	0:19:59	0:12:56	0:08:46	0:22:00
Certificate of address	0:16:28	0:18:49	0:11:03	0:05:14	0:20:37
ClientGate	0:06:20	0:09:36	0:03:56	0:02:52	0:05:59
Passport	0:16:13	0:17:44	0:11:38	0:04:42	0:20:28
Student ID card	0:14:04	0:17:18	0:08:46	0:05:23	0:16:26
Health insurance	0:07:22	0:07:53	0:05:48	0:03:10	0:09:05
Receipt of completed documents	0:33:44	0:36:35	0:19:08	0:07:19	0:47:08
Family support	0:10:26	0:12:21	0:07:46	0:04:56	0:04:56
Individual Proprietorship	0:10:17	0:12:39	0:06:20	0:03:02	0:12:06
Parking certificate	0:24:12	0:25:38	0:17:28	0:06:30	0:30:05
Other	0:10:19	0:16:46	0:04:47	0:01:42	0:10:50
Pension	0:12:25	0:09:12	0:10:34	0:05:40	0:16:32
Ownership certificate issues	0:12:38	0:15:24	0:09:01	0:05:14	0:14:20
Birth registration	0:09:53	0:17:19	0:05:06	0:02:50	0:10:57
Citizenship	0:17:32	0:16:06	0:11:32	0:06:36	0:24:36
Social affairs	0:11:02	0:13:17	0:07:03	0:03:39	0:11:28
Population registers	0:22:44	0:29:57	0:10:14	0:02:53	0:31:24
Construction affairs	0:17:40	0:15:44	0:13:28	0:05:25	0:28:43
Disability issues	0:15:50	0:29:58	0:02:08	0:00:50	0:15:39
Hungarian identification affairs	0:13:29	0:26:34	0:01:40	0:00:58	0:04:05
Rehabilitation and disability benefits	0:14:53	0:11:38	0:11:49	0:06:36	0:20:55
Guardianship affairs	0:16:08	0:34:03	0:06:02	0:01:39	0:10:16
Employment	0:08:16	0:10:17	0:04:58	0:03:05	0:07:23
Consumer protection	0:23:12	0:41:22	0:05:41	0:01:16	0:28:38
Inheritance, legacy procedure	0:19:55	0:43:10	0:04:30	0:02:19	0:14:47
Housing aid	0:06:59	0:07:00	0:03:30	0:01:42	0:13:50
Trade and services	0:05:43	0:08:14	0:00:55	0:00:45	0:08:08
Foreign affairs	0:06:44	0:08:30	0:03:22	0:01:31	0:06:09
MINIMUM	**0:05:43**	**0:07:00**	**0:00:55**	**0:00:45**	**0:04:05**
MAXIMUM	**0:33:44**	**0:43:10**	**0:19:08**	**0:08:46**	**0:47:08**

Source: Author's own creation

6.4. Lead time statistics of all Government Window case types

Case types	Mean	Deviation	Median	Lower quartile	Upper quartile
Vehicle affairs	0:27:55	0:24:19	0:21:10	0:11:35	0:36:05
ID card	0:25:54	0:20:39	0:20:57	0:12:31	0:33:45
Driving license	0:28:20	0:21:47	0:22:15	0:14:29	0:35:47
Certificate of address	0:27:42	0:21:13	0:22:34	0:13:53	0:35:30
ClientGate	0:11:18	0:11:59	0:07:34	0:04:25	0:13:52
Passport	0:24:28	0:20:33	0:19:26	0:11:58	0:31:28
Student ID card	0:23:37	0:19:26	0:18:19	0:11:39	0:29:41
Health insurance	0:13:29	0:11:32	0:10:31	0:06:19	0:17:11
Receipt of completed documents	0:42:10	0:37:21	0:28:29	0:15:38	0:57:10
Family support	0:16:42	0:15:14	0:13:00	0:07:27	0:07:27
Individual Proprietorship	0:15:47	0:14:53	0:11:42	0:06:36	0:19:40
Parking certificate	0:41:26	0:32:29	0:33:01	0:20:38	0:55:09
Other	0:15:27	0:18:15	0:09:42	0:04:31	0:18:30
Pension	0:19:56	0:13:16	0:17:09	0:10:36	0:27:09
Ownership certificate issues	0:20:13	0:17:38	0:15:03	0:10:39	0:24:47
Birth registration	0:15:48	0:19:42	0:09:50	0:05:34	0:18:57
Citizenship	0:24:00	0:19:38	0:16:50	0:09:28	0:33:53
Social affairs	0:16:06	0:15:52	0:11:12	0:07:05	0:22:07
Population registers	0:31:09	0:30:26	0:20:10	0:10:35	0:34:57
Construction affairs	0:24:53	0:18:40	0:18:40	0:11:55	0:31:23
Disability issues	0:19:25	0:29:29	0:07:24	0:02:25	0:19:40
Hungarian identification affairs	0:19:55	0:28:24	0:05:02	0:03:03	0:16:49
Rehabilitation and disability benefits	0:24:16	0:21:12	0:18:31	0:11:38	0:31:04
Guardianship affairs	0:20:13	0:34:10	0:09:06	0:05:02	0:14:29
Employment	0:12:43	0:12:05	0:07:29	0:04:07	0:19:16
Consumer protection	0:29:08	0:41:05	0:10:40	0:03:47	0:38:15
Inheritance, legacy procedure	0:23:19	0:42:29	0:07:59	0:04:17	0:18:16
Housing aid	0:27:22	0:38:55	0:15:05	0:06:04	0:22:00
Trade and services	0:06:44	0:08:25	0:02:31	0:01:29	0:08:57
Foreign affairs	0:17:47	0:03:32	0:17:16	0:17:01	0:20:14
MINIMUM	**0:06:44**	**0:03:32**	**0:02:31**	**0:01:29**	**0:07:27**
MAXIMUM	**0:42:10**	**0:42:29**	**0:33:01**	**0:20:38**	**0:57:10**

Source: Author's own creation

6.5. Average waiting time, processing time and lead time of all Government Window case types

Case types	Waiting time	Processing time	Lead time
Vehicle affairs	0:08:27	0:19:28	0:27:55
ID card	0:08:54	0:17:00	0:25:54
Driving license	0:09:21	0:18:59	0:28:20
Certificate of address	0:11:14	0:16:28	0:27:42
ClientGate	0:04:58	0:06:20	0:11:18
Passport	0:08:15	0:16:13	0:24:28
Student ID card	0:09:33	0:14:04	0:23:37
Health insurance	0:06:07	0:07:22	0:13:29
Receipt of completed documents	0:08:26	0:33:44	0:42:10
Family support	0:06:17	0:10:26	0:16:42
Individual Proprietorship	0:05:31	0:10:17	0:15:47
Parking certificate	0:17:14	0:24:12	0:41:26
Other	0:05:07	0:10:19	0:15:27
Pension	0:07:31	0:12:25	0:19:56
Ownership certificate issues	0:07:35	0:12:38	0:20:13
Birth registration	0:05:55	0:09:53	0:15:48
Citizenship	0:06:27	0:17:32	0:24:00
Social affairs	0:05:04	0:11:02	0:16:06
Population registers	0:08:25	0:22:44	0:31:09
Construction affairs	0:07:13	0:17:40	0:24:53
Disability issues	0:03:35	0:15:50	0:19:25
Hungarian identification affairs	0:06:26	0:13:29	0:19:55
Rehabilitation and disability benefits	0:09:23	0:14:53	0:24:16
Guardianship affairs	0:04:05	0:16:08	0:20:13
Employment	0:04:26	0:08:16	0:12:43
Consumer protection	0:05:56	0:23:12	0:29:08
Inheritance, legacy procedure	0:03:24	0:19:55	0:23:19
Housing aid	0:20:23	0:06:59	0:27:22
Trade and services	0:01:01	0:05:43	0:06:44
Foreign affairs	0:11:04	0:06:44	0:17:47

Source: Author's own creation

6.6. Starting dates of process steps during the iterations of the contact affair procedure example

Iteration	Submission of an application	Receiving and filling the application	Formal and substantive check	Making an interlocutory decree	Call for making statements, attaching evidences	Holding a negotiation, Making statements	Decision	Length in days
1.	03.09	03.10	03.10	03.10	03.10	03.30	03.30	**21**
2.	03.28	03.29	03.29	03.29	03.29	04.21	04.21	**24**
3.	03.28	03.30	03.30	03.30	03.30	04.26	04.26	**29**
4.	04.04	04.05	04.05	04.05	04.05	04.25	04.25	**21**
5.	05.02	05.03	05.03	05.03	05.03	05.11	05.22	**20**
6.	05.03	05.03	05.03	05.03	05.03	06.01	06.08	**36**
7.	05.19	05.22	05.22	05.22	05.22	06.19	06.20	**32**
8.	06.08	06.08	06.08	06.08	06.08	06.30	06.30	**22**
9.	06.08	06.13	06.13	06.13	06.13	06.30	06.30	**22**
10.	06.12	06.13	06.13	06.13	06.13	07.06	07.07	**25**
11.	06.12	06.13	06.13	06.13	06.13	06.28	06.30	**18**
12.	06.30	07.03	07.03	07.03	07.03	07.25	07.25	**25**
13.	07.27	07.27	07.27	07.27	07.27	07.27	07.27	**0**
14.	08.02	08.02	08.02	08.02	08.02	09.01	09.01	**30**
15.	08.07	08.08	08.08	08.08	08.08	08.17	08.17	**10**
16.	08.14	08.15	08.15	08.15	08.15	08.17	10.04	**51**
17.	08.16	08.17	08.17	08.17	08.17	08.17	10.04	**49**
18.	08.30	09.05	09.05	09.05	09.05	10.03	10.16	**47**
19.	08.31	09.01	09.01	09.01	09.01	09.15	09.16	**16**
20.	09.05	09.06	09.06	09.06	09.06	10.16	10.16	**41**
21.	09.05	09.06	09.06	09.06	09.06	10.16	10.16	**41**
22.	09.27	09.29	09.30	09.30	09.30	10.30	11.13	**47**

Source: Author's own creation

6.7. Legal Background of the Contact Affair Procedure

The term "contact" in this case refers to the regulation of the relationship between a parent and child. The supervision and regulation of these procedures is within the competence of the Guardianship Offices of the given city (Government Decree 331/2006. (XII. 23.)). The procedure is regulated by the following legislations:

- Act CXL of 2004 on the General Rules of Administrative Procedure and Services
- Act XXXI of 1997 on the Protection of Children and Guardianship
- Act IV of 1952 on Marriage, Family and Guardianship
- Act IV of 1959 on the Civil Code
- Government Decree 149/1997 (IX.10.) on guardianship authorities and child protection and guardianship proceedings

Primarily it is the Guardianship Office where employees know much about patchwork families. The workers of Guardianship Offices every day face with such cases the subjects of which are members of patchwork families. The cases typically affecting patchwork families too are the followings:

1. cases related to the advancement of alimony by the state,
2. contact affairs,
3. open adoption matters.

In the literature review of the research we see it important to highlight the law-based regulation of the conduct of business of the analysed contact affairs as well as the directions related to the conduction of the conducts of business. According to the 9 § of the 331/2006. (XII.23.) Governmental Decree on the roles and responsibilities in child protection and guardianship affairs and on the authority and jurisdiction of Guardianship Offices, the county government's district office acting on child protection and guardianship affairs (henceforth Guardianship Office):

a) decides about the communications between the child and the parent, or other person in charge of contact, orders monitored contact in justified cases, and in contact affairs also orders the mandatory child protection mediation procedure or the use of mandatory supported procedure,

b) disposes of the enforcement of the court's or the Guardianship Office's regulation on communications.

In case of the Guardianship Office and within this in case of the cases of communications the following laws are normative and determine the conduct of business:

a) The 4:178 § - 4:185 § provisions of Chapter XVIII on exercising parental supervision of the Fourth Book (Family Law) of Act V of 2013 on the Civil Code pertain to communications.

b) Article 4 (27§-33/B§) of 149/1997. (IX. 10.) Governmental Decree on the Guardianship Offices and on the proceedings of child protection and guardianship cases deals with contact affairs.

c) Act CL of 2016 on general administrative order which entered into force in 1 January 2018 disposes of the rights and obligations of the clients, of the general administrative deadline and of the rules of conducting administrative procedure. Act XXXI of 1997 on child protection and on guardianship administration disposes of the rights and obligations of the child and the parent, and on the main rules of child protection and guardianship administration.

d) We consider the above acts and the Chapter XVI of the 2nd volume of Polgári jog kommentár [Commentary on civil law] edited by Dr. Ferenc Petrik as "literature".

County government office judges the requests for legal remedy handed in against the decisions of the official procedure of the first instance, the office also states its own professional case regarding unique decisions, and according to a determined plan, they execute the control of the authority of the first instance and the target examination of each field, and doing so it has a supervision over the authorities of the first instance. The law ensures 60 days for the administrator.

Relationship issues are issues that arise after the divorce of parents or the termination of cohabitation. Usually a parent stays with the child (children) and lives his or her daily life there. It is up to the court to decide. A parent with whom the child (children) does not live in a household is entitled to maintain contact with the child (children). The manner, form and regularity of contacts are also regulated by the court, but Guardianship Offices are also entitled to make such decisions or to regulate contacts (Boér, 2000). The issue of contact has become important nowadays due to the emergence of new types of family models and the increase in divorces. Half of the marriages end in divorce, but children and parents has the right to meet with each other and keep in touch. The parent living with the child is required to ensure smooth communication. According to Act V of 2013:

(1) The child shall have the right to have personal and direct contact with his / her separated parent. The parent or other person who is taking care of the child is required to maintain a smooth relationship.

(2) A parent who lives separately from his or her child shall be entitled and obliged to maintain contact with his or her child, unless otherwise provided by the court or guardian.

(3) A parent shall have the right to maintain contact with his or her child even if parental responsibility is interrupted, unless he or she is the subject of a decision rendering a stay void by reason of an act adversely affecting the child or a relative in the same household as the child.

(4) In duly justified cases, in the interests of the child, the parent may also be authorized to maintain contact with the child,

   a) whose parental responsibility has been terminated by a court;
   b) who has consented to the adoption of the child by the spouse of the other parent; or
   c) whose custody has been terminated because he or she without disclosing his or her identity consented to the adoption of the child by an unknown person by leaving the child in a designated place, medical facility, does not apply for the child within six weeks and the child has not been adopted.

(5) In the case referred to in subsection (4), the court or - if the child is protected by the guardianship authority – the Guardianship Office shall decide whether or not the parent is authorized to maintain contact with the child.

This right is regulated by Paragraph 4:178 of the Civil Code (2013) and is in sync with Article 9(3. paragraph) of the Convention on the Rights of the Child, which is also regulates the right of the child to maintain contact with a parent who is separated from him/her (Filó, Katonáné Pehr, 2015).

In some cases, it is not the parent but other affected clients that requests to control the relationship:

In practice, it is usually the case that in addition to the request for the initiation of the process other clients (other than the one who initiated the process) also submit a request to establish his or her rights. This is the case, for example, with the guardianship procedure for re-regulating the contact terms of a single parent where the parent raising the child requests that the contact right of the separated parent become restricted and the separated parent requests to be allowed to take the child abroad (Boros, 2016; Boros, Darák, 2018)

The latter statement is also clearly covered by Act CL of 2016 on the General Administrative Order, even though it is no longer a means of initiating the main proceedings. The two requests are dealt with in a single proceeding: the re-regulation of contacts. (Boros et al., 2018)

6.8. List of DESI Dimensions and Sub-dimensions

DESI Overall Index	
Digital Economy and Society Index	Notation: desi
	Definition: DESI overall index, calculated as the weighted average of the five main DESI dimensions: 1 Connectivity (25%), 2 Human Capital (25%), 3 Use of Internet (15%), 4 Integration of Digital Technology (20%) and 5 Digital Public Services (15%)

DESI Dimensions	
1 Connectivity	Notation: desi_1_conn
	Definition: DESI Connectivity Dimension calculated as the weighted average of the five sub-dimensions: 1a Fixed Broadband take-up (25%), 1b Fixed broadband coverage (25%), 1c Mobile broadband (35%) and 1d Broadband price index (15%)
2 Human Capital	Notation: desi_2_hc
	Definition: DESI Human Capital Dimension calculated as the weighted average of the two sub-dimensions: 2a Internet User Skills (50%) and 2b Advanced Skills and Development (50%)
3 Use of Internet Services	Notation: desi_3_ui
	Definition: DESI Use of Internet Dimension calculated as the weighted average of the three sub-dimensions: 3a Internet Use (25%), 3b Activities Online (50%), 3c Transactions (25%)
4 Integration of Digital Technology	Notation: desi_4_idt
	Definition: DESI Integration of Digital Technology Dimension calculated as the weighted average of the two sub-dimensions: 4a Business digitisation (60%) and 4b e-Commerce (40%)
5 Digital Public Services	Notation: desi_5_dps
	Definition: DESI Digital Public Services Dimension calculated by taking the score for 5a e-Government

DESI Sub-dimensions	
1a Fixed broadband take-up	Notation: desi_1a_fbbtc
	Definition: DESI Fixed Broadband take-up sub-dimension calculated as the weighted average of the normalised indicators: 1a1 Overall fixed broadband take-up (50%), 1a2 At least 100 Mbps fixed broadband take-up (50%)
1b Fixed broadband coverage	Notation: desi_1b_fbbc
	Definition: DESI Fixed Broadband coverage sub-dimension calculated as the weighted average of the normalised indicators: 1b1 Fast broadband (NGA) coverage (50%), Fixed Very High Capacity Network (VHCN) coverage (50%)
1c Mobile broadband	Notation: desi_1c_mbb

	Definition: DESI Mobile Broadband sub-dimension calculated as the weighted average of the normalised indicators: 1c1 4G coverage (25%), 1c2 Mobile broadband take-up (25%) and 1c3 5G readiness (50%)
1d Broadband price index	Notation: desi_1d_bbpi
	Definition: DESI Broadband price index sub-dimension calculated as the weighted average of the normalised indicator: 1d1 Broadband Price Index (100%)
2a Internet User Skills	Notation: desi_2a_bsu
	Definition: DESI Internet User Skills sub-dimension calculated as the weighted average of the normalised indicators: 2a1 At least Basic Digital Skills (33%), 2a2 Above basic digital skillst (33%) and 2a3 At least basic software skills (33%)
2b Advanced Skills and Development	Notation: desi_2b_asd
	Definition: DESI Advanced Skills and Development sub-dimension calculated as the weighted average of the normalised indicators: 2b1 ICT Specialists (33%), 2b2 Female ICT specialists (33%) and 2b3 ICT graduates (33%)
3a Internet use	Notation: desi_3a_ui
	Definition: DESI Internet Use sub-dimension calculated as the weighted average of the normalised indicators: 3a1 People who never used the internet (50%) and 3a2 Internet Users (50%)
3b Activities online	Notation: desi_3b_acton
	Definition: DESI Activities Online sub-dimension calculated as the weighted average of the normalised indicators: 3b1 News (16.6%), 3b2 Music, Videos and Games (16.6%), 3b3 Video on Demand (16.6%), 3b4 Video Calls (16.6%), 3b5 Social Networks (16.6%), and 3b6 Doing an online course (16.6%)
3c Transactions	Notation: desi_3c_trans
	Definition: DESI Transactions sub-dimension calculated as the weighted average of the normalised indicators: 3c1 Banking (33%), 3c2 Shopping (33%) and 3c3 Selling online (33%)
4a Business digitisation	Notation: desi_4a_bd
	Definition: DESI Business Digitisation sub-dimension calculated as the weighted average of the normalised indicators: 4a1 Electronic Information Sharing (16.7%), 4a2 Social media (16.7%), 4a3 Big data (33.3%) and 4a4 Cloud (33.3%)
4b e-Commerce	Notation: desi_4b_ecomm
	Definition: DESI e-Commerce sub-dimension calculated as the weighted average of the normalised indicators: 4b1 SMEs Selling Online (33%), 4b2 e-Commerce Turnover (33%), 4b3 Selling Online Cross-border (33%)
5a e-Government	Notation: desi_5a_egov
	Definition: DESI e-Government sub-dimension calculated as the weighted average of the normalised indicators: 5a1 e-Government Users (20%), 5a2 Pre-filled Forms (20%), 5a3 Online Service Completion (20%), 5a4 Digital public services for businesses (20%) and 5a5 Open Data (20%)
DESI Individual Indicators	
	Notation: desi_1a1_fbbtc

1a1 Overall fixed BB take-up	Definition: Percentage of households subscribing to fixed broadband
1a2 At least 100 Mbps fixed BB take-up	Notation: desi_1a2_ufbbtu
	Definition: Percentage of households subscribing to fixed broadband of at least 100 Mbps, calculated as overall fixed broadband take-up
1b1 Fast BB (NGA) coverage	Notation: desi_1b1_fbbc
	Definition: Percentage of households covered by fixed broadband of at least 30 Mbps download. The technologies considered are FTTH, FTTB, Cable Docsis 3.0 and VDS
1b2 Fixed Very High Capacity Network (VHCN) coverage	Notation: desi_1b2_vhcnc
	Definition: Percentage of households covered by any fixed VHCN. The technologies considered are FTTH and FTTB for 2015-2018 and FTTH, FTTB and Cable Docsis 3.1 for 201
1c1 4G coverage	Notation: desi_1c1_4g
	Definition: Percentage of populated areas with coverage by 4G - measured as the average coverage of telecom operators in each country
1c2 Mobile BB take-up	Notation: desi_1c2_mbbtu
	Definition: Number of mobile data subscriptions per 100 people
1c3 5G readiness	Notation: desi_1c3_5g
	Definition: The amount of spectrum assigned and ready for 5G use by the end of 2020 within the so-called 5G pioneer bands. These bands are 700 MHz (703-733 MHz and 758-788 MHz), 3.6 GHz (3400-3800 MHz) and 26 GHz (1000 MHz within 24250-27500 MHz). All three spectrum bands have an equal weight
1d1 Broadband price index	Notation: desi_1d1_bbpi
	Definition: The broadband price index measures the prices of representative baskets of fixed, mobile and converged broadband offers
2a1 At least Basic Digital Skills	Notation: desi_2a1_bds
	Definition: People with "basic" or "above basic" digital skills in each of the following four dimensions: information, communication, problem solving and software for content creation (as measured by the number of activities carried out during the previous 3 months)
2a2 Above basic digital skills	Notation: desi_2a2_abds
	Definition: People with "above basic" digital skills in each of the following four dimensions: information, communication, problem solving and software for content creation (as measured by the number of activities carried out during the previous 3 months)
2a3 At least basic software skills	Notation: desi_2a3_abss
	Definition: People who, in addition to having used basic software features such as word processing, have used advanced spreadsheet functions, created a presentation or document integrating text, pictures and tables or charts, or written code in a programming language
2b1 ICT Specialists	Notation: desi_2b1_ictspec
	Definition: Employed ICT specialists. Broad definition based on the ISCO-08 classification and including jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers
	Notation: desi_2b2_fictspec

2b2 Female ICT specialists	Definition: Employed ICT specialists. Broad definition based on the ISCO-08 classification and including jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers
2b3 ICT graduates	Notation: desi_2b3_ictg
	Definition: People with a degree in ICT
3a1 People who never used the internet	Notation: desi_3a1_notiu
	Definition: People who never used the Internet
3a2 Internet Users	Notation: desi_3a2_iu
	Definition: People who use the Internet at least once a week
3b1 News	Notation: desi_3b1_news
	Definition: People who used the internet to read online news sites, newspapers or news magazines
3b2 Music, Videos and Games	Notation: desi_3b2_mvg
	Definition: People who used the internet to play or download games, images, films or music
3b3 Video on Demand	Notation: desi_3b3_vod
	Definition: People who used the internet to use Video on Demand services
3b4 Video Calls	Notation: desi_3b4_vidcall
	Definition: People who used the internet to make telephone or video calls (e.g. Skype)
3b5 Social Networks	Notation: desi_3b5_socnet
	Definition: People who used the internet to participate in social networks (create user profile, post messages or other contributions)
3b6 Doing an online course	Notation: desi_3b6_courseon
	Definition: People who have used the Internet for doing an online course (on any subject)
	Time coverage: 2015 - 2020
3c1 Banking	Notation: desi_3c1_bank
	Definition: People who used the Internet to use online banking
3c2 Shopping	Notation: desi_3c2_shop
	Definition: People who ordered goods or services online
3c3 Selling online	Notation: desi_3c3_sell
	Definition: People who sold goods or services online
4a1 Electronic Information Sharing	Notation: desi_4a1_eis
	Definition: Businesses who have in use an ERP (enterprise resource planning) software package, to share information between different functional areas (e.g. accounting, planning, production, marketing)
4a2 Social media	Notation: desi_4a2_socmed
	Definition: Businesses using two or more of the following social media: social networks, enterprise's blog or microblog, multimedia content sharing websites, wiki based knowledge sharing tools. Using social media means that the enterprise have a user profile, an account or a user license depending on the requirements and the type of the social media
4a3 Big data	Notation: desi_4a3_bigdat
	Definition: Enterprises analysing big data from any data source
4a4 Cloud	Notation: desi_4a4_cloud

	Definition: Businesses purchasing at least one of the following cloud computing services: hosting of the enterprise's database, accounting software applications, CRM software, computing power
4b1 SMEs selling online	Notation: desi_4b1_smeso
	Definition: SMEs selling online (at least 1% of turnover)
4b2 e-Commerce turnover	Notation: desi_4b2_ecomturn
	Definition: SMEs total turnover from e-commerce
4b3 Selling online cross-border	Notation: desi_4b3_sellcb
	Definition: SMEs that carried out electronic sales to other EU countries
5a1 e-Government Users	Notation: desi_5a1_egovu
	Definition: People who sent filled forms to public authorities, over the internet, previous 12 months
5a2 Pre-filled Forms	Notation: desi_5a2_prefform
	Definition: Amount of data that is pre-filled in public services' online forms
5a3 Online Service Completion	Notation: desi_5a3_osercomp
	Definition: The share of administrative steps related to major life events (birth of a child, new residence, etc) that can be done online
5a4 Digital public services for businesses	Notation: desi_5a4_psb
	Definition: The indicator broadly reflects the share of public services needed for starting a business and for conducting regular business operations that are available online for domestics as well as for foreign users. Services provided through a portal receive an higher score, services which provide only information (but have to be completed offline) receive a more limited score
5a5 Open Data	Notation: desi_5a5_opendata
	Definition: This composite indicator measures to what extent countries have an Open Data policy in place (including the transposition of the revised PSI Directive), the estimated political, social and economic impact of Open Data and the characteristics (functionalities, data availability and usage) of the national data portal