Towards a new transformation of e-payments paradigm: a case study on Moldovan public services

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Abstract

E-payment paradigm in the context of fighting corruption and increasing transparency at the public-sector authority’s level is becoming more important than ever especially for Eastern Europe. The present research will address how an electronic payment system is affecting the diffusion of innovation among online public services, settling the challenges at the government level, providing solutions for diminishing the money laundering in the country and all other associated problems.

Diffusion of innovations theory had been investigated by many scholars in different industries and countries. The research implication is to generate general knowledge by fulfilling the literature gap related to electronic payment systems in the public sector and diffusion of innovations. The research aim is to provide (1) an extensive literature review to gain familiarity principally on the diffusion of innovation theory, secondary on government electronic payment systems and cashless societies; (2) collect, explore and analyze empirical evidence related to the perceived attributes of diffusion of innovations theory and the rate of adoption of e-payment system designed for public services from the perspective of consumers, public service providers, and payment operators; (3) answer the research questions by the aid of the diffusion of innovation theory, and measure the rates of adoption of public e-payment systems by using an case study approach, the researchers analyzed the case of Moldova and the Governmental Payment Gateway MPay, one of the initiatives launched by the Public Institution e-Government Center.
The interpretivism research paradigm was adopted for the research, and an exploratory case study methodology is implemented to gain insights, familiarity with the subject, and acquire more knowledge in the concepts and theoretical frameworks that are related to the research problem and question.

Key-words

Perceived attributes of innovation, the rate of adoption, e-payments, governmental payment gateway, diffusion of innovations, Moldova
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## Glossary of Terms and Abbreviations

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<th>Abbr.</th>
<th>Description</th>
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<tbody>
<tr>
<td>3G</td>
<td>Third generation of mobile telecommunications technology</td>
</tr>
<tr>
<td>ADSL</td>
<td>Asymmetric Digital Subscriber Line</td>
</tr>
<tr>
<td>API</td>
<td>Application program interface</td>
</tr>
<tr>
<td>CPA</td>
<td>Central Public Authority</td>
</tr>
<tr>
<td>EGC</td>
<td>Electronic Government Center</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GeT</td>
<td>Governance e-Transformation</td>
</tr>
<tr>
<td>HBR</td>
<td>Harvard Business Review</td>
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<tr>
<td>ICT</td>
<td>Information Communication Technologies</td>
</tr>
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<td>IT</td>
<td>Information Technologies</td>
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<tr>
<td>KTH</td>
<td>Royal Institute of Technology</td>
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<tr>
<td>MConnect</td>
<td>Moldova Government Interoperability Platform</td>
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<tr>
<td>MDL</td>
<td>Moldovan Leu, Moldovan National Currency</td>
</tr>
<tr>
<td>MoI</td>
<td>Ministry of Interior</td>
</tr>
<tr>
<td>MPay</td>
<td>Moldova Governmental e-Payment Gateway</td>
</tr>
<tr>
<td>TAM</td>
<td>Technology Acceptance Model</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>USD</td>
<td>US Dollar, US National Currency</td>
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Chapter 1

1 Introduction

1.1 Background

The topic of fighting corruption and increasing transparency at the public-sector authority’s level is becoming more important than ever and very actual especially for Eastern Europe. The importance of government payments as part of the transparency programs have been much discussed in recent years. Until now, few analyses are developed specifically to country cases of efficient adoption of electronic payments designed for the public services as part of the government modernization agendas. Public sector innovation is a multi-dimensional effort, and technology plays a crucial role in the generation and dissemination of innovation in the government. The internet and other digital technologies have proved to be powerful enablers of innovation, changing the way governments innovate and interact with citizens. Governments should harness the power of digital technologies to adapt and respond efficiently and effectively to challenges and demands coming from citizens. E-government tools play a key role in reshaping the way governments engage with the people, deliver better and more personalized services, embed new ideas and behaviors such as collaboration, citizen-centered, co-creation in the “genetics” of the public administration. Governments are to embrace change and not fear it, to stay relevant to people they serve.

The research topic is related to the learning content of Industrial Dynamics field and the Master Programme of Entrepreneurship and Innovation. Though the focus is on technology change and innovation processes in areas of technology, especially information communication technologies (ICT) and e-transformation having as a framework Rogers diffusion of innovation theory. The research will address the problem of how an electronic payment system (launched within Moldova Governance e-Transformation agenda, 2010-2016) is affecting the diffusion of innovation among e-transformation of the public services, settling the challenges at the government level, providing solutions for diminishing the money laundering in the country and all other associated problems, and the benefits for the parties involved. Understanding these payment system aspects is crucial to understanding and ensuring safe and efficient government payments that could improve revenue generating activities.

The improvements in government payment programs can have a great impact on the economy and for the gross domestic product (GDP), covering important economic sectors. According to the World Bank (2012, p.1) “Governments make payments to and collect payments from individuals and businesses, financial resources being also transferred between the various government agencies”. Thus, payment programs become an effective tool for the promotion of public policy objectives, financial inclusion, and modernization of the national payments system, consequently leading to higher levels of efficiency, safety, and transparency.

A case study of the Public Institution Moldova e-Government Center (EGC), a non-profit organization pursuing public benefit (EGC, 2017a), is brought into attention. The Center is the owner of the Governmental Online Payment Gateway (MPay®) platform (EGC, 2017c) and its role in the current initiative is to promote and constantly encourage the citizens of Moldova, together with the Public Service Providers and Association of Banks from Moldova, to go cashless.
and decrease the dependence on cash transactions and adopt the use of electronic payments for the public services. According to the World Bank (2010) “Moldova was the first country to join the World Bank’s e-Transformation Initiative, which was launched in April 2010 as a major new initiative to use the transformative power of Information and Communication Technologies (ICT) to enhance developing countries’ delivery of government services”. As part of the Strategic Program for Governance Technological Modernization (e-Transformation), Moldova has registered significant results by creating a convenient electronic payment system (EGC, 2011). This allowed more citizens of the country to benefit from it, making the relative advantage of the innovation more visible. Thus, on September 17 of 2013, the Government of Moldova through the E-Government Center in close cooperation with the Ministry of Finance and the Central Bank of Moldova launched MPay (NOVATECA, 2013).

MPay could be treated as an innovation and "performance-enhancing product" (Tidd, 2013), that repositioned the perception about the Moldova Government, payments for the public services and association with corruptive practices in the public sector. The transition from a cash payment system to an electronic payment system at the governmental level is already representing a big leap for the Moldovan public sector as e-payments methods have a competitive advantage compared to the traditional payment systems. Because the latter is using lots of cash simply to settle financial transactions through the transfer of monetary value, involving different payment instruments of financial institutions, rules, and procedures, people, and technologies that make such an exchange possible, its “substitution” was a prerequisite at the government level to decrease corruptive practices. MPay, the online payment instrument, was developed and expanded among all central public authorities (CPAs), as a service embedded in government portals that allows citizens and businesses to authorize payments for public services such as taxes, police fines, medical insurance, criminal records, business licenses and visas to enter the country (EGC, 2013c). Comparing to the traditional payment methods, MPay also offers additional benefits to public service providers (public authorities) and citizens by providing them the freedom and convenience to choose any payment method available in the country legally (credit/debit cards, internet banking, e-wallet or with cash) without charging any additional fees.

According to the monthly statistics collected EGC (2017b) and barometers prepared by EGC (2016a) there are currently 14 payment providers integrated with MPay, out of which 9 financial institutions, the Moldovan Post Office, Cash-in terminals and e-Wallet providers. Since its launch the number of payments made through MPay reached nearly 4.8 million transactions, estimated at over MDL 2.6 billion (as of 31.05.2017), giving some insights into the fast growth of adopters among the system (EGC, 2013b). This is a significant increase for a new payment instrument in a country with a relatively small number of transactions and only 1,566,686 cardholders (National Bank of Moldova, 2017).

MPay has led to a decrease of tax evasion, and consequently encouragement of more cashless transactions. Although the service was conceived initially for public services payments, in 2015 the Government identified a strong potential in the private sector (EGC, 2016d). Now, the service is available to private companies as well as to the public, for services such as utility and e-commerce payments.
Moody’s Analytics (2015, p.15) states that "a sustainable payment system is not just about technology, but about driving incentives for others to participate in it and derive value from doing so. Encouraging the growth of e-payments gives consumers and merchants a choice and increases competition. When countries allow for competition and a level playing field, banks and consumers benefit ". While referring to EGC and its platforms, several sustainability dimensions could be assessed, but three were selected as most relevant for the current analysis: ownership by Government, financial sustainability, and institutional sustainability. The ownership by Government envisions the following main directions: definition of mission and role of EGC in the future years within the e-Transformation agenda; clarification of legal statute of EGC within the perspective of World Bank phase-out; the institutional architecture of the Governance e-Transformation and priority setting and on-going adjustment to community needs. The financial sustainability has the focus on the sufficiency of funding parameters; the amount of self-financing; reliability of funds and resilience to issues in obtaining financing. Finally, the institutional sustainability dimension focuses on structures and appropriate processes to maintain EGC agility and functions post-implementation, on two layers: external (ownership by government and relationships with other relevant stakeholders) and internal (agile organizational structure adapted to strategic objectives, relevant capabilities, optimal headcount, etc.) (EGC, 2015a).

1.2 Research problem

In the digital “era” the use of electronic and mobile payments methods tend to have a competitive advantage compared to the traditional payment systems all over the world (Accenture, 2015). However, the preference for the traditional methods is still actual for lots of developing countries or countries in transition, such as Moldova. The main Moldovan cardholder users, prefer to withdraw money from bank terminals or banks and go through traditional ways when certain payments should be processed, rather than go cashless (National Bank of Moldova, 2017).

The transition to a cashless society and paying for the public services online, via on-mobile tools and payment methods was a prerequisite and an immediate step undertaken by the Government of Moldova in 2013 to decrease financial corruptive practices. Before introducing the MPay service, there was no consistent or unified way to pay for public services. In most of the cases, the public service provider decided upon the acceptable payment mechanisms, departing from its technical, financial and organizational capacity (EGC, 2016d). Nevertheless, many of the public service providers selected the same payment providers every year, bypassing any competition policies thus promoting corruptive practices. Obviously, this inconsistency created a discomfort for citizens and affected the development of the country in general.

After the preliminary topic of the research was determined, a literature review related to the preliminary topic was performed to identify the research problem. As stated by Collis and Hussey (2014) “In academic research, the classic way to identify a research problem is to consider the literature and identify any gaps, as these indicate original areas to research”. There has been a vast variety of researches on the diffusion of innovation of mobile payments or e-payment systems, but less on governmental electronic payments as part of the existing or innovative government payment agendas. Analysis of this gap will be conducted in the current research to address the problem of how a governmental electronic payment system affects the diffusion of innovation and e-transformation of the public services from the perspective of consumers, public service providers, and payment operators.
Besides this, for the purposes of this analysis and understanding the research problem, the case study of the Public Institution Moldova e-Government Center - the leading institution and the owner of the e-payment gateway, but also the driver of the governmental e-payment system – will be brought to attention. The benefits of a governmental payment gateway as an efficient and transparent tool for the management of public financial resources, the parties involved and the advantages for citizens, businesses and public institutions will be also considered.

1.3 Research questions

After the research problem is defined and the research purpose is determined, the main research questions are identified. The aim of the research questions is to provide direction and let the researchers explore and acquire knowledge in specific areas. Also, to fulfil the literature gap related to the diffusion of innovation and e-payment systems at a governmental level of perceived attributes of innovation and the rate of adoption among consumers, public and payment services providers.

According to Rogers (1983), many diffusion scholars addressed questions to compare how early adopters differ from later adopters and explore the perceived attributes of innovation and the s-curve to analyze the rate of adoption. Rogers research questions suggestions will be used as a starting point; however, the research questions will be tailored to get more familiar with the perception of diffusion of innovation specifically on public electronic payment systems among consumers, public and payment services providers (as main actors of MPay service in Moldova).

For that purpose, the following research questions are adopted for the research:

1. How do citizens, public and payment services providers perceive e-transformation of governance and the electronic public services?
2. How can the Moldovan public e-payment system rate of adoption be measured with the diffusion of innovation s-curve among consumers, public and payment services providers?

1.4 Research purpose

According to Collis and Hussey (2014, p.2) “The general purpose of academic research is to investigate a research question with a view to generating knowledge”. In that terms the general purpose of the research is to address the gaps in the literature and search for concepts and theoretical frameworks that will help us explore, analyze and understand different aspects of the transformation from cash payments to e-payment systems designed specifically for the public sector or CPAs, including the perceived attributes of innovation stated by Rogers (1983) relative advantage, compatibility, complexity, trialability, observability and the rate of adoption among consumers, public and payment services providers. The unit of analysis of the research is the online public services of the Moldovan Government and the implemented MPay service. Moldova is chosen for reasons explained in the introduction chapter - “the first country to join the World Bank’s e-Transformation Initiative as a major new initiative to use the transformative power of ICT to enhance developing countries’ delivery of government services.” (World Bank, 2010).
For this aim, an extensive literature review will be performed considering different sources of information. However, due to the time constraints, the focus will be only on the most important sources and aspects in order not to exceed the scope of the current research.

The type of research to be applied and classified according to its purpose is exploratory research, where the focus is on gaining insights and familiarity with the subject. Empirical evidence will be applied for more rigorous investigation (Collis and Hussey, 2014). This type of research is preferred when the time is the principal constraint of the research. An exploratory case study methodology will be implemented for the development of the research.

1.5 Research delimitation

The research scope of the current analysis is going to be delimited by several aspects: the e-payments for public services, Moldova case study (MPay) among two perspectives (consumers and services providers; and finally, the research will focus on the analysis of the innovation variable of the diffusion of innovation theory. Consumers are defined as citizens or organizations, end-users or direct consumers of the MPay service through which they can pay off public services with any payment instrument of their choice, such as credit card, internet banking or cash (EGC, 2017c). Service providers are composed by (a) Public services providers are the state organization, responsible for providing public services, direct or indirect determination of the tariffs policy for public services and calculation of the price for the public service, invoicing the user; (b) Payment services provider (payments operator) – commercial organizations (usually banks) which are responsible for receiving payments for published invoices by using own networks and infrastructure, daily/monthly transfer of financial means to the accounts of service providers (EGC, 2016d).

1.6 Research scope

Before describing the research scope, it is important to mention that in the thesis the words governmental electronic payments, public e-payment system, governmental payment service, governmental online payment gateway, MPay, MPay service and Moldova e-payment platform are used interchangeably and have the same meaning.

The research scope is divided into four main areas, that are related to the literature gap, empirical evidence, research questions and adoption of the innovation which are limited to Moldova governmental e-payment platform (MPay) implemented under Governance e-Transformation initiative in Moldova heavily using ICT to enhance the delivery of government services.

In terms of the literature gap, the scope is to contribute to the knowledge body by fulfilling the literature gap identified between electronic payments at the governmental level and diffusion of innovations, having as a unit of analysis the Republic of Moldova. For this purpose, the researchers will analyze the literature to gain familiarity principally on the diffusion of innovation theory, secondary on government electronic payment systems and cashless societies.
The empirical evidence section has the purpose to collect, explore and analyze empirical evidence related to the perceived attributes of diffusion of innovations theory and the rate of adoption of e-payment system designed for public services from the perspective of consumers, public service providers, and payment services providers. Under the current research, the researchers will refer to empirical evidence that is going to be qualitative (based on the documentation that is analyzed and qualitative information) and quantitative.

A list of activities that will aid this process is detailed below: (1) Identify the citizens level of usage of internet; (2) Identify the citizens level of knowledge of the e-Governance concept; (3) Identify the citizens level of satisfaction with the quality of the service, and the advantages it provides; (4) identify and analyze the perceived attributes of diffusion of innovations theory from the perspective of consumers, public service providers and payment services providers; (5) identify and analyze the rate of adoption of e-payment systems designed for public services considering the perspective of consumers, public service providers, and payment services providers.

The researchers will answer the research questions by the aid of the diffusion of innovation theory, rate of adoption of public e-payment system and empirical evidence collected to determine (a) how do citizens, public and private services providers perceive e-transformation of governance and the electronic public service; and determine (b) how can the Moldovan public e-payment system rate of adoption be measured with the diffusion of innovation s-curve among consumers, public and payment services providers.

For the adoption of an innovation, the researchers will develop an s-curve graph of the rate of adoption of the public e-payment system MPay and discuss the adoption stage of MPay among consumers, public and payment services, providers.

1.7 Research structure

This thesis consists of five chapters. The introduction is the first chapter of the thesis, in which is described the thesis background, as well as the research problem and the research questions. This chapter also comprises an analysis of the purpose and the scope of the thesis.

In chapter two a literature review is undertaken to understand the main concepts and theories such as diffusion, diffusion of innovation theory, perceived attributes of innovations, the rate of adoption, electronic payment systems, and cashless societies. The chapter also reviews the methodologies and theories of previous studies related to diffusion of innovations in payment systems.

Chapter three provides a description of the methodology that will be used and applied throughout the research and provides the research paradigm. Different approaches to qualitative research, case study, and analysis are discussed, culminating in defining the approaches believed to be the best fit for purposes of the research, along with a general analysis of their reliability and validity, and finally, the methodology limitations are defined.
In Chapter four the focus is on main findings and analysis including the empirical findings related to the perceived attributes of diffusion of innovations theory (relative advantage, compatibility, complexity, trialability, and observability) and the rate of adoption of e-payment system from the consumers and public services providers and payment operator’s perspectives.

The fifth Chapter represents the conclusion made under the current research, and finally, the sixth Chapter provides future research suggestions.
Chapter 2

2 Literature review

To gain understanding of what diffusion of innovation and rate of adoption is this chapter is divided into two sections, the first section will provide principally a literature review of diffusion, diffusion of innovation theory, perceived attributes of innovations (including relative advantage, compatibility, complexity, trialability and observability) and rate of adoption, and secondary the concepts of governmental electronic payments, and cashless society will be described. The second section presents a review of methodologies and theories of previous studies related to diffusion of innovation.

Collis and Hussey (2014, p. 87), states that “A literature review is a critical evaluation of the existing body of knowledge on a topic, which guides the research and demonstrates that the relevant literature has been located and analyzed”. The most relevant literature related to the research questions are described in this chapter to provide the necessary background as a departing point for the research analysis. To find the most proper methodology and theories for the research design previous studies related to diffusion of innovation in payment systems where reviewed. Further on chapter three, the literature search and review processes are described in detail.

2.1 Theories and concepts

The following section starts providing the definition of diffusion, secondly, we introduce the four main elements of the diffusion of innovations theory, then go deeper into the attributes of innovations and the rate of adoption. Finally, the electronic payment systems and cashless society concepts are described to have an overview of the context of the research and to be able to build relations between diffusion of innovations and electronic payment systems.

2.1.1 Diffusion

In Latin “diffusio” means “to spread out”, Rosenberg (1994), stated that diffusion is not a passive process, though that involves a complex process with incremental adjustments to make all the parts of the system fit together. Rogers (1983, p. 5) defines diffusion as “the process in which an innovation is communicated through certain channels and a special type of communication over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas”. Diffusion can be considered a process where all the variables involved have a high level of complexity and the context where innovation are developed and used play an important role in the rate of adoption. According to Hall (2005) innovation alone without the diffusion process would not have much effect.

2.1.2 Diffusion of Innovation Theory

The diffusion of innovation theory is adopted to guide the research and literature review related to this theory has been prioritized. As stated by Parisot (1995); Medlin (2001) this theory is the most appropriate and convenient for analyzing the adoption rates of technology in higher education educational environments. The diffusion of innovations theory is composed of four main elements,
Chapter 2

(1) innovation, (2) communication channels, (3) time and (4) social system (Rogers, 1983). These four main elements are critical to predicting the adoption of an innovation, a description of them follows below.

The first element of the diffusion of innovation theory is innovation, “An innovation as an idea, practice, or object that is perceived as new by an individual or another unit of adoption” (Rogers, 1983, p. 135). Schumpeter (1934) combines a set of other definitions, considering innovation as: (1) “The introduction of a new good, that is one with which consumers are not yet familiar, or of a new quality of a good; (2) The introduction of a new method of production, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially; (3) The opening of a new market, that is a market into which the particular branch of manufacture of the country in question has not previously entered, whether or not this market has existed before”. Sometimes innovations desired for one adopter in one situation can be undesired for another potential adopter that is in a different situation (Rogers, 1983), this is an example that the rate of adoption of an innovation may differ depending on the context and their perceived attributes. After analyzing the different definitions of innovation Rogers definition will be adopted in the present research though that has more relation with the subject and context. For analysis purpose, MPay will be considered an innovation of the Moldovan Government e-payment systems for public services, which is offering an alternative for the services that are available only in traditional payment systems, in this case, cash payments under different platforms (EGC, 2017c).

The second element of the diffusion of innovation theory is the communication channel, as defined by Rogers (1983, p. 17) “Is the means by which messages get from one individual to another”. Rogers highlighted that mass media channels, such as radio, television, newspaper and so, are the most rapid and efficient way to transmit the existence of an innovation. On the other hand, Rogers also highlighted that interpersonal channels are more effective in persuading individuals to adopt a new idea. The type of the communication channel can be selected by the complexity of the innovation, for complex innovations mass media channels are adopted and for non-complex innovations interpersonal channels are more suitable (Rogers, 1983). Müller and Rode (2013) stated that communication channels are important because they can influence the adoption rate of innovations. Rogers suggested that to increase the transference of ideas and to have more effective communications between two individuals the degree of homophily had to be high. Homophily is defined by Rogers (1983, p. 18) as the “degree to which two or more individuals who interact are similar in certain attributes, such as beliefs, education, socioeconomic status, and the like”. On the other hand, heterophily the opposite of homophily tends to lead to ineffective communication and increases the probabilities of rejecting the innovations. The Internet as a mass media channel and the implementation of MPay made possible the diffusion of the government e-payment system in Moldova achieving a high penetration level and an increasing uptake of the service in the society.

The third element of the diffusion of innovation theory is the time element, the inclusion of this element had strengthened the diffusion research, this element has been ignored or was not important in other behavioral science research (Rogers, 1983). As defined by Rogers (1983, p.20) the time dimension is involved in diffusion in three main factors, “(1) the innovation-decision process by which an individual passes from the knowledge of an innovation to its adoption or
rejection, (2) the innovativeness of an individual or other unit of adoption (that is, the relative earliness/lateness with which an innovation is adopted) compared with other members of a system, and (3) an innovation’s rate of adoption is a system, usually measured as the number of members of the system who adopt the innovation in a given time period”.

Finally, the fourth element of the diffusion of innovation theory is the social system, as defined by Rogers (1983, p. 37) is a “Set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or subsystems.” The users of the Moldovan Government e-payment system are part of the social system that will be analyzed in the present research. According to Rogers, there are several issues that involve the relationship between the social system and the diffusion process, the social structure, norms on diffusion, roles of opinion leaders and change agents, and finally types of innovation-decisions (Rogers, 1983). Change agents as stated by Haider and Kreps (2004, p. 3-11) are responsible for 7 roles “to develop a need for change, to establish an information-exchanging relationship, to diagnose problems, to create an intent in the client to change, to translate an intent to action, to stabilize adoption and prevent discontinuance and to achieve a terminal relationship”. According to Rogers (1983), change agents are qualified professionals with a degree in a technical field, and commonly use opinion leaders in a social system as their lieutenants in diffusion activities. Watson (1971) mentioned that change within social systems is usually resisted by some members of the society especially changing the way we do things, this shows the importance of the introduction of opinion leaders and/or incentives to hinder this barrier.

2.1.3 Perceived attributes of innovations

Perceived innovation attributes are important factors that can be observed and measured in certain ways in different units of analysis, they can also help to explain the different rates of adoption, and identify the weakness of each attribute, which can later be improved or eliminated. According to Rogers (1983), research on the perceived attributes can help to predict rates of adoption be explored. A brief description of the five perceived attributes of innovations is detailed in the following section.

Rogers (1983, p. 213) defines relative advantage as “the degree to which an innovation is perceived as being better than the idea it supersedes”, Rogers also states that “the degree of relative advantage is often expressed in economic profitability, low initial cost, a decrease in discomfort, social prestige, a savings in time and effort, and the immediacy of the reward”. Adopters determine which specific relative advantage types are more important, according to their needs and other variables. According to Rogers, many diffusion scholars have found a relative advantage to be one of the best predictors of an innovation's rate of adoption, which indicates the benefits and the costs from adopting an innovation. A previous study on e-payments systems performed by Mallat (2007, p. 427) defined the relative advantage of mobile payments for consumers as “the perceived independence of time and place, availability to avoid queues, and the ability to complement traditional services (cash payments)”.
According to Glanz, Rimer, and Viswanath (2008), if an idea is not compatible with its required values and norms of a social system, it will not be adopted as rapidly as a compatible innovation. For Rogers (1983, p. 223) “compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters”. However, Schierz, Schilke, and Wirtz (2010) stated that perceived compatibility encompasses the compatibility of the new technology with existing values, behavioral patterns, and experiences. According to different researchers, the compatibility definition has values of a social system as an important factor that could be considered important in terms of the success of adoption of innovations. The naming of the innovation is an important part of compatibility, though that catchy and/or simple names are easier to remember. Rogers (1983) defined that an innovation can be compatible or incompatible (1) with sociocultural values and beliefs, (2) with previously introduced ideas, or (3) with client needs for the innovation.

Rogers (1983, p. 230) defined complexity as “the degree to which an innovation is perceived as relatively difficult to understand and use, but negatively correlated with the rate of adoption”. As stated by (Labay and Kinnear, 1981; Vollink, Meertens and Midden, 2002; Karakaya, Hidalgo and Nuur, 2014) innovations with high complexities was directly related to low adoption rates, this finding was validated by (Balcombe, Rigby and Azapagic, 2013) mentioning that a high complexity greatly affects the diffusion rate. According to all previous studies mentioned above, we can say that complexity is directly related to low adoption rates.

Rogers (1983, p. 231) stated that “Trialability is the degree to which an innovation may be experimented with on a limited basis”. Innovations with longer trialability periods often have a higher diffusion rate (Makse and Volden, 2011). Roger states that “new ideas that can be tried on the installment plan will generally be adopted more quickly than innovations that are not divisible” (Rogers, 1983).

According to Rogers (1983, p. 16), observability is defined as “the degree to which the results of an innovation are visible to others”, and the easier it is for individuals to see the results of an innovation, the more likely they are to adopt. Such visibility stimulates peer discussion of a new idea, as friends and neighbors of an adopter ask him or her for innovation-evaluation information about it. Getting a new idea adopted, even when it has obvious advantages, is difficult.

### 2.1.4 Rate of adoption

As defined by Rogers (1983, p. 232) the rate of adoption is “the relative speed with which an innovation is adopted by members of a social system”. It is generally measured as the number of individuals who adopt a new idea in a specified period, such as each year, quarter or month. Figure 1 provides three diffusions of innovation s-curves examples, were the rate of adoption is a numerical indicator of the steepness of the adoption curve for an innovation.
Tornatzky and Klein (1982) after performing a literature review discovered that the characteristics of relative advantage and compatibility were positively related to adoption, and complexity was negatively related to adoption, this important finding was performed from a meta-analysis of seventy-five articles from different industries related to innovation characteristics and their relationship to innovation adoption and implementation. Further research by Yang et al. (2012) using the Technology Acceptance Model (TAM) and the diffusion of innovation theory investigated what factors were important for adopters of mobile payments in China, concluding that compatibility is the most important factor for adoption followed by relative advantage, perceived risk, and perceived fee. Validating these findings different studies on photovoltaic technologies discovered that there is a direct relation between compatibility and the adoption (McEachern and Hanson, 2008; Shum and Watanabe, 2009; Karakaya, Hidalgo and Nuur, 2014). Summing up the findings of different researchers independently from the industry the innovation attributes of relative advantage and compatibility are the most critical factors for increasing the rates of adoption.

Rates of adoption can help us identify the stage of adoption of an innovation, for this purpose as defined by Rogers (1983) there are 5 adopter categories in a social system according to the basis of innovativeness; (1) innovators – people that can understand and try new ideas; (2) early adopters – individuals that have greater degree of opinion leadership; (3) early majority – people that adopt new ideas before the average member of a social system; (4) late majority – individuals that adopt new ideas just after the average member of a social system; and finally (5) laggards – the last people that adopt an innovation. Schierz, Schilke, and Wirtz (2010) suggested that firms should identify early adopters and stimulate their usage of mobile payment to create diffusion and reach the majorities in the future, and Lu et al. (2011) argues that potential adopters of mobile payments services are highly influenced by friends, colleagues, and important social circles. According to Moore (1999), the most difficult step is making the transition between visionaries (early adopters) and pragmatists (early majority).
2.1.5 Electronic Payments

According to Humphrey, Kim and Vale (2001) the introduction and use of electronic payment instruments holds the promise of broad benefit to both business and consumers in the form of reduced costs, greater convenience and more secure, reliable means of payment and settlement for a potentially vast range of goods and services offered worldwide over the internet or other electronic networks. As stated by Worku (2010) e-payment and e-banking applications represent a security challenge as they highly depend on critical ICT systems that create vulnerabilities in financial institutions, businesses and potentially harm customers. Interoperability plays an important role in the electronic payments and refers to the ability of different systems and sometimes different products to seamlessly interact or exchange data. The MPay service is designed to re-use all relevant governmental platforms, including the interoperability platform, meant to ease the development of the current service, to lower the investment costs and to ensure its sustainability.

For payment systems, “interoperability” depends not only on the technical ability of two platforms to interact but also the contractual relationships between the entities wanting to interact. HIMSS (2013) stated that “Interoperability describes the extent to which systems and devices can exchange data, and interpret that shared data. For two systems to be interoperable, they must be able to exchange data and subsequently present that data such that it can be understood by a user”. While referring to the MConnect Government Interoperability Platform, the E-Government Center presents it as a platform to enable public authorities for data exchange in real time, exempting them to require citizens and businesses to provide certificates, reports etc. The next step envisaged by the EGC were to connect the public authorities’ information systems and databases to the MConnect platform to reduce the administrative burden on the business environment and citizens (EGC, 2015b). The EGC data from the end of 2016 reveals that through MConnect 60 integration projects to facilitate data exchange between 24 authorities were undertaken (EGC, 2017b). MConnect serving as the core of the process for re-engineering the Republic of Moldova’s public services, enabling the streamlined delivery of public services - both for citizens and businesses - as well as the optimization of internal governmental business processes (WSO2, 2017). Reverting to the MPay case, the agreements and contracts between the public authorities, the MPay owner, and the payments operators, clearly stipulates the provisions on ensuring a quality level of the service on this segment, including provisions regarding its availability and security. According to The World Bank (2016), “Interoperability is no longer limited by national borders and the overall ecosystem has become more complex. A lack of interoperability can result in inefficiencies due to overlapping or limited coverage and sunken investment costs, which can negatively impact adoption and usage”.

2.1.6 Cashless society

According to World Atlas (2016), a cashless society is a society where currency notes or cash money are not used in monetary transactions. In the past cashless societies were based on the barter system, but the present concept refers to transactions made with the help of digital currencies (i.e. bitcoin), money being exchanged and recorded only in the electronic digital forms. The Harvard Business Review (2016) research presents into its article the countries that would profit
most from a cashless world, also refer to the best-positioned countries that shifted to the digital money (such as Sweden, UK, Finland, Denmark, New Zealand, etc.). Figure 2 provides the country's position towards going cashless, Harvard Business Review (HBR) also states that “these irregularities in the migration to non-cashless raise several questions: Which countries have the greatest to gain from the migration to a cashless society? Which countries are most prepared in terms of their digital readiness? Understanding the answers to these questions will enable decision-makers, innovators, and investors in both the public and the private sectors to locate the world’s “cashless sweet spots” and allocate resources to unlock value trapped by transaction costs and frictions inherent to cash-intensive societies”.

![Figure 2 Which countries are best positioned to go cashless?](source)

Source: (Harvard Business Review, 2016)

### 2.2 Methodologies of previous studies related to diffusion of innovations in payment systems

Based on the information provided in Table 1, we found that the majority of researchers adopted the interpretivist paradigm and a qualitative methodology, based on case studies. Diffusion of innovation theory was the most common among all researchers. Case studies where performed in different industries and countries, demonstrating that the theory of diffusion of innovation can be widely implemented under different scenarios. After performing a literature search the researchers identified a gap in previous studies corresponding to following keywords, diffusion of innovation and electronic payments applied to governmental gateways or public services. The information provided by some previous studies related to diffusion of innovation in payment systems stated in
Table 1 supports the research problem, paradigm, methodology, and theory to be adopted in the present research.

**Table 1 Previous studies methodologies related to diffusion of innovation of payment systems**

<table>
<thead>
<tr>
<th>Item</th>
<th>Author/s</th>
<th>Date</th>
<th>Topic / University</th>
<th>Paradigm</th>
<th>Methodology</th>
<th>Theory/s</th>
<th>Location/Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Martin Eriksson, Talls Van Trinh</td>
<td>2012</td>
<td>The Swedish mobile payment market: An analysis from a consumer's perspective / KTH</td>
<td>Interpretive</td>
<td>Qualitative /Case study</td>
<td>Diffusion of Innovations</td>
<td>Sweden</td>
</tr>
<tr>
<td>2</td>
<td>Jonas Eder, Christopher Mutsaerts</td>
<td>2013</td>
<td>Diffusion of innovation at the bottom of the pyramid: the impact of a payment system on the adoption of electricity in rural Uganda/ KTH</td>
<td>Interpretive</td>
<td>Qualitative /Case study</td>
<td>Diffusion of innovations</td>
<td>Uganda</td>
</tr>
<tr>
<td>3</td>
<td>Menard Nyirenda, Patrick Albert Chikumba</td>
<td>2014</td>
<td>Consumer Adoption of Mobile Payment Systems in Malawi: Case of Airtel Malawi ZAP in Blantyre City</td>
<td>Interpretive</td>
<td>Qualitative /Case study</td>
<td>Diffusion of innovations</td>
<td>Malawi</td>
</tr>
<tr>
<td>4</td>
<td>Badar H. Al-Lawati, Xiaowen Fang</td>
<td>2016</td>
<td>Diffusion of Innovations: The Case Study of Oman’s e-Payment Gateway</td>
<td>Interpretive</td>
<td>Qualitative /Case study</td>
<td>Diffusion of innovations</td>
<td>Oman</td>
</tr>
<tr>
<td>5</td>
<td>Tiago Oliveira, Manoj Thomas, Goncalo Baptista, Filipe Campos</td>
<td>2015</td>
<td>Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology</td>
<td>Interpretive</td>
<td>Qualitative /Case study</td>
<td>Diffusion of innovations, Unified theory of acceptance, Technology (UTAUT2)</td>
<td>Portugal</td>
</tr>
<tr>
<td>6</td>
<td>Tatjana Apanasevic, Jan Markendahl, Niklas Arvidsson</td>
<td>2015</td>
<td>Stakeholders’ expectations of mobile payment in retail: Lessons from Sweden</td>
<td>Interpretive</td>
<td>Qualitative /Case study</td>
<td>Diffusion of innovations, Technology adoption model, Network externalities</td>
<td>Sweden</td>
</tr>
</tbody>
</table>

Source: Authors elaboration
3 Methodology

As mentioned in the literature review chapter the methodology framework adopted by the researchers follows a trend of previous research on diffusion of innovation of payment systems. This chapter describes the methodology applied in the research, in terms of research paradigm, type of research, methodology, methods, methodology limitations, and finally, the research reliability and validity are discussed.

3.1 Identification of the paradigm

The interpretivist research paradigm was adopted although no experimentations, deductive logics, and quantitative data will be generated by the researchers; therefore, the research will involve an inductive process with a view to provide an interpretive understanding of social reality and phenomena within the context. According to Collis and Hussey (2014, p. 45) interpretivists adopt a range of methods that “seek to describe, translate and otherwise come to term with the meaning not the frequency of certain naturally occurring phenomena in the social world” and the findings are derived from qualitative methods of analysis, based on interpretation of qualitative research data. Orlikowski and Baroudi (1991, p. 5) states that the main objective of the interpretive researcher is to “attempt to understand phenomena through accessing the meanings that participants assign to them”.

3.2 Qualitative research

As stated by Collis and Hussey (2014) a qualitative approach addresses their research questions and designs studies that involve collecting qualitative data and analysis of data with interpretative methods, and at the same time the research will not measure variables or count occurrence of the phenomenon, instead will emphasize the themes and patterns of meanings and experiences related to the phenomena. Creswell (2014, p. 32) defines a qualitative research is “an approach to exploring and understanding the meaning individuals or groups ascribe to a social or human problem”. On the other hand, according to Szmigin and Bourne (1999); Plouffe, Vandenbosch, and Hulland, (2000), researchers frequently use qualitative studies in the analysis of adoption of payment systems. According to the above statements and to the methodology review of previous studies in the diffusion of innovation in payment systems performed in the literature review chapter a qualitative approach methodology has been selected through the appropriateness with the interpretivist research paradigm, and therefore no quantitative data will be collected, generated, or statistically analyzed in the research.

3.3 Case Study

Beyond the different methodologies associated with the interpretivism paradigm, the case study is the one that best fits with the purpose and outcomes of the research, and because according to the findings of Table 1 of the literature review chapter, almost every paper that has been written on the diffusion of innovation in payment systems adopts a case study approach. As defined by Collis and Hussey (2014, p. 68) a case study is a “methodology used to explore a single phenomenon
(the case) in a natural setting using a variety of methods to obtain in-depth knowledge”. Similarly, Yin (2011) argues that a case study approach is appropriate when exploring a contemporary phenomenon and to gain a complete view of complex instances through observation, and searching for patterns especially when there is a lack of previous research in governmental/public e-payment systems. A combination of exploratory and opportunistic case study methodology will be conducted in the research having as a unit of analysis the Moldova e-Government Center (EGC) Public Institution, primary to fulfill the literature gap and subsequently to take advantage of the availability of access to specific data and information by the researchers. As defined by Collis and Hussey (2014) an exploratory case study is conducted where there is a deficient body of knowledge, and an opportunistic case study is where the opportunity to examine a phenomenon arises because the researchers have access to an organization and/or information.

### 3.4 Methodology and methods

To find a proper methodology, methods and theories for our research a review of some previous studies methodologies have been performed, journal articles and theses with topics related to diffusion of innovation in payment systems were considered. According to the findings of the methodology review presented in the literature review chapter most researchers adopted the interpretivism paradigm, implemented a qualitative approach based on case studies, and used the diffusion of innovation theory as a framework to guide their research analysis, demonstrating that the theory of diffusion of innovation can be widely implemented under different scenarios, in terms of industries and countries. Figure 3 represents the four stages of the case study methodology implemented at the research.

![Figure 3 Summary of case study methodology](image-url)

Source: Authors elaboration
In the following sub-section a brief description of the stages of the case study methodology will be addressed:

**Research problem**

A preliminary literature review was performed to identify the research problem taking care that the topic selection was related to the learning content of the Master Programme of Entrepreneurship and Innovation. Subsequently, research questions were defined to help explore the identified literature gap of the research.

**Research design**

The research design follows the actual trend of previous studies as described in the literature review chapter. As stated by Collis and Hussey (2014, p. 10) “the starting point of the research design is to determine your research paradigm”. The methodology approach and methods to be applied in the research are aligned principally to the interpretivism paradigm, the research design will be adapted to comply with the research purpose, outcomes, limitations, and at the same time to address the research questions in a proper way, in that terms as stated lines above a case study methodology will be conducted.

**Data collection**

Qualitative and quantitative secondary data will be the only source of information collected, though that in the research a documentary analysis will be performed. Primary data has not been necessary to collect because secondary data provided the enough information for answering the research questions. As defined by (Collis and Hussey, 2014) “secondary data are research data collected from an existing source, such as publications, databases or internal records, and may be available in hard copy form or on the Internet”. In these terms, a mixed method of qualitative and quantitative data collection will be addressed verifying the relevance of the information with the literature gap. Qualitative secondary data will include journals articles, EGC internal documentation, master and doctoral theses. Quantitative secondary data will include an internal quantitative research performed by a consultant company for EGC to determine and monitor the level of understanding and support of the e-Transformation of Governance reform by the citizens, their awareness of the advantages, benefits, and opening to uptake and assimilate the e-Governance products, among which MPay would be considered. The data were collected on a representative sample that included localities from all districts of Moldova.

Data collection will be divided into two main parts, literature search and literature review, the purpose of the literature search is to collect all the literature related to the keywords of the research and become familiar with the literature available. The aim of the literature review is to select the most relevant content of literature related to the research problem by using a systematic method.
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Literature search and review

As stated by Collis and Hussey (2014) a literature search can be defined as a systematic process with a view to identifying the existing body of knowledge on a topic. Due to time limitations, a reduced number of keywords will be addressed in the literature search, principally they are based on diffusion of innovation, perceived attributes of innovation, the rate of adoption, e-payments, governmental payment gateway which have a direct relation to the research questions. For this purpose, KTH search tool Primo, Google Scholars and Web of Science databases a commonly used database for reviewing studies will be used (Sriwannawit and Sandström, 2015; Crossan and Apaydin, 2010).

According to Collis and Hussey (2014), “A literature review is a critical evaluation of the existing body of knowledge on a topic, which guides the research and demonstrates that the relevant literature has been located and analyzed”. For this purpose, only relevant information will be collected and analyzed in the present research.

Data analysis

Collis and Hussey (2014) suggests two types of data analysis for case study methodologies, within-case analysis or cross-case analysis; (1) With-case analysis is when the researchers require to become totally familiar with the material, enabling the researchers to build up separate descriptions of events, opinions, and phenomena, which can be used to identify patterns; (2) Cross-case analysis is when the researchers require to draw out similarities and differences to help identify common patterns. To fulfill the purpose and outcome of the research, the data analysis phase will include a with-in case analysis of the secondary data, where qualitative and quantitative data will be analyzed. The qualitative analysis will have as a framework the diffusion of innovation theory which will aid an exploratory process, and the researchers will become familiar with the material. In terms of quantitative analysis an s-curve graph of the rate of adoption will be performed, which will aid to explore and analyze the rates of adoption of the Moldovan e-payment systems among main consumers (citizens and organizations), public service providers (state organization, responsible for providing public services) and payment services providers (payments operators). The combination of quantitative and qualitative data analysis is subject to the experience, knowledge, and skills of researches that would influence the quality of data collected, research design, observations made, analysis and assessment of data.

3.5 Methodology Limitations

Every research method has certain limitations, situations that can barely be controlled by the researchers but should be considered to evaluate the level of certainty or uncertainty in the data analyzed, results obtained and observations made. The limitations of this research are connected to the relatively short period of time the authors had to conduct the research and the data about governmental e-payment system designed for the public services and collected from the analyzed literature. Time constraints leading to the performance of an exhaustive literature search and literature review. Though to time limitations primary data will not be generated or collected in the present research, secondary data will be the only source of information collected. As the research
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Methodology is based on a concrete case study analysis (Governmental Payment Gateway - MPay, implemented by the Government of Moldova), the limitations arise from the vast amount of data available, and a selection of a limited amount of information to be inserted into the research.

Despite the above mentioned, the literature review will be performed considering different sources of information, but the researchers will focus only on the most important sources and aspects in order not to exceed the scope of the current research.

3.6 Reliability and validity

While identifying the own paradigm, the researchers analyzed and tried to meet the research methods criteria of reliability and validity. According to Collis and Hussey (2014, p. 52) "for a research to be reliable, a repeat study should produce the same result. Reliability referring to the accuracy and precision of the measurement and absence of differences the results if the research were repeated." Research reliability also refers to “the extent to which the data collection techniques or analysis procedures will yield consistent findings” (Saunders et al., 2009, p. 149).

Under the current research, reliability was ensured through the secondary data based on e-Government Center internal records and external documentation (monthly and quarterly statistics, financial and economic data, surveys, online articles, case studies). The secondary data will be the only source of information collected. The researchers did not use primary data as the secondary data were sufficient for this stage to answer to the envisaged research questions. These data have been accurately documented and reused for the research purpose. By analyzing them, the researchers aimed to provide context to understand the motivations behind people’s attitude and behavior, thus explaining the results, and capture the findings of the governmental e-payment systems via the diffusion of innovation theory, the perceived attributes, and rate of adoption of innovation.

To eliminate the bias related to the governmental data, the researchers assessed together the secondary data which included into an internal quantitative research performed by an external consultant company contracted by EGC to determine and monitor since 2012 the level of understanding and support of the e-Transformation of Governance reform by the citizens, their awareness of the advantages, benefits, and opening to uptake and assimilate the e-Governance products, including MPay. The data were collected on a representative sample that included localities from all districts of Moldova. In this regard, the survey company collected data using a structured questionnaire, which answers were collected in different localities from all the districts of Moldova. According to EGC (2016b), the sample size number was 3013 respondents from different ages starting from 18 years to 74 years. The stratification criteria were determined by 13 geographic regions covered by the capital of Moldova (Chisinau), other urban areas, and rural areas.

According to Collis and Hussey (2014, p.53), validity refers to “the extent to which a test measures what the researcher wants it to measure and the results accurately reflect the phenomena under study”. Yin (2014) presents three (3) tests – construct validity, internal validity, and external validity - that ensure the validity of an empirical social case study. The construct validity implies
the correct identification of operation measures for the phenomenon under investigation. Under the current research, the construct validity is ensured through the utilization of the qualitative and quantitative data collection techniques. Internal validity refers to the establishment of a causal relationship between different conditions, by delineating the relationship between the theoretical framework and the research findings (Yin, 2014). The detailed analysis of the theoretical aspects and foundation upon which e-payment systems were built served as a basis for the internal validity. To have a reliable conclusion, the researchers analyzed thoroughly the theoretical justification, empirical data, defined parameters and main findings. External validity is defining the establishment of a context in which the research findings could be generalized (Yin, 2014). The empirical evidence and Moldova case study analyzed into this research envisaged a specific cultural, technical and organizational context, which validate and reconfirm the findings for this context.
4 Findings and Analysis

The following chapter is divided into five sections which mainly includes the empirical findings and analysis that will help answer the research questions of the present study. Before we start with the discussion of the empirical findings and analysis, it is important to mention the two perspectives that had been considered in our research; the first perspective is related to (1) Consumers that are citizens and business, but according to the delimitation of the research we will focus on citizens; the second perspective is related to (2) Service providers which are composed of, public services providers (state organizations) and payment service providers (commercial organizations). For this purpose, special care has been taken so that all the information presented is in the context of the unit of analysis (Moldova Governmental Online Payment Gateway - MPay).

The first two sections of this chapter will present detailed qualitative and quantitative information related to the perceived attributes of diffusion of innovations theory, the first section will be related to the consumers perspective, and the second section will be related to the public and payment services providers perspective. The third section of this chapter will include quantitative information related to the rates of adoption of e-payment systems from the consumers perspective. The fourth section will consider the rates of adoption of e-payment systems from the public and payment services providers perspective, and finally, the fifth section will provide a summary of the empirical evidence and analysis among the two perspectives delimited in our research.

The qualitative and quantitative data presented in this chapter are public and internal documents from EGC. The quantitative research performed by a consultant company for EGC collected data using a structured questionnaire, which was conducted to representative samples of different localities from all the districts of Moldova. The sample size number is 3013 respondents from different ages starting from 18 years to 74 years. The stratification criteria were determined by 13 geographic regions covered by the capital of Moldova (Chisinau), other urban areas, and rural areas, (EGC, 2016b). The quantitative research was focused on online public services which have a direct connection with MPay, though that the e-payment systems is integrated to the public online services.

4.1 Perceived attributes of diffusion of innovations theory from the consumer perspective

4.1.1 Relative advantage

Public e-payment system advantages

According to EGC (2016d), the public e-payment system provides a win-win situation for citizens and organizations involved in the electronic payment process of public services and other mandatory public payments. There are several advantages that citizens perceive from the public e-payment system, an important one is the freedom and convenience to choose any payment method available in the country legally (credit/debit cards, internet banking, e-wallet or with cash) without charging any additional fees, additionally the payments can be done within the 14 payment
providers (financial institutions, the Moldovan Post Office, Cash-in terminals, e-Wallet providers, and others). Going deeper to the advantages that public e-payment system provides to citizens we detail a list below:

- Convenient: allows for any kind of payment to be made anywhere - a choice of on-line, on-mobile tools and payment methods.
- Secure: the payment tool is reliable and modern.
- Fast and timely: the payments reach the beneficiary by the due date avoiding penalties.
- Inexpensive: removes all extra commissions and fees and enables discounts for timely payment.
- Reduces corruption for cash payments and increased transparency via e-trail and transaction history.
- Eliminates queues from cumbersome procedures and long services.
- Promotes democracy, reassuring the equal treatment following the law.
- Financial inclusion, encourage many of the citizens to use the current instrument.

The public e-payment system relative advantage degree can be analyzed by 5 of the 6 types defined by Rogers (1983), (1) Economic profitability, MPay does not provide profit, but is an inexpensive online payment service that removes all extra commissions, fees for consumer and enables discounts for timely payment. (2) Low initial cost, MPay initial cost does not exist because it is a free online payment service, and can be accessed only by having an internet connection. These findings are in line with those of previous studies by Karnouskos (2004) which compared the relative advantage between e-payment and cash payments stating that cash payment has no cost for consumers, and they expect the cost of a mobile payment service to be low or zero. (3) The decrease in discomfort, MPay allows payments to be made anywhere and by different payment methods, eliminating queues from cumbersome procedures and long services decrease steeply the degree of discomfort to citizens. (4) Savings in time and effort, MPay provides a fast and reliable service where payments reach the beneficiary almost at real time and before the due date. (5) The immediacy of the reward, citizens perceive and immediate reward in terms of having access to a secure and reliable payment tool, by which citizens receives incentives by the Government every time they use MPay.

The only relative advantage degree that can’t be expressed is the (6) social prestige, because MPay is an intangible product (service) which is not visible to others, and has non-aesthetics, which is contrary to Tarde (1903) previous research which had suggested that status seeking was the main reason for imitating the innovation behavior of others. These findings seem to be consistent with Mallat (2007, p 427) research which defined that consumers of e-payment systems perceived the relative advantages as the “independence of time and place, availability to avoid queues, and the ability to complement traditional services (cash payments)”.

Figure 4 shows a breakdown of advantages that citizens perceive among public online/electronic services which can have positive or negative implications. The relative advantages percentages of e-payment systems correspond to the 2016 period.
Figure 4 Online public services advantages perceived by citizens

Source: adapted from (EGC, 2016b)

The relative advantages are going to be classified according to positive and negative implications, from Figure 3 going from top to down the first ten advantages are considered relative advantages with positive implications, the remaining two are considered with negative implications, though that they don’t contribute the diffusion. According to Rogers (1983), adopters determine which specific relative advantage type are more important, according to their needs and other variables, this is being clearly observed in figure 4 where relative advantages are rated with different percentages. From the relative advantages with positive implications, by far the greatest percentage is for the time saving / no standing lines with 25% which can be considered as the most important relative advantage. The nine remaining relative advantages go from 9% to 1%, which don’t have a big impact separately but summing up all them they do, reaching up to a 30%. However, 31% of respondents do not know the relative advantages of the public online services, because there is a high percentage of consumers that didn’t use the public online service. Other 9% stated that the service has no relative advantages, summing up the relative advantages with negative implications reach a 40%. However, the 40% reached by the relative advantages with negative implications get dim by the 60% reached by the relative advantages with positive implications, giving the perception that this trend can gradually rise when consumers that never used service start adopting the public online services.

Incentives mechanisms for digital payments

According to Rogers (1983) to increase the rate of adopting innovations and to make relative advantage more effective, direct or indirect financial payment incentives may be used to support the individuals, incentives being part of the support and motivation factors. The mandate of the EGC is to promote the use of the e-services and e-payments accordingly. In this regard, EGC encouraged the citizens through several ways to pay digitally for public services. In 2014, working together with VISA and several commercial banks, the Center has conducted a promotional campaign. Each person, who declined the cash payment method and used his/her visa card to pay
online, received a bonus of MDL 25 translated into minutes on their mobile phone. Another example would be the discount or exemption from payment of taxes by the citizens and business in case of using cashless payment methods.

### 4.1.2 Compatibility

As defined by Rogers (1983, p. 223) “compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters”. The compatibility attribute of diffusion of innovation will be analyzed from the perspective of the parameters of citizen’s expectations and satisfaction assessment of online public services. Meeting the citizen’s expectations parameter can measure the degree of sociocultural values, and the level of satisfaction with the quality of online public services parameter can measure the degree of satisfying the consumers need for the innovation.

**Citizens expectations and satisfaction assessment of online public services**

Figure 5 presents the dynamics of the confidence level assessment of the quality of online public services meeting citizens expectations of the last five years. The horizontal scale of Figure 4 measures the confidence level among citizens which starts from 1 (not confident) to 6 (fully confident).

![Figure 5 Online public services meeting citizen’s expectations assessment](image)

Source: adapted from (EGC, 2016b)

Figure 5 reveals that the level that online public services meet citizen’s expectations among citizens remains steady for the last two years, and had increased compared to year the service was assessed for the first time. A level of confidence of 3.8 on a scale of 6 represents an average level of complying citizen’s expectations which can remain the degree of the rate of adoption.
The last 4 years level of satisfaction assessment of the quality of online public services perceived by citizens are summarized in Figure 6.

![Figure 6 Level of satisfaction with the quality of electronic public services](image)

Source: adapted from (EGC, 2016b)

As discussed above almost the same phenomenon that was presented in Figure 5 can be perceived at Figure 6, where the level of satisfaction with the quality of the online public services remains steady for the last three years with a value of 66% of satisfaction among citizens. In the other hand, it can be observed that levels of citizens not satisfied is gradually decreasing and getting very close to 0%. The steady levels of citizen’s satisfaction with the quality of the online public services along the last years, are in line with Figure 4 assessment, suggesting that there is not enough research on the identification of the citizen’s needs, and an inconsistency with existing citizen’s values, generating a steady degree of the rate of adoption along the last 3 years.

### 4.1.3 Complexity

As mentioned in the literature review, Rogers (1983, p. 230) defined complexity as “the degree to which an innovation is perceived as relatively difficult to understand and use, but negatively correlated with the rate of adoption”. The complexity attribute of diffusion of innovation will be analyzed from the perspective of the parameters of (1) understanding of the online public services, and (2) the reasons why citizens have not used the online public services.

**Reasons why citizens have not used the online public services, and understanding of the online public services**

Table 2 provides a broad overview of twelve reasons why citizens have not used the online public services in the 2016 period, a variety of reasons have been consulted to citizens.
Table 2 Reasons why the online public services have not been used by citizens

<table>
<thead>
<tr>
<th>Item</th>
<th>Reasons</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>During that time, I did not need any public service</td>
<td>45%</td>
</tr>
<tr>
<td>2</td>
<td>Did not need the public service available via the internet</td>
<td>14%</td>
</tr>
<tr>
<td>3</td>
<td>Did not know that the public services I needed could be requested via the internet</td>
<td>10%</td>
</tr>
<tr>
<td>4</td>
<td>Even though I use computer, I do not have enough skills to access the online public services</td>
<td>8%</td>
</tr>
<tr>
<td>5</td>
<td>I feel more confident to physically visit the institution and req. services than to do it via the internet</td>
<td>7%</td>
</tr>
<tr>
<td>6</td>
<td>Do not want my personal data to be available to irrelevant persons or institution</td>
<td>4%</td>
</tr>
<tr>
<td>7</td>
<td>The public services I needed were not available via the internet</td>
<td>3%</td>
</tr>
<tr>
<td>8</td>
<td>Do not believe that accessing public services via the internet could save you from physically reaching the institution</td>
<td>3%</td>
</tr>
<tr>
<td>9</td>
<td>I believe that it would take more time to access the online public service than traditionally</td>
<td>2%</td>
</tr>
<tr>
<td>10</td>
<td>Did not have access to the internet</td>
<td>2%</td>
</tr>
<tr>
<td>11</td>
<td>I assumed the public service requested via the internet are more expensive than those requested directly at institutions</td>
<td>1%</td>
</tr>
<tr>
<td>12</td>
<td>Even though I use the cell phone, I do not have enough abilities to access via public services available</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: adapted from (EGC, 2016b)

As can be seen from Table 2 the main reasons why citizens have not used the online public services are attributed to different reasons not related to complexity, having a value of 92%. Despite from these results the only reason that has a partial connection with complexity is that even though citizens use computer, they do not have enough skills to access the online public services that represent an 8%, which suggest that there is a gap in defining specifically the reasons if online public services are complex to use.

According to EGC (2016b), 63% of respondents in 2016 said that online public services where easy to understand, compared to 2013 that only 54% of respondents had the same opinion. There is an increase of 9% in 3 years of citizens that understands how online public services work, however, 37% of citizens in 2016 find online public services still complex to use. According to these data, we can infer that the positive trend of not finding complex the online public services increases the degree of rate of adoption. However, from the previous findings of the reasons why citizens have not used the online public service are not encouraging the results from the present finding are considered more reliable. Though that the complexity is considered quite high the positive trend of its reduction, generates a gradual increase in the degree of the rate of adoption. Findings from previous research (Constantiou, Damsgaard, and Knutsen, 2006; Goeke and Pousttchi, 2010; Kim, Mirusmonov and Lee, 2010; Hsu, Wang, and Lin, 2011; Duane, O’Reilly and Andreev, 2014) have shown that ease of use is crucial for the adoption of online services.
Chapter 4  
Findings and Analysis

4.1.4 Trialability

As defined by Rogers (1983, p. 231), “Trialability is the degree to which an innovation may be experimented with on a limited basis”. The trialability attribute of diffusion of innovation will be analyzed from the perspective of the parameters of (1) household connection to the internet, (2) usage of internet, (3) citizens access to online public services, and (4) online public services usage.

Household connection to the internet

Figure 7 shows the level of household connection to the internet for the last 5 years in Moldova. The types of connection considered are ADSL, optical fiber, Wi-Fi, 3G, Dial up, and mobile phone.

![Figure 7 Household connection to the internet](image)

Source: adapted from (EGC, 2016b)

It can be seen from the data in Figure 7 that there is a positive gradual increase during the last 5 years in the level of household connection to the internet, starting with a value of 53% at 2012 and reaching a high value of 76% in 2016. This positive trend ensures the access of citizens to public online services.

Usage of internet

The percentage of citizen’s usage of the internet of the last five years is presented in Figure 8, according to EGC (2016b), positive trends are observed especially in urban areas and in the capital. However, the internet use in rural areas continues to be significantly lower.
As discussed above the same phenomenon that was presented in Figure 6 can be perceived at Figure 8, there is a positive gradual increase of 14% during the last 5 years in the level of usage of the internet, reaching a value of 71% in 2016. This result shows that a high percentage of citizens makes use of the internet, reducing the barriers of trialability of online public services.

**Citizens access assessment to online public services**

The results of the citizen’s access assessment to online public services are presented in Figure 9, data is available from the last 5 years.
Table 3 presents the percentages of online public services (provided against a fee and could be paid via MPay) access among citizens, the data collected is from the last three years.

Despite from the two previous positive result of the household connection to internet and usage of internet, there is still a low percentage of citizens having access to online public services. Figure 9 presents a positive trend in the access of citizens to online public services, but still, the 44% reported at 2016 is a percentage of the mean. This low percentage decrease the degree of the rate of adoption of online public services.

<table>
<thead>
<tr>
<th>Item</th>
<th>Online public services integrated to MPay gateway</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E-application for issue of a Criminal Record</td>
<td>19%</td>
<td>26%</td>
<td>33%</td>
</tr>
<tr>
<td>2</td>
<td>Issuance of certificates from the Real Estate Register</td>
<td>10%</td>
<td>11%</td>
<td>14%</td>
</tr>
<tr>
<td>3</td>
<td>Certificate of Real Estate Value</td>
<td>7%</td>
<td>11%</td>
<td>14%</td>
</tr>
<tr>
<td>4</td>
<td>Issue of information on real estate value</td>
<td>4%</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>5</td>
<td>E-Apostille</td>
<td>7%</td>
<td>9%</td>
<td>13%</td>
</tr>
<tr>
<td>6</td>
<td>Issuance of Certificate on the records made in the Real Estate Register</td>
<td>4%</td>
<td>9%</td>
<td>13%</td>
</tr>
<tr>
<td>7</td>
<td>E-application to request a Certificate of Origin for Goods</td>
<td>3%</td>
<td>5%</td>
<td>11%</td>
</tr>
<tr>
<td>8</td>
<td>Certificate on the records made in the Real Estate Register</td>
<td>4%</td>
<td>7%</td>
<td>9%</td>
</tr>
<tr>
<td>9</td>
<td>E-licensing (application for a company's license)</td>
<td>4%</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>10</td>
<td>Online ordering and procurement of livestock identification means</td>
<td>2%</td>
<td>6%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: adapted from (EGC, 2016b)

However, the negative results of the access of citizens to online public services, Table 3 shows a positive trend of the usage of online public services integrated to MPay.

### 4.1.5 Observability

As mentioned in the literature review, Rogers (1983, p. 16) defined observability as “the degree to which the results of an innovation are visible to others”, and stated that most of the diffusion of innovation research are based on technological ideas. Rogers (1983, p.232) defined that “a technology has two components, (1) a hardware aspect that consists of the tool that embodies, the technology as material or physical objects, and (2) a software aspect that consists of the information base for the tool”. The present research considers online public services as a technological innovation focused on the software component, which is not so apparent to observation as a hardware component would. In these terms, the observability attribute of diffusion of innovation will be analyzed from the perspective of the parameters of knowledge/awareness of public online services among citizens.

### Knowledge of online public services

Previous research has established that the level of knowledge of public online services continues to be quite low in Moldova, with almost similar levels during the studied periods. Like previous
studies, using a scale from 1 (not familiar) to 6 (very familiar) the current data reveal an average of 2.3 points (EGC, 2016b). Figure 10 presents the level of awareness of public online services among citizens, for the 2016 period.

As can be seen in Figure 10 the percentages of citizens being very aware of the online public services are very low reaching a value of 6%, in contrast, the percentages of not awareness are very high, reaching a value of 49%. These findings are similar to previous research that established the level of knowledge of online public services at a value of 2.3 of 6 points, a relatively low value. In the other hand, it was determined that the highest awareness levels are found among heads of public authorities, administrative officials, highly qualified specialists, and people with higher education. As an overall, the low percentages of awareness and knowledge of online public services, decrease the degree of the rate of adoption.

According to EGC (2016b), the highest awareness levels of online public services are observed among heads of public authorities, administrative officials, highly qualified specialists, and people with higher education (that graded their knowledge with 5 and 6 points). The population of Chisinau recorded higher level of awareness in this respect (72%) in comparison with rural areas (58%) and other towns (64%). An important observation is that the positive perceptions are linked to respondents age, the share of elderly who are aware of online public services is 44% versus 73% among those aged 16-25 years.
4.2 Perceived attributes of diffusion of innovations theory from the public and payment services providers perspective

4.2.1 Relative advantage

Public e-payment system advantages

When a new product such as MPay is planned to be introduced in the market, especially at the governmental level, the innovation is perceived differently by the citizens and institutions.

The monthly statistics collected by EGC (2017b) proved that MPay gained acceptance and an increasing uptake in a relatively short term. Comparing to the traditional payment methods, advantages of going online were immediately perceived by all parties and stakeholders involved. More transparency, enhancing the efficiency of institutions and security of transactions, improving the interaction and experience with customers, time factor, cost benefits increased the adoption of MPay service among the public service providers and payment operators (EGC, 2016d). MPay was one of the successful attempt to introduce innovations by changing the perception of the CPAs level about the experience of citizens and businesses while performing payments for public services. Among the main benefits for the governmental institutions and payment services providers are as follows:

Government (Ministry of Finance, Central Bank, Administration/Government):

- Faster, more efficient tracking tool and collection of incomes/revenues.
- No “holding or delay” of funds in bank accounts until “clarification”.
- Reduced corruption at frontline – where cash collection for the national budgets is historically made.
- Reduced costs for the government payment collection process.
- Increases cash-less payments and encourages other cashless initiatives.

Business (Banks, Post Office, Payment Service Providers):

- Efficiency, MPay accelerates and automates the collection of government income and budget payments.
- Encourages migration towards cashless payment methods.
- Transition to low cost paperless (electronic) invoicing and settlement technology.
- Such innovations push for further investments and growth into the own business

Governance e-Transformation agenda aimed to equip government institutions with the relevant and state-of-the-art digital tools and platforms, open the government for innovation, enable service redesign and digitization, efficient, effective and open government. Data exchange and reuse, interoperability of government IT systems, cloud computing and shared platforms, mobile and social media platforms have been used to develop government e-services delivery infrastructure, which is to help us overcome departmental silos and enable government as a platform. Due to the
existing infrastructures, MPay managed to create horizontal organizations eliminating organizations silos.

**Incentives mechanisms for digital payments**

Although across the country, as per the National Bank of Moldova (2017) there are 1.6 million cardholders most payments made in Moldova are still in cash. Out of approximately MDL 10 million, only MDL 1.2 million are cashless transactions. This is explained by the population's preferences and previous practices to withdraw money directly from the banks or bank terminals and go through traditional ways of payment and requesting public services, rather than going online. In the same time, it should be stated that the quality of offline public services are to a certain extent quite good and these services are perceived positively by the consumers. Therefore, the advantage of going online or use cashless transactions does not represent a clear difference for the citizens at this stage, meaning that the identified relative advantages might be insufficient.

Together with its partners, EGC aims further to promote cashless payments to reduce costs and enable transparency of payments records (EGC, 2016d). Continuously EGC examines methods of promotion campaigns and seeks to establish a partnership with commercial banks and international payment systems such as VISA and MasterCard. In 2014, working together with VISA and several commercial banks, EGC has conducted a promotional based campaign.

In principle, digital payments are less expensive than cash, the reality though shows a different situation in Moldova. Payments made with cards attract costs significantly high in comparison with cash payments. These costs consist of the interchange commission charged by the acquiring bank and shared with the issuing bank. This commission for MPay transactions is 1.5 % of each transaction made with a domestic card and 2.2 % of each transaction made with an international card. In this regard, EGC submitted an initiative to cap the interchange at a lower percentage and to align it with the EU Directives and best practices. The most important factor is that per the Government Decision no. 280 as of April 24, 2013, individuals will pay only the service cost. All fees will be paid, as applicable, from the state budget or by the service provider (EGC, 2013c).

**Financial and economic perspectives**

According to the EGC Sustainability and Business Model document (EGC, 2016c), MPay as a service created to enable contributors to pay fees, taxes, and contributions due to state authorities is generating huge savings for the national budget of the Republic of Moldova (EGC, 2017b). The internal financial and economic analysis data (EGC, 2016c) projects an increase of savings from USD 5,697,141 in 2017 to USD 21,371,248 in 2020. To compute them, a methodology on the public services reorganizing process has been applied.

Here, it is important to understand why the public institutions and payment operators joined the efforts into a public private partnership model to cut bureaucracy, decrease corruptive practices, be more transparent and more efficient. The innovation adoption rate is strongly interrelated with its compatibility with the values, beliefs, and past negative experiences (previously interacting with civil servants or payment operators) of individuals in the social system compatible with the
values that they wish to express (cut bureaucracy and time in queues, need for qualitative public services provision, diminish corruption at the CPAs level, etc.).

To a certain extent, the diffusion of innovation is perceived as a social process rather than a technical one. Under the Moldova’s case, the diffusion innovation process proved to be a combination of the social and technical process. It started and concentrated its efforts mainly on the CPAs level, also because of the focus of Governance e-Transformation agenda (on the central level), integrating at the first stage the most open to collaboration institutions (public or payment services providers), technically ready to embark on the present initiative, but also including the political factor and opinion leaders, acting as change agents’ promoters, who had locally a supportive role to enforce the innovation spread.

4.2.2 Compatibility

Changing perception about governmental institutions

MPay was one of the successful attempt to introduce innovations to change the perception of the CPAs level and later the local level about the views and experience of citizens and businesses while performing payments for public services. The actual relatively rapid grow of the service, involved major changes in citizens’ perception and behavior about the electronic payments. Moreover, the reluctance to use cashless transactions was constantly diminished due to the cost benefits, time-saving, easy use. Here, the monthly statistics (EGC, 2017b) (including the number of institutions/public authorities (21), groups of services (more than 50 integrated with MPay and 11 in process of integration), services (more than 55 integrated with MPay and 11 in process of integration) collected by the e-Government Center are an important key success indicator.

The former Moldovan Minister of Interior (MoI) within the period 2012-2015, declared (EGC, 2016d) that “the MoI has undergone a fundamental reform aiming at increasing the trust into police by improving the police service and tackling corruption in the system. In both directions, the new MPay system helped in an important way. Road police in Moldova have had a very bad reputation because of poor service and corrupt interactions between drivers and policemen. In the process of reform that the MPay platform made the payment of the fines easier, more transparent, secure and instant. That, combined with other measures, allowed to improve the traceability and measurement of the police activity. MPay also enabled improved MoI services while issuing the Criminal Records certificate. Queues, cumbersome procedures, and long service cycles produced bad service and corruption. Through MPay, the Ministry has been enabled to introduce an electronic service that automated most of the components, thus, dramatically improving the service and eliminating corruption. Overall, one can see the improvement of many governmental services in Moldova with the advance of ICT solutions for service offering and electronic payments”.
4.2.3 Complexity

**MPay - an intuitive innovation with a user-friendly interface**

It should be mentioned that public services providers and payment services providers are operating in the backstage when referring to the MPay usage. According to Rogers (1983), complexity refers to how difficult it is for adopters (public authorities and payment operators) to learn to use an innovation (MPay) and to incorporate it into their daily activities.

To ensure a good understanding of the system and easiest perception of how MPay works, EGC together with its partners trained the public authorities personnel to get a better insight of the new initiative as the bank staff was more qualified compared to the latter. MPay proved to be an intuitive innovation with a user-friendly interface. The main challenge that was faced – lack of skilled people or IT personnel to handle all technical aspects behind the MPay platform. These characteristics were more obvious for the public authorities. The case of payment operators was much better. With this purpose training of trainers, sessions were held and dedicated presentations, events, learning materials, video tutorials or guidelines to address simple and advanced workflows and clarify terminology and a list of frequently asked questions were elaborated. The MPay Integration Guide (EGC, 2013a) provides a glossary of terms, introduction, organizational and system context, interaction scenarios, integration development, integration testing, security considerations, API (Application program interface) reference and samples. These activities and materials had the purpose of explaining step by step how to use the system. The feedback out of these sessions was positive as it led to the easiest use of the system. Upon request, special guidelines were adjusted to the needs of public services providers and payment operators. In their turn, the users were supposed to revise or go through the drafted guidelines or instructions to ensure the smooth functionality of the system and transition to a new system.

MPay is a reusable and shared platform-level service the main scope of which is to enable the payment for any e-Service with any available payment instrument (EGC, 2017c). For both public authorities and payment operators, the MPay platform is putting under the same roof all necessary tools to process the payment for public services. MPay enhanced the role of a unified platform designed for payment purposes. Moreover, due to the existing government e-services delivery infrastructure built so far by EGC, the public authorities and payment providers benefited for free out of the most innovative and secure IT infrastructure, overcoming departmental silos and enabling government as a platform.

4.2.4 Trialability

**Easiness to explore an innovation**

Trialability refers to how easily the adopters of an innovation can explore it (Rogers, 1983). Before launching MPay system, the public-sector providers, payment operators and EGC (2016d) had a round of consultations, pre-testing and testing the system since all institutions involved had different levels of digital and technological readiness. Demo or beta releases were applicable to
"feel" the innovation, see what is its potential, understand the risks, test it, attend customized training, and then embark or commit into MPay initiative.

The testing part played an important role for main beneficiaries of the system as they perceived by their own the direct involvement, the benefits of a complex platform, but also what resources would be necessary to budget (EGC, 2013b) or plan if the innovation is adopted. So far, the features and upgrades of the MPay system were supported and envisaged in the frame of the private public partnership established from the early beginning between the main partners. However, in the case of the public authorities, the people needed for the maintenance of the system or other associated works had to be planned thoroughly. This was a crucial aspect, especially considering that in December 2016, Governance e-Transformation Project was closed and fewer resources for further development were available.

For the trialability attribute, the most important factor is to ensure that the trial version of a product (MPay system) the stakeholders involved designed a reliable and high-quality product to align with the needs of public services providers and payment operators.

4.2.5 Observability

As earlier mentioned, observability is the degree to which the results or benefits of using an innovation are visible to adopters (Rogers, 1983). There are first followers and late adopters/laggards as not everybody from the public authorities or payment operators adopted immediately MPay system. The desire to be among the innovators / early adopters secured positive results among the public institutions and payment operators and played an important role for those that were willing to see how other adopter are using the innovation and then be the next followers and adopt the new idea. However, according to Yocco (2015) "observability extends beyond having earlier adopters use an innovation in view of later adopters. Potential adopters of an innovation, coming from diverse groups and institutions, have to see clearly the benefits of adopting an innovation" such as MPay and using it.

Before and after integration with MPay

Public institutions and payment services providers compared how their life look like before and after using MPay. The positive difference "highlighted" the huge impact MPay could have into the future. Less-reluctant towards changes and most open-minded public institutions (EGC, 2016d), whose services were most demanded and ready from the technical standpoint started the collaboration with EGC and partners from the private sector.

EGC was also able to increase observability of MPay through promotional materials and stickers placed into the Moldovan Post Office, payment operators/banks' premises at the front-desks or cash-in terminals where the fees for public services are collected. The design for the MPay product was obvious, this helping to make observable the benefit of the innovation and follow the described steps to pay for a public service.
4.3 Rate of adoption of e-payment system from the consumers perspective

As mentioned in the literature review, Rogers (1983, p.232) defines the rate of adoption as “the relative speed with which an innovation is adopted by members of a social system”, and states that it is common to measure rates of adoption in terms of number of adopters in a specified period, but this information could not be easily being acquired from the MPay gateway database, though that the process of integrating a public service with MPay is not oriented to the adoption rate as number of users but to institutions and their services connected. In these terms, the s-curve and histogram graphs have been developed having as parameters the number of transactions per month.

S-curve and histogram of e-payment transactions

Figure 11 presents an s-curve and a histogram of citizen’s payment transactions performed with the MPay gateway in a monthly basis, from September 2013 to April 2017. The transactions are performed by different payment methods (credit/debit cards, internet banking, e-wallet or with cash) and within 14 payment providers (Financial institutions, post offices, cash-in terminals, and others). MPay gateway data has been used to draw the graphs on the below figure due to the availability of data.

![Figure 11 S-curve and histogram of e-payment transactions](image)

Source: authors elaboration

As stated by Rogers (1983), the rate of adoption is a numerical indicator of the steepness of the adoption curve for an innovation. From the s-curve graph above, according to the degree of steepness, we can observe that the rate of adoption started growing at a fast pace in April 2015, then steepness fluctuated with fast and slow paces from June 2015 to June 2016, finally from July
2016 until the date the steepness has a steady fast pace. These findings suggest that there is a positive trend in the rates of adoption of the MPay gateway among citizens.

**Level of satisfaction with the quality of public services**

The level of satisfaction with the quality of public services between via the internet and at the office of the public entity for the last four years are presented in Figure 12.

![Level of satisfaction with the quality of public services](image)

**Figure 12 Level of satisfaction with the quality of public services**

Source: adapted from (EGC, 2016b)

Figure 12 provides an interesting result, where the level of satisfaction with the quality of public services via the internet and at the office of the public entity are similar, this finding suggests that a possible barrier to the adoption of online public services can be the good quality offered by offline public services, hindering the rates of adoption of online public services.

**4.4 Rate of adoption of e-payment system from the public and payment services providers perspective**

**MPay implementation partners**

According to EGC (2016d) in 2013, the Government, through the EGC in close cooperation with the Ministry of Finance and the Central Bank of Moldova, implemented the Governmental Payment Gateway within the Governance e-Transformation Program funded by the World Bank. EGC developed and expanded this online payment instrument among all public authorities, as a service embedded in government portals that allows citizens and business to authorize payments for public services such as taxes, fines police, medical insurance, criminal records, business licenses, visas to enter the country, etc.
In performing e-payments under MPay platform several institutions (EGC, 2017c) are involved:

- Public service providers, the state organizations, responsible for providing public services, direct or indirect determination of the tariffs policy for public services, calculation of the price for the public service, invoicing the user.
- Payment service providers (payment operators), commercial organizations (usually banks), responsible for receiving payments for published invoices by using own networks and infrastructure, daily/monthly transfer of financial means to the accounts of service providers.
- MPay Owner, the state organization responsible for providing the users with payment alternatives, offering the technical platform for publishing electronic invoices, informational mediation of the payment process from payments operators to public services providers, solving atypical cases, payment for services of payments operators, maintaining the technical infrastructure of MPay, with the support of the Ministry of Finances – budgeting and paying for expenses related to payments associated with public services.
- Treasury (Ministry of Finance) – structure of the Ministry of Finances, which administers the accounts of (most) public service providers in the context of electronic payments.
- Central Bank of Moldova, the public authority, which regulates and supervises the activity of payment service providers.
- The government of Moldova, the public authority, which in the context of e-payments, together with the National Bank of Moldova, cooperates in creating and promoting a favorable environment.

Rogers (1983, p. 209), Stated that "most research on the attributes of innovations and their rate of adoption utilized individuals as the units of analysis, but this need not necessarily be so". For instances, under MPay case, all the beneficiaries are important and have a certain role in its adoption. Therefore, adopters are analyzed from a mixed prospective: organizations (Government - Central Public Authorities - providers of public services, private sector - payment service providers, banks) and consumers. Adoption of MPay among consumers (number of citizens/end-users of MPay service) would be inaccurate considering that an individual could request/pay for more public services at the same time or cover a payment on behalf of somebody else. More accurate data would be if referring to the number of institutions and the public services offered by them integrated with MPay, several payment providers that offer services associated with MPay and the transactions processed/money collected and savings made at the governmental level within a certain period, etc.

By May 2017, the number of payments made through MPay reached nearly 4.8 million transactions (with an average of 3500 transactions/day), estimated at over MDL 2.6 billion (with an average of MDL 1.7 million/day) (as of 31.05.2017), giving some insights into the relatively fast growth of adopters among the system (EGC, 2017b). This is a significant increase for a new payment instrument in a country with a relatively small number of transactions. MPay has led to a decrease of tax evasion, and consequently encouragement of more cashless transactions.
The relative speed with which MPay innovation was adopted until present by members of a social system, namely public services providers and payment operators are counted as the total number of institutions and services integrated since 2013. According to EGC (2017b), within the period September 2013 – May 2017, a total of 23 institutions were integrated with MPay, out of which 21 public service providers/public institutions. Figure 13 represents the data about yearly evolution and integration of public institutions with MPay. The evolution is as follows: in 2013, the public services of 6 institutions - State Enterprise Cadaster, Ministry of Internal Affairs, Ministry of Justice, State Enterprise CRIS Registru (Registry of Population), State Enterprise Agricultural Information Center, Civil Status Service were integrated; in 2014 (5 institutions - State Tax Service, State Agency on Intellectual Property, National Agency of Auto Transport, Licensing Chamber, Ministry of Foreign Affairs); in 2015 (7 - National House of Health Insurance, State Enterprise Center for Special Telecommunications, Monitorul Fiscal, State Chamber of Registration, Education, Youth and Sport General Direction of the Chisinau Municipality, Customs Service, State Enterprise VamServInform); in 2016 (2 – Ministry of Justice, Parents Association) and 2017 (3 - Best Travel, Ministry of Transport and Roads Infrastructure, State Enterprise FiscServInform and services of previously integrated Civil Status Service).

![Figure 13 S-curve and histogram of organizations](image)

Source: authors elaboration

Integration with MPay (September 2013 – May 2017):

- 21 public authorities / public service providers integrated (6 in process)
- Figure 14 shows, 28 groups of services integrated with MPay
- More than 56 services integrated with MPay and 11 in process of integration
Figure 14 Public Services Providers integrated with MPay

Source: (EGC, 2017c)

- 14 payment providers, out of which 9 financial institutions/banks, the Moldovan 1 Post Office, 2 Cash-in terminals and 2 e-Wallet providers (Figure 15 details the payment providers)

Figure 15 Payment Services Providers integrated with MPay

Source: (EGC, 2017c)
4.5 Empirical findings and analysis summary

4.5.1 Consumers perspective

Table 4 provides a summary of the empirical findings and analysis among the consumers perspective. The table includes the five attributes of innovation, a list of parameters that had been used to measure each attribute, and shows how each parameter affects the rates of adoption.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Parameters</th>
<th>Rate of adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantage</td>
<td>Economic</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Initial cost</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Discomfort</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Time &amp; effort</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Rewards</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Social prestige</td>
<td>→</td>
</tr>
<tr>
<td>Compatibility</td>
<td>Meeting expectations</td>
<td>→</td>
</tr>
<tr>
<td></td>
<td>Satisfaction of quality</td>
<td>→</td>
</tr>
<tr>
<td>Complexity</td>
<td>Reasons why didn’t use</td>
<td>→</td>
</tr>
<tr>
<td></td>
<td>Easy to understand</td>
<td>↑</td>
</tr>
<tr>
<td>Trialability</td>
<td>Household connection to the internet</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Usage of internet</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Access to online public services</td>
<td>↑</td>
</tr>
<tr>
<td>Observability</td>
<td>Knowledge and awareness of online public services</td>
<td>↓</td>
</tr>
</tbody>
</table>

Source: Authors elaboration

According to the data provided in Table 4, we can observe from the innovation attributes that most of the parameters of relative advantage and trialability are increasing the rates of adoption; compatibility and complexity parameters are maintaining steady the rates of adoption, and finally, the observability parameters are decreasing the rates of adoption.

Summarizing the implications of Table 4 we can observe that only two of five attributes of innovation are increasing the rates of adoption. Even the adoption of innovation under trialability and relative advantage attributes and the defined parameters (such as economic, initial cost, discomfort, time and effort, rewards, social prestige, etc.) is high, there are some barriers mainly referring to the quality of offline services. According to the latest survey ordered by EGC (2016b), the household connection to the internet in Moldova, the usage of internet and access to online public services is quite high. However, the quality of offline public services is still perceived positively by the consumers. Therefore, the advantage of going online or use cashless transactions
does not represent a clear difference for the citizens at this stage, meaning that the identified relative advantages might be insufficient.

4.5.2 Service providers perspective

Table 5 provides a summary of the empirical findings and analysis among the payment service providers perspective (both public authorities and payment operators). Similar to the consumers perspective, the table includes the five attributes of innovation, a list of parameters that had been used to measure each attribute, and shows how each parameter affects the rates of adoption.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Parameters</th>
<th>Rate of adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantage</td>
<td>Efficiency</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Low cost/Savings</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Reduced corruption/transparency</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Traceability/measurement</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>Rewards</td>
<td>→</td>
</tr>
<tr>
<td></td>
<td>Cashless payments</td>
<td>↓</td>
</tr>
<tr>
<td>Compatibility</td>
<td>Meeting expectations</td>
<td>→</td>
</tr>
<tr>
<td></td>
<td>Change perception</td>
<td>→</td>
</tr>
<tr>
<td>Complexity</td>
<td>Easy to understand/Intuitive</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>User-friendly interface</td>
<td>↑</td>
</tr>
<tr>
<td>Trialability</td>
<td>Pre-testing and testing</td>
<td>↑</td>
</tr>
<tr>
<td>Observability</td>
<td>Knowledge and awareness campaigns</td>
<td>↑</td>
</tr>
</tbody>
</table>

Source: Authors elaboration

Based on the data provided in Table 5 we can observe from the innovation attributes that most of the parameters of relative advantage, complexity, trialability, and observability are increasing the rates of adoption; compatibility parameters are maintaining steady the rates of adoption. Only one parameter of the relative advantage - cashless payments - is decreasing the rate of adoption. Here should be stated that most payments made in Moldova are still in cash due to the lack of trust in Moldovan banking system, population's preferences or previous practices to withdraw money directly from the banks or bank terminals and consequently go through traditional ways of payment and requesting offline the public services, rather than going online. The offline option is also possible via MPay. It allows the beneficiary to pay for public services that are available only in traditional format. Additionally, through the MPay service, payments could be processed with any payment instrument, legally available in the Republic of Moldova. If the beneficiary does not have a credit card, payment is covered in cash using the payment terminals, bank counters or online via the internet banking systems of the bank whose client is the beneficiary.
Summarizing the implications of Table 5 we can notice that four out of five attributes of innovation are increasing the rates of adoption. This could be explained by the factor that MPay was implemented with the purpose to make the public sector more transparent, to cut corruption and bureaucracy at the governmental level. Moreover, there was a push and a strong commitment coming from the Moldovan Government side to adopt the innovation and encourage private public partnership (including banks, payment operators or IT developer’s companies) to boost the service. Consequently, the adoption rate reached by a smaller amount of institutions (among them public authorities and payment operators) comparing to a larger number of existing consumers/end-users turned services providers category into the main beneficiaries of a higher MPay adoption rate.
5 Conclusions

The thesis aims to overcome the limitation related to diffusion of innovation for the adoption of governmental electronic payments at the governmental level and the rate of adoption among consumers, public and payment services, providers. Our findings have identified several factors that affect the diffusion of innovation and the public electronic payments, demonstrating the main motivators for the rate of adoption of the innovation analyzed through the perspective of five perceived attributes of innovation. After performing the four stages of the case study methodology implemented under the current research the literature gap could be fulfilled and enough empirical evidence to answer our research questions could be collected to answer the envisaged research questions.

For this aim, a set of EGC internal and secondary data, implicitly a complex literature review was performed. Nevertheless, among the main methodology limitations and constraints were identified: (1) limited data about governmental e-payment systems designed for public services collected from the analyzed literature, and (2) the vast amount of data available about Moldova case study and a selection of a limited amount of information to be inserted into the research. Though we had these limitations we could conclude our research based on the case study methodology adopted. Primary data was not collected as the secondary data was sufficient to answer to the envisaged research questions. These data have been accurately documented and reused for the research purpose. By analyzing them, we aimed to provide context to understand the motivations behind people’s attitude and behavior, thus explaining the results, and capture the findings of the governmental e-payment systems via the diffusion of innovation theory, the perceived attributes, and rate of adoption of innovation.

Collis and Hussey (2014, p.2) states that “The general purpose of academic research is to investigate a research question with a view to generating knowledge”, according to this statement the research implications of the current thesis is to generate general knowledge based on the identified gap, delimited by the diffusion of innovation for adoption of governmental electronic payments as per the defined research questions. The most important contribution is towards the analyses made and interpretation of data, key concepts, empirical evidence to support the assertions or interpretations presented, findings of the main topic and conclusion chapter focused on what was found and what led into the implications of the findings, defined limitations of the research and future research suggestions.

Reverting to the selected research questions, we must mention that the first question "How do citizens, public and payment services providers perceive e-transformation of governance and the electronic public services?" refers to the perceived attributes of innovation, and the second "How can the Moldovan public e-payment system rate of adoption be measured with the diffusion of innovation s-curve among consumers, public and payment services providers?" refers to the rate of adoption.

Based on a deep and extensive empirical evidence collected, the answers to the present questions and what was perceived by the researchers is that comparing to the Consumer perspective the rate
of adoption is increasing more for the Services Providers. Under the Public and Payment Services Providers perspective out of five attributes, four (all except for compatibility) are increasing the rate of adoption of innovation comparing to two attributes (relative advantage and trialability) under the Consumers’ prospective. Thus, we can conclude that comparing the two perspectives, the Services Providers have a much higher rate of adoption comparing to the latter. This happened mainly because MPay was implemented with the purpose to make the public sector more transparent, to cut corruption and bureaucracy at the governmental level. Moreover, there was a push and a strong commitment coming from the Moldovan Government side to adopt the innovation. Consequently, the adoption rate reached by a smaller amount of institutions (among them public authorities and payment operators) comparing to a more extensive number of existing consumers/end-user turned Services Providers into main beneficiaries of a higher MPay adoption rate. To answer the second question, the researchers used the number of monthly transactions for the first selected perspective (consumers) and for the second perspective (payment services providers) the researchers considered the number of organization/institutions and their services integrated yearly with MPay.

Another important finding is that according to different researchers the relative advantage and compatibility attributes are two most important and successful attributes directly related to increasing the adoption rates. They are viewed as similar, although they are conceptually different, something to take into consideration when planning to introduce a new product in the market. Under the current research, the compatibility attribute is maintaining steady and not affecting the adoption rate. The steady level of compatibility parameters defined from the perspective of citizens (meeting expectations and satisfaction of quality) and services providers (meeting expectations and change perception) are considering the citizen’s satisfaction with the quality of the online public services, suggesting that there is not enough research on the identification of the citizens’ needs, and an inconsistency with existing citizen’s values, generating a steady degree of the rate of adoption along the last three years. In terms of meeting citizen’s expectations parameter, it was concluded that it remained steady for the last two years and had increased compared to year the service was assessed for the first time. Moreover, the level of confidence represents an average level of complying citizen’s expectations which can remain the degree of the rate of adoption. From the services providers’ prospective, the role of MPay is treated and perceived by the main users separately when referring to the public authorities and banks, and MPay. MPay was one of the successful attempt to introduce innovations by changing the perception of the CPAs level about the experience of citizens and businesses while performing payments for public services. Due to the existing infrastructures, MPay managed to create horizontal organizations eliminating organizations silos, to serve as a faster, more efficient tracking tool in the collection of incomes/revenues, reducing delays and costs for the government payment collection process. Even though, still public institutions and banks, due to the image and decreased credibility they have, maintain an unchanged perception about their efficiency while providing public services to its customers.

Even we have the relative advantage attribute and parameters (such as economic, initial cost, discomfort, time and effort, rewards, social prestige, etc.), and the trialability attributes that increase the rates of adoption, there are some barriers, mainly referring to the quality of offline services. According to the latest survey ordered by EGC (2016b), the household connection to the
internet in Moldova, the usage of internet and access to online public services is quite high. However, 37% of citizens in 2016 find online public services still complex to use, but in the same time, the quality of offline public services is perceived positively by the consumers. This might hinder the rates of adoption of online public services. According to these data, we can infer that for consumers, using online or offline public services does not represent a clear difference, meaning that the existing relative advantages might be insufficient at this stage.

An important finding was that part of the scope of the research was to search and review the methodologies and theories that previous researchers adopted in topics related to diffusion of innovations. As a result of that analysis, the researchers could identify a pattern among the paradigms, methodologies, and theories adopted by researchers that had different backgrounds and focused in different industries. Based on these findings, interpretivist paradigm, qualitative/case study approach and diffusion of innovations were adopted for the current thesis.

The sustainability aspect of a public electronic system would be strongly related to several dimensions analyzed into the present research: ownership by the Government, financial sustainability, and institutional sustainability. The data analyzed proves that MPay as a service created to enable contributors to pay fees, taxes, and contributions due to state authorities is generating huge savings for the national budget of the Republic of Moldova. Thus, encouraging the adoption of e-payments not just as a technology, but a more complex tool, would bring value both to governments, consumers and service providers. Moreover, to keep a system working and increase its adoption rate, driving incentives should be also considered.
6 Future research

As stated earlier, the diffusion of innovations theory is composed of four main elements, (1) innovation, (2) communication channels, (3) time and (4) social system (Rogers, 1983). These four main elements are critical to predicting the adoption of an innovation. Under the current research, out of these four elements, only one (1) variable of the diffusion of innovation theory was analyzed - the innovation variable. Thus, to perform a deeper analysis the researchers suggest that future analyses can be performed to the rest of three (3) variables (communication channels, time and social system).

Also, Rogers (1983) noted that although there is a lot of diffusion research on the characteristics of the adopter categories, there is a lack of research on the effects of the perceived characteristics of innovations on the rate of adoption. Therefore, the analysis of these effects could be also considered by future researchers.
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